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WHAT'S NEW IN PROCESS TECHNOLOGY
AUTOMATION + CONTROL + INSTRUMENTATION

PROtop

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Weidmüller

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WHAT'S NEW IN
PROCESS TECHNOLOGY
MARCH 2017

CONTENTS

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www.processonline.com.au/magazine

ON THE COVER

Weidmuller presents their new flagship power supply family, the PROtop. This high-end power supply range has been offered to meet — and exceed — some of the most demanding requirements found in the Australian market.

Introduced in this series is a unique to the market, built-in O-Ring MOSFET redundancy capability. This allows for true N+1 redundancy without requiring any external diode modules, reducing wiring complexity and saving precious cabinet space.

Featuring DCL (dynamic current limiting) technology, the PROtop power supply can reliably trigger circuit breakers with a top boost of 600%, while in addition, it can reach continuous peak reserves from milliseconds to seconds ensuring powerful motor starting.

Efficiencies up to 94.5% reduce power losses significantly, which allows the PROtop to reach new levels of space saving — only 39 mm width for a 10 A device.

Designed for use in the process, energy and mining industries where a high level of reliability is required, the PROtop provides an MTBF of greater than 1,000,000 hours, which ensures a long lifecycle of greater than 10 years.

Even in challenging conditions, the PROtop continues to provide. With a maximum operating temperature of 75°C and high resistance to vibration, it can survive in some of Australia's harshest environments.

Its unique features make PROtop your first choice for reliability, service life and energy efficiency, even under extreme temperature and vibration conditions.

Let's connect.

Weidmuller Pty Ltd
www.weidmuller.com.au/au/protop

Weidmüller

EDGE COMPUTING PRIMER

IoT INTELLIGENCE STARTS AT THE EDGE

You've heard about cloud computing, which is using a network of remote servers to store and manage data and run computer programs. Edge computing brings cloud computing down to the edge of the network, in the physical world — filtering and processing data to send only the required data to the cloud.

On the train to work, Lee opened an email on her smartphone sent from a PAC (programmable automation controller) operating a surface-mount tool at her factory. The PAC attached a quality control report to the email that suggested changing the tool's solder temperature.

To generate that email suggestion, the PAC had securely sent yesterday's production data to a cloud-based analytics system to compare current and historical data for the machine. Next, it accessed the machine manufacturer's website and obtained the latest recommended settings. Finally, the PAC built a production efficiency report with a suggested solder temperature for today's production run that would increase yield by 7% over yesterday's run.

Lee clicked a link in the email and connected to the PAC's mobile interface over a secure, encrypted channel. Lee logged in and navigated to the machine's solder temperature setpoint, where she entered the recommended value.

All this took place before she got to the office.

PAC at the edge

That PAC operating the surface-mount tool at Lee's factory operates at the edge of the factory's network.

Systems like these at the network edge are increasingly able to leverage cloud-based resources to perform edge computing — if computing resources exist as needed along the path from a sensor to the cloud — and if these computing resources reduce the total amount of data to be sent to the cloud for storage, processing and analysis. As a result, businesses can more quickly identify real opportunities for operational efficiency improvement and meaningful revenue generation.

To foster such business benefits, data from the physical world of machines and equipment must be available to the digital world of the internet and information technology systems, quickly, easily and continuously.

Successful IoT applications require operational technology (OT) professionals to make data from their systems, which monitor and control the physical world, accessible to the data processing systems of information technology (IT) professionals.

Once the data is there, cognitive prognostics algorithms running on IT systems can analyse it, refining raw physical data into actionable information that can predict outcomes in real time. The results can be used to improve inventory management and predictive maintenance and reduce asset downtime.

But before such benefits can be realised, three problems need to be solved: connectivity, big data and IoT architecture.

The connectivity problem

The Internet of Things runs on vast amounts of data, generated by the physical world and then transported and analysed by the digital world. It's an attempt to achieve perpetual connectivity and communication between people and things and even between things and other things. But unfortunately most of these things were never designed to serve this new purpose. They were designed and installed long before the internet was developed.

At the edge, things like sensors, circuits, relays and meters are attached to industrial control systems used to operate equipment and machines. These sensors translate what's physically happening in the world (temperature, light, vibration, sound, motion, flow rate and so on) into an electrical signal like voltage or current that can be interpreted by other systems to monitor and control physical equipment and machines.

These sensors typically have little or no intelligence and are designed to merely observe and report. They were not designed to communicate with the digital world of the IoT. They also lack the physical connections and logical interfaces to communicate on the Internet of Things. Many do not have a built-in Ethernet jack or wireless interface, let alone speak or understand the languages the internet uses, like JSON, RESTful APIs and JavaScript. They don't run an operating system or have a built-in TCP/IP stack or web server.

And they have little or no built-in computing power, so providing edge computing at this level to filter volumes of data before forwarding to the cloud is impossible.

Right now the internet and the things we want to connect to it aren't communicating.

> RIGHT NOW THE INTERNET AND THE THINGS WE WANT TO CONNECT TO IT AREN'T COMMUNICATING. THERE'S A DISCONNECT BETWEEN THE PHYSICAL WORLD OF CURRENT AND VOLTAGE AND THE DIGITAL WORLD OF SERVERS AND CLOUDS.

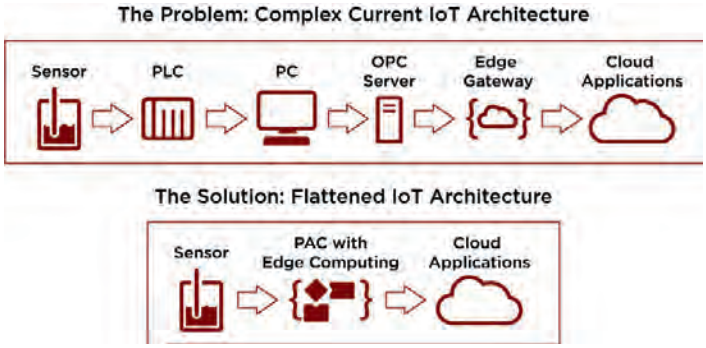

Figure 1: Reducing complexity with a flattened IoT architecture.

There's a disconnect between the physical world of current and voltage and the digital world of servers and clouds.

Integrating these disconnected things and systems is no small task. And with the significant potential technical pitfalls and risks of integrating these disconnected systems, we begin to wonder how long it will take to realise return on our investments in IoT applications.

One option is to simply wait for highly intelligent, connected sensors to become available to the marketplace. But those sensors are years away from being cost-effective.

Moreover, sensors installed today or even decades ago are still performing their tasks. They're just not connected to the IoT, so the data they generate is siloed and inaccessible to IT systems for further analysis.

The big data problem

Across the globe a massive installed base of things exists today, generating useful data that the IoT wants to access and consume. In oil and gas applications a typical oilfield has up to 30,000 sensors installed. Factories and plants across the world have billions of sensors.

Each sensor is capable of generating huge amounts of data from the physical world. Some IoT applications could potentially generate terabytes of data per second. These are volumes of data the digital world has never seen before. This is the big data problem.

Moving that much data onto existing network and internet infrastructures for cloud-based analytics and centralised management will clog networks, vastly increasing network and internet latency. For many industrial IoT applications, that is not acceptable, because real-time control and monitoring are mandatory.

For the Internet of Things to reach critical mass, intelligence must be pushed to the network edge, where the physical world meets the digital world. Computing systems at the network edge must have the capability to collect, filter and process data generated at the source, before it's transmitted up to the IoT.

And at the same time these edge computing systems must be able to complete the local real-time process control and automation tasks of traditional industrial applications.

The IoT architecture problem

Let's take a look at how today's IoT architecture works, so we can see its complexity and perhaps find a path forward.

For a cloud-based server to capture data from an analog sensor today, the sensor's data must be translated using a series of disparate software and hardware tools. First, the sensor is physically wired to a device such as a PLC. While modern PLCs do provide basic analog-to-digital conversion of sensor signals, PLCs were not designed to interface with the Internet of Things.

PLC hardware, software and programming languages were designed for repetitive, application-specific tasks like process control and discrete automation. They typically use proprietary protocols and languages for communication and programming, and do not include information security standards like encryption and authentication.

PLCs were originally designed as standalone systems. The protocols they use are seldom internet compliant and are designed for point-to-point communication instead of the point-to-multipoint communication architecture found in the IoT ecosystem. If systems that communicate using internet-compliant protocols — such as PCs, web servers and databases — want to communicate with a PLC, a vendor-specific and often proprietary software driver or hardware-based protocol gateway is required. OPC software is one solution to this communication disconnect, but OPC was originally designed around PC architecture using the Microsoft Windows-only process exchange, COM/DCOM. Most systems and devices connecting to the IoT are not Windows-based devices.

For example, take your smartphone. It's likely an Apple or Android device, both of which run modified versions of the Linux operating system, where COM/DCOM process exchange does not exist.

OPC UA (Unified Architecture) has been released, but it's merely a wrapper for existing OPC drivers built on Windows architecture. It requires design engineers to build an OPC UA client adapter into their products. And even then, modern network and internet assets such as web servers, databases, smartphones and tablets do not speak OPC UA.

PLCs, OPC servers, proprietary drivers and protocol gateways quickly become a convoluted IoT architecture. These layers of complexity not only require time, money and specific domain expertise to install and maintain, but also the data being sent from the physical world has been converted by so many different pieces of hardware and software that data integrity can be jeopardised.

And then consider that today's automation architectures often do not address information security. Sending data generated at the edge through so many layers of conversion not only increases network latency but also

> IN THE LONG RUN, OT/IT CONVERGENCE WILL DEMAND A FLATTENED ARCHITECTURE AND SEAMLESS COMMUNICATION BETWEEN ASSETS, USING OPEN, STANDARDS-BASED COMMUNICATION PROTOCOLS AND PROGRAMMING LANGUAGES.

opens up complex information security concerns as the data is transported to the cloud.

Multiply these issues across the billions of devices we expect to connect using the IoT, and you see the communication challenge the IoT faces.

There has to be a better way.

Flattening the IoT architecture

As we've seen, for the IoT to reach critical mass, internet protocols and technologies need to be driven into systems at the edge, where the physical world and the digital world connect.

Layers of complexity must be removed from the communication process between digital systems and physical assets. Modern IoT system architectures must be flattened, streamlined, optimised and secured.

If we drive internet connectivity and data processing power into edge devices, we can greatly accelerate our time to insight and action. Edge computing devices will become the sensor on-ramp for the billions of data points we intend to connect to the IoT. These edge computing systems will need the ability to receive the input signals of the physical world and output the meaningful data the IoT needs, in a form that digital internet-enabled systems already understand.

Edge computing systems must easily and securely access the cloud through the open, standards-based communication technologies the internet is based on.

That means:

- internet technologies like TCP/IP, HTTP/S, MQTT and RESTful APIs — the dialect of the internet — must be built directly into the input/output level, or the point of physical to digital conversion;
- internet security technologies like SSL/TLS encryption and authentication must be built in directly to edge computing systems;
- cloud-based systems must be able to make RESTful API calls to access data, or subscribe to data points on remote edge devices, without the layers of complexity and conversions that exist in industrial applications today.

The power of interoperability

We did not always have one cohesive system for sending and transmitting information. Before the internet and the World Wide Web, many different internet-like protocols and architectures existed. Computer systems all ran different operating systems requiring different programming languages.

Small pockets of interconnectivity existed, but for the most part systems were disconnected from each other. It was very similar to the way industrial systems communicate today, with the need for converters, adapters and gateways.

The internet was designed to allow I/O and information systems to share data through a common interface, removing layers of complexity and allowing for greater interoperability between systems designed and manufactured by different vendors. That's why an Apple computer or Android phone today can send an email to a Windows computer: they speak the same internet languages. Today's internet uses a common set of protocols, tools and routines designed to make the transportation, acquisition and analysis of digital information a seamless process, no matter what device you're using.

Although sensors and other physical assets installed at the edge may not have been designed with internet interoperability in mind, there's still a massive opportunity to collect meaningful data from the huge installed base of existing things. But it will require a solution that understands both sides of the OT and IT convergence — something that can:

- locally translate the physical world of currents and voltages (OT) into the secure, RESTful APIs and JSON (JavaScript Object Notation) frames the digital world (IT) understands;
- process and filter mountains of data, sending only the necessary data to the cloud for analysis;
- provide communications interfaces and processing power to maintain the closed-loop, real-time control requirements of industrial applications;
- deliver all of the above in a package suitable for challenging industrial environments where dust, moisture, vibration, electro-mechanical frequencies and temperature vary widely.

Conclusion

We've seen that edge computing is the sensor on-ramp to the IoT. Until the communication, security and computing technologies of the internet find their way into computing at the edge, the IoT will fall short of its potential.

Internet technologies are available in some industrial systems today. And some vendors have already started bridging the gap between OT and IT by adding IoT technology like MQTT, RESTful APIs and JavaScript directly into programmable automation controllers (PACs). Our shortest path to a successful IoT is to leverage the existing interoperability technologies of the internet in industrial automation products and applications.

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www.systems22.com.au

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AMS Instrumentation & Calibration Pty Ltd

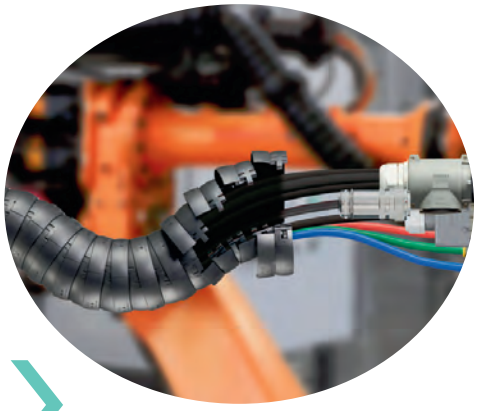
http://bit.ly/2lo3jUn

HMI PLCs WITH CODESYS 3

Turck's TX500 HMI PLCs are suitable for use in small to medium-sized machines whose processes have to be controlled, displayed and operated locally.

Turck Australia Pty Ltd

http://bit.ly/2lnO2Tr



READY-TO-USE ROBOT DRESS-PACKS

For the quick replacement of energy chain systems on welding robots, igus now offers fully assembled dress-packs.

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At a narrow 12 mm wide per module, the Valvetrab SEC Type 2 surge protective device is highly compact and reduces the need for installation space to a minimum.

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SEW EURODRIVE

Foundry determines OEE performance indicators with RFID

WESO is one of the largest foundries in Germany and has produced high-quality cast iron products for the global market for more than 120 years. The product portfolio includes precision cast parts for mechanical engineering and drive construction, pumps and fittings, refrigerating machines, tractor and rail vehicle construction and components for heating boilers. The latter comprise 135 different variants in sizes from 15 to 270 kW. The throughput times are between 7.4 and 122 minutes.

By installing a UHF industrial RFID system from Balluff onto the assembly line for heating boilers, WESO foundry has solved one of the most difficult problems for determining OEE key performance indicators.

Determining KPIs for OEE (overall equipment effectiveness) always proves to be extremely difficult if detecting and comparing parameters using a control system is not possible in process flows. This is frequently true for assembly lines with primarily manual or semiautomated processes. As part of a ReVista project, Michael Kreide of WESO actively sought the most difficult range to measure on an assembly line for heating boilers. He did this in order to implement existing monitoring of the energy management system using component identification at every point down to the product level.

ReVista is a concept encompassing comprehensive resource and availability-oriented maintenance strategies. These strategies enable material and energy-efficient production and ensure availability as needed during operation.

"In addition to the special requirements due to greatly varying component dimensions and changing assembly positions, we sometimes handle liquid working materials. The environment is already relatively unforgiving, and this makes it even more difficult to recognise components using optical systems," said Kreide. This is why he sought out an RFID solution for identifying the heating boilers individually in the respective stations of the assembly line. This allows the actual consumption of operating materials such as electricity, compressed air, working material and the like to be tailored accurately to each heating boiler and allows the KPIs to be determined.

For Kreide, this makes RFID the ideal technology, because it can ensure automatic identification of objects of any kind and does so without direct visual contact between the data carrier and reader, and even if the data carriers are covered in dirt. Of the five different Balluff RFID systems, the UHF BIS U version is the optimal solution for the assembly lines at WESO, as it can cover read areas of up to six metres.

However, the challenge now is to configure the process parameters of the reading system — the operating point — so that the only data carrier detected is the one that is supposed to be detected. This has to happen even if there are still other data carriers in the immediate vicinity, since this is unavoidable at WESO. This is achieved by varying antenna power to determine the setting value at which the transponder function is just barely guaranteed but other transponders do not respond, and then the transmitting power is increased to set the operating point so that the identification system is immune to changes in the environment, component or assembly.

Since the ambient conditions of the individual RFID reading points differ from each other, the field intensity and the corresponding antenna transmitting power must be determined individually for each detection point. Technicians from Balluff do this on-site using their special Power Scan procedure supported by software developed specifically for commissioning these types of applications, which allows the sensitivity of the data carrier to be measured at an assembly point in the space in front of the antenna.

Setting the process parameters using the Power Scan process also provided the ideal positions for the antennas as well as the most suitable attachment point on the heating boiler housings for interchangeable data carriers. The first of four antennas covers the material pick-up area. Here, the individual segments of the heating boiler are positioned by hand and a data carrier with a permanent identification number is affixed onto the base body. A second antenna detects the transponder when the heating boiler moves into the next joining station.

After press-fitting, various attachment parts are assembled before the heating boiler reaches an inspection station for a leakage test. A third read station installed here makes it possible to assign operating and auxiliary material consumption selectively once again.

"Configuring the read station in this area proved to be particularly challenging because up to four heating boilers can be in the confined space within the inspection station depending on the type of heating boiler," explained Kreide. Once the leakage test has been completed, the heating boilers reach the packaging area where the transponder is removed again and, at the same time, the completion message is issued by the fourth antenna installed at this point.

Balluff Pty Ltd

www.balluff.com.au

A longer and more detailed version of this article can be read online at: www.bit.ly/2m4N1QP

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A DIVISION OF THE KAISHAN GROUP

REFRIGERATED AIR DRYER WITH PCM TECHNOLOGY

The FLEX Series refrigerated air dryer from Hankison utilises a phase change material (PCM) to efficiently remove liquid from compressed air.

A PCM is a material that harnesses latent heat produced as it converts from solid to liquid or liquid to solid. While latent heat is being absorbed or released, the process is isothermal and the energy from the heat is used to change the form of the material. The PCM has high latent heat properties, meaning it absorbs heat at constant temperature as it melts or freezes and stays colder for longer periods of time. While the PCM absorbs heat from warm, moisture-laden compressed air there is no significant rise in temperature.

Designed with a 3-in-1 heat exchanger, the PCM encapsulates the refrigeration and compressed air circuits. This allows the phase change material to stay colder for longer periods of time, cycling the refrigerant compressor less often than conventional energy-saving designs. As the FLEX Series dryer automatically matches the compressed air load at any point in time, it can be sized to the maximum plant compressed air load without a material energy consumption penalty.

The PCM itself is an eco-friendly refrigerant that melts and solidifies above 0°C and does not require the use of glycol, pump, tank or hot gas bypass, further increasing the efficiency of the dryer. FLEX Series dryers minimise the number of components for easy servicing and maximum reliability. Additionally, they have an integrated controller with clear LCD display for easy monitoring and operation.

SPX Flow Inc
www.spxflow.com/au

CORONA CAMERA

The UVollé-VX is a handheld, battery-operated corona camera that enables the user to detect, test, record and display both corona and partial discharge. It is available to rent from TechRentals.

With in-built DayCor technology, the UVollé-VX is designed to provide accurate, reliable data relating to the occurrence of corona for predictive maintenance needs. Featuring visible and UV zoom functionality, this device allows for the seamless capture of still/video footage for both indoor and outdoor application. Reporting, researching and comparison analysis is easy due to the detection of corona intensity being presented as a count of the captured UV events per time unit.

The Uvollé-VX features full manual and auto-focus for UV and visible channels, as well as GPS, temperature and humidity interfaces. The UV optical spectral range is from 240 to 280 nm, and it has a 5″ WVGA sun-readable backlit TFT LCD screen with a brightness of 1000 cd/m^2.

TechRentals
www.techrentals.com.au

CONFIGURABLE PANEL PC

The Advantech PPC-6151C is a configurable panel PC featuring a 15″ true-flat resistive touch TFT LCD display and an optimised chassis with 2.5″ SATA HDD bay. The PPC-6151C can be equipped with various certified mini-ITX motherboards and configured to specific application requirements. In addition to multiple I/O ports, including RS232/422/485, DisplayPort 1.2, VGA, USB 3.0, Line-Out and Mic-In, the system features an integrated PCI/PCIe x4 slot to enable flexible expansion for increased functionality. The entire system is CE and FCC Class A certified while the front panel is IP65 rated for protection from water and dust, making PPC-6151C a suitable system for industrial applications in a wide range of environments.

The PPC-6151C is said to be the first commercially available configurable panel PC compatible with any mini-ITX motherboard. Advantech have developed a proprietary daughter board that transmits display panel signals to the motherboard. This allows customers to select their preferred mini-ITX motherboard platform and configure the system specifications and functions according to their usage requirements and budget considerations, rather than overspending on redundant features. This flexible design also means that in the event of a motherboard failure, a replacement motherboard of the same model can be directly installed on-site.

Advantech's configure-to-order service team offers professional technical support and customisation services to deliver solutions that satisfy customers' specific requirements. In addition to providing a list of pre-certified motherboards that can be installed in seven days, Advantech's Panel PC Product Division can certify any off-the-shelf motherboard within 30 days, reducing the system development time.

Advantech Australia Pty Ltd
www.advantech.net.au

DISCRETE I/O WITH PEER-TO-PEER TECHNOLOGY

Acromag's XT1111 Modbus/TCP discrete I/O is designed to provide a reliable, simple way to communicate with multiple distant locations.

Where a user has multiple remote locations linked over an Ethernet network, each requiring discrete outputs, Acromag's i2o peer-to-peer communication on the XT1111 Modbus/TCP discrete I/O module can send one signal from a central control room PLC that can be split and retransmitted to the many remote sites at the same time.

Channels are individually configurable for input or low-side switched output operation.

The XT1111 has an input range of 0–32 VDC, TTL thresholds and an output range of 0–32 VDC, open-drain, up to 250 mA. Ethernet communication includes Modbus/TCP, EtherNet/IP, Profinet, i2o peer-to-peer, 10/100Base-T(X) PriorityChannel device determinism and a power requirement of 12–32 VDC at 2.5 W.

Rugged construction, high-density design and easy USB-to-PC/Windows set-up combine for an effective I/O solution. These units are suitable for remote monitoring, distributed control or SCADA applications.

Metromatics Pty Ltd

www.metromatics.com.au

CONTRAST SENSOR

In many packaging processes, contrast marks must be reliably detected on film, bag and blister packaging or on labels.

With its integrated three-colour technology (red, green, blue), automatic sensitivity readjustment and an integrated dual-channel IO-Link interface, the KRT 18B colour contrast sensor is suitable for meeting the requirements of rapid packaging processes in foil-bag packaging machines, label detection in filling systems and detecting glossy and faded marks.

The KRT 18B colour contrast sensor is easy to set up by use of an alignment aid and a bar graph indicator (on the rear of the sensor) to indicate signal strength.

Different models are available with various options depending on the application. The Standard model is designed for simple applications, while the Teach model is for more universal use. The Multi-turn model allows for manual optimisation, the Tracking model is for maximum reliability with detecting difficult marks. The Speed model provides precise positioning with fast processes, while the Analog model is designed for signal evaluation in the PLC.

The stainless steel compact housing is designed for high temperature stability and is suitable for use in areas with stringent hygienic requirements with IP67 and IP69K degrees of protection. The KRT 18B also has various mounting options and accessories.

Leuze electronic Pty Ltd

www.leuze.com.au

DEVICE COMMUNICATOR

Emerson Automation Solutions has introduced Power the Loop technology for the AMS Trex Device Communicator, helping users work more effectively and perform faster device configuration — on the bench or in the field — by removing the need for an external power supply.

The Trex communicator supports Emerson's Project Certainty initiative, adding flexibility in project scheduling and helping project teams achieve faster start-up times. When using the Trex communicator in the field for new projects, Power the Loop technology can help take device configuration off the critical path. The Trex communicator allows users to power devices directly from the handheld communicator. Users can perform device configuration tasks before power and I/O infrastructure are in place, and without the need for the installation of the host system, wiring, piping and other elements. During everyday field maintenance, users will no longer waste time searching the shop for a compatible power supply or confirming adequate loop resistance before connecting to a device. Technicians can simply connect the communicator to a loose device to power it, speeding configuration on the bench.

The Trex communicator is designed to give technicians the flexibility they need to work efficiently in the field without carrying extra equipment, increasing productivity and speeding project start-ups.

Emerson Automation Solutions
www.emersonprocess.com.au

PASSIVE SIGNAL ISOLATORS

PISO is a range of passive signal isolators from Klemsan. Designed as a low-cost alternative to active signal isolators, they electrically isolate extra low voltage analog signals. They can also assist in mitigating ground loops, ungrounded signals, induced voltage spikes and electrical noise in long cable runs to protect expensive industrial PLCs and I/O equipment.

The PISO range includes analog current inputs for both single and dual channels in one compact DIN rail housing plus a splitter type with a single input to dual output. For example, one analog sensor's output can be fed into two devices such as a local LED display and PLC I/O for control in the same compact housing.

Designed to isolate and retransmit, the PISO range will convert the analog output type to 0–20 mA, 4–20 mA, 0–5 V or 0–10 V. Incorporating overcurrent protection and very low output ripple, the PISO range are designed to guarantee the analog output accuracy value less than 0.1% error in respect with the analog input measurement.

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

SLIDE SYSTEM

HepcoMotion's SL2 stainless steel-based slide system includes a range of stainless steel slides and bearings, together with specially treated aluminium components.

Suitable for applications requiring high precision under cleanroom conditions with no lubrication, or corrosion resistance in washdown and harsh environments, the system offers long service life with virtually zero maintenance, according to the company.

The linear range consists of stainless steel bearing assemblies, flat slides and spacer slides produced from AISI 400 series stainless steel. A complementary range of lightweight aluminium carriage plates and flange clamps are also available with special surface treatment providing corrosion resistance. The treatment process for the aluminium is approved by the US Department of Agriculture for use in food processing machinery.

The V-shaped slide surface provides the system with smooth-running and low-friction characteristics which allow it to be operated dry, without lubrication, for sensitive applications.

In most circumstances, the system can also be equipped with cap seals that prevent the ingress of dirt, provide positive lubrication and extend service life. Grease used can be temperature-resistant, food-compatible or suited to a nuclear engineering application specification.

There are seven sizes of flat-slide sections and four sizes of spacer-slide sections in the range. All slides are available in lengths up to 4 m, except for the smallest size. There are three lengths of carriage plates available for each slide, with the option of either double-row or twin-bearing assemblies.

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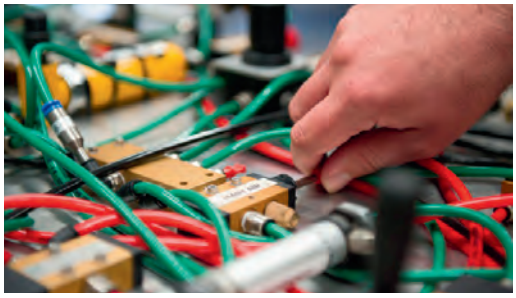

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To complement the PGC hand pump there is also a 40 bar T-Hose set with fittings that match the PGC hand pump and Beamex pressure modules in the same way that the current 20 bar T-hose set does.

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THE DIGITAL TRANSFORMATION OF AUSTRALIAN INDUSTRY

In the world of process control, we are seeing tremendous advances in technology ranging from smart devices through to process control analysis tools that promise to optimise the efficiency of our industrial sites. Many claim to lower costs and deliver higher end performance solutions. It seems that a large number of the major companies that I talk to are putting their digitisation plans into play. But will digitisation really deliver what we expect? Or are we simply catering to the whims of process engineers who crave the latest and greatest technology, in the same way that we all 'just have to have' the latest smartphone?

It often seems to me that we are rapidly losing our ability to keep up with the massive amounts of data being processed in Australian manufacturing plants. One of the biggest challenges is managing the data and analysing it so that we can work out trends in our performance and make continuous improvements. Rather than holding back on new technologies, embracing them is seen as the way to harness this information and do something useful with it.

Digitisation has only just begun to transform Australian industry, but the pace of change is dramatic, to say the least. Although challenging, it is an exciting time for Australia as opportunities open up to enhance our competitiveness and improve our cost base. We are using more and more 'smart' instrumentation, actuation devices, valves and process equipment to provide advanced diagnostics and control as well as real-time knowledge of what's happening in our plants at any given time, even remotely from anywhere in the world. Standard global protocols are helping us to ensure that we can communicate with our equipment in a common way.

Hardware devices are getting smarter, but they are only one small piece of the puzzle. Harmonising process devices across the plant, through software that can tune equipment to work together in its respective loops while identifying the troublemakers and bottlenecks, is a great step forward. In this way we can empower optimisation teams to focus on those areas that provide the fastest and most cost-effective benefit to us.

Creating the culture for our employees to operate in this new world is also complex. It is important to challenge our people when we forge ahead with digitisation. To be successful, it must become embedded in our business culture and form a part of the mindset of our management — developing our staff and providing them with new leadership skills. Having a well-trained and motivated workforce is a key asset in such a rapidly changing environment.

Safety and plant up-times are benefiting greatly from these new technologies. We are already beyond preventive maintenance and well into understanding predictive maintenance of plant using the concepts of intelligent maintenance. Improvements in uptime using predictive diagnostics and increasing our productivity can realise substantial cost savings.

Digitisation is an area that most complex industries such as oil and gas are likely to invest in. This creates tremendous opportunity for Australian business. We have entered the era where we know that there will be future jobs that haven't been invented yet. Far from being a cost burden to business, it seems that digitisation and new technology opens the door to significant improvements across our industry. There is no doubt that the impact of sophisticated systems is being seen in a very positive way on the bottom lines of many Australian businesses.

By 2020 it is predicted that over 30 billion devices or more will be connected to the Industrial Internet of Things. This is leading us to the ability to connect ourselves to the whole world around us in many different ways. As we develop our digitisation plans we move to a level of systems capable of self-optimisation and self-analysis. Such systems will self-adjust to improve, and will even be capable of managing their own energy demands and adjusting to different external environmental conditions.

While success with digitisation is greatly dependent on our ability to connect simply and securely, the cost advantages and opportunities created are too powerful to ignore.

Hugh Gullick is currently head of Metso Australia's Flow Control Business. Hugh is responsible for the valves, pumps, services and performance solutions business throughout Australia and New Zealand. Having first studied mechanical engineering, then business and finance, Hugh began his long association with the flow industry very early in his career, over 35 years ago, as a trainee engineer at a large industrial valve manufacturer in the UK. Since migrating to Australia in 1992 he has held senior positions in a number of major flow control businesses, and now manages the growing portfolio of Metso Flow Control products.

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Mobile robot colleagues on wheels increase productivity and worker safety

High-mix, low-volume electronics manufacturer Scott Fetzer Electrical Group (SFEG) of Tennessee, through utilising collaborative robots, has optimised production by 20%, taking over monotonous and potentially hazardous tasks from employees now reallocated to more rewarding jobs.

SFEG was looking for ways to be more competitive on the global scale, while taking more advantage of existing machinery.

"One of our biggest challenges is we're a high-mix, low-volume producer, and most of our lines don't run all the time, so trying to find a way to put robots on the line in the traditional sense was a very big challenge," said Matthew Bush, director of operations at SFEG.

"We wanted to build a mobile, flexible robot force. The only way we would accomplish this was with a collaborative robot. We only saw a couple of offerings and the UR robot was the only robot that we thought could do the job. It's got the speed and precision of a standard industrial robot with the ability to move around and work next to humans."

SFEG placed the UR robots on pedestals with wheels and is now building the fleet of mobile UR robots deployed throughout the sheet metal department, integrating them in the entire production cycle from cutting the initial blank on the blanking press to forming, folding and final assembly of the electrical components. Additional robots are planned to help tend the turret presses and press brakes.

"We want to have robots standing by, waiting for a job to do. When the staff arrives in the morning, we'll have work-orders printed for employees to wheel the robots over to the tasks at hand that day."

The UR robots working the motor field line are a UR5 and a UR10 robot. The UR5 is placed at the end of the line right next to an employee that hands the robot a motor field part. The UR5 picks up the part, puts it in a holder, picks up a wire cutter to trim the wires, and then places the part for the UR10 robot to pick up and place on a conveyor for final assembly. The UR5 cuts 16,000 wires daily, a job that used to be performed manually.

"It's a potential carpal tunnel syndrome application. So we thought that was a great place to put robots — let them get carpal tunnel!" said Bush.

The two UR robots working in tandem communicate their position to each other through Modbus socket connections.

"We can interlock multiple robots together and read through Modbus/TCP the connections and robot status. We can also pass information along to other software packages, and collect data. It opens up a lot of doors to do a lot of things we're just now beginning to look at," said the principal engineer at SFEG, Jamie Cook, who found the implementation time to be a third to half of the time compared to previous robot experiences.

One of the new applications now using the UR robots for data collection is in the live testing of new designs, where a small motor manufactured at SFEG is placed in the customer product. The robot turns the product's switch on and off, runs it for a minute on, 30 seconds off, for the next 400 hours. The robot collects data pertinent to the test such as maximum and average current, and the number of cycles completed, transmitting that data to data storage.

"It's a quick way for us to perform lifecycle testing. We didn't have to set up a lot of equipment; the initial program took us only about 5 minutes to create," said Bush.

"It has enabled us to actually engage our customer in the testing as well — they're excited to see us use new technology to push our design faster into production. It gives us an advantage over our competitors thousands of miles away in low-cost source countries. We're now winning orders against Chinese competitors and bringing back work that used to be sourced in China as well."

Another task now handled by the mobile UR robot fleet is filling epoxy into circuit boards.

"In the past, employees would make up a big batch of circuit boards and they would stand there and manually fill them with two-part epoxy and send them down the curing line. Today, the robot does that all day long, enabling us to go to a one-piece flow," added Bush. "This is an example of an application that would not happen with a stationary robot as we have to move the robot in and out of the cell every day to dismantle the epoxy machine and clean up the cell.

"We're looking at everything we're designing now to make sure we can assemble it with a robot. If we can't put that together with a robot, we've got to go back to the drawing board and try again."

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CIP PROCESS EFFICIENCY

REAL-TIME MONITORING AND CONTROL — PART 2

The implementation of accurate process measurement in the CIP process enables food and beverage organisations to reduce waste and save energy, while minimising the production downtime needed for cleaning. In Part 1 we looked at the pressure and temperature requirements.

In the food and beverage industry, the cleaning of process equipment is critical to ensure the health and safety of the consumer, as well as maintain the quality of the product. Proper cleaning is essential for the production of high-quality food products, especially those with extended shelf life. As a result, cleaning-in-place (CIP) systems are commonly found in many dairy, processed food, beverage plants and breweries — replacing manual strip down and cleaning of process equipment.

In Part 1 of this article we examined the necessary conditions for effective cleaning of soil from food and beverage processing equipment, including the effective use of temperature and flow rate. We now need to look at the important monitoring of chemical composition of the cleaning wash cycles.

Concentration

Mechanical forces at the right temperature are not sufficient for many soils — the soils also need to be chemically attacked to help them leave the production surfaces.

Typically, there will be at least two cycles of chemical wash — usually an alkaline wash and an acid wash. Each wash is followed by a rinse cycle to clear out the remaining residue and chemicals.

Normally the alkaline wash takes place first — the alkaline chemicals help to break down the organic soil, such as proteins, fats and carbohydrates. The most commonly used chemical is caustic soda (NaOH), or a formulated mixture with NaOH and other additives to make it more effective or lower the sodium concentration in the waste. Sodium in wastewater poses an environmental problem because it is typically difficult or impossible for wastewater plants to remove. Potassium hydroxide (KOH) is sometimes used instead, but it requires a greater concentration and is significantly more costly than NaOH.

The caustic solution is usually used at a concentration of between 0.5 wt% and 2 wt%, although some foods may require a higher concentration. In most cases, however, a concentration that is too high can be counterproductive because it can induce crosslinking of proteins, making them harder to remove. In dairy applications, for example, 0.5 wt% has been found to be the most effective — dairy protein fouling is caused by protein crosslinking, and the right concentration of NaOH will break down the

> KNOWING WHEN A CYCLE HAS FULLY BEGUN... OPTIMISING THE CONCENTRATION THROUGHOUT THE WASH, AND KNOWING AS SOON AS CLEANING HAS COMPLETED, ALL SERVE TO MINIMISE THE WASTAGE OF ENERGY, CHEMICALS, WATER AND TIME, BY USING ONLY OF MUCH OF EACH AS IS NECESSARY.

crosslinks, while too much can induce more crosslinking. Similarly for breweries, the alkaline wash cycle breaks down the hop oils, tannins and resins that acid washing cannot. Mineral-based soils, however, as commonly found in milk or brewing, such as calcium oxalate, that lead to build-up of beerstone or milkstone, require an acid wash cycle to remove them.

The acid wash step is used to dissolve minerals, such as beerstone, water scale, calcium and magnesium carbonates, although it has some effect on organic soil as well. It is also more effective against bacteria than alkaline solutions. Typically nitric acid (HNO_3) or phosphoric acid (H_3PO_4) is used. As for the alkaline solution, there are also mixed formulas available. Nitric acid is typically used at a concentration of 0.5 wt% to 1 wt%. Having a solution that is too strong can attack some polymer materials and stainless steel.

Instruments for monitoring concentration and completion

Without a way of measuring the concentration of cleaning chemicals in a CIP system, a purely timing-based method tends to be used — assuming the whole system is up to the correct concentration and then running the wash through for a set period of time. To ensure cleaning occurs effectively, the set time for the wash normally includes a safety margin.

By installing conductivity sensors in the CIP return line, it is possible to know when the wash fluid is up to the correct concentration, and that ideal cleaning concentration has been reached — as well as when a rinse cycle has flushed the chemicals.

Conductivity sensors in the chemical storage vessels also confirm the correct concentration of the alkaline and acid cleaning solutions in storage, and whether the concentration needs adjustment after recycling.

It should be pointed out, however, that conductivity is related to chemical concentration via a calibration curve (Figure 1), and such calibration curves relate to a specific temperature. As temperature increases, conductivity increases for the same concentration. Given that different cycles of a CIP process may occur at different temperatures, it is necessary to compensate the conductivity measurement with real-time temperature measurement collected by a temperature sensor. Temperature compensation coefficients are also required for the chemical cleaning agent being used (see Figure 2).

Optical sensors can also be used to detect suspended solids in the wash return and to detect when soil is no longer present.

Conductivity and optical instruments can be used to:

- detect when the alkaline or acid wash solution has achieved ideal concentration (conductivity);
- detect and adjust for fluctuations in the concentration of the wash solution due to soiling (conductivity);
- confirm the flow of soil in the waste return (optical);
- confirm the end of the wash cycle by detecting no further soil (optical) and normal chemical concentration (conductivity);
- confirm the end of a rinse cycle when all chemicals have been flushed (conductivity);
- monitor the correct concentration of wash chemicals in storage (conductivity).

Knowing when a cycle has fully begun (correct concentration), optimising the concentration throughout the wash and knowing as soon as cleaning has completed all serve to minimise the wastage of energy, chemicals, water and time, by using only as much of each as is necessary.

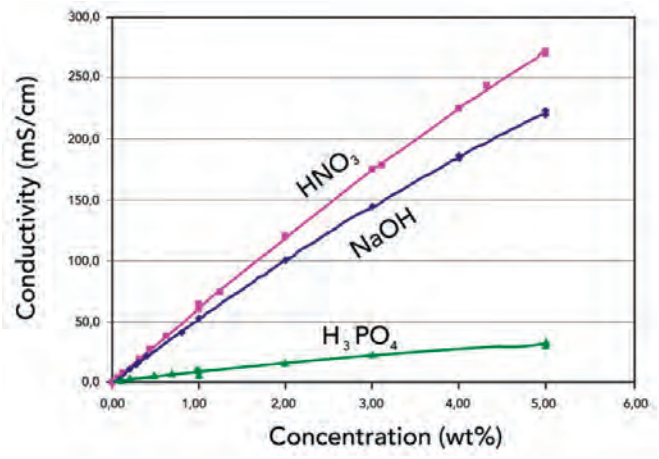

Figure 1: Conductivity versus concentration at 25˚C.[1]

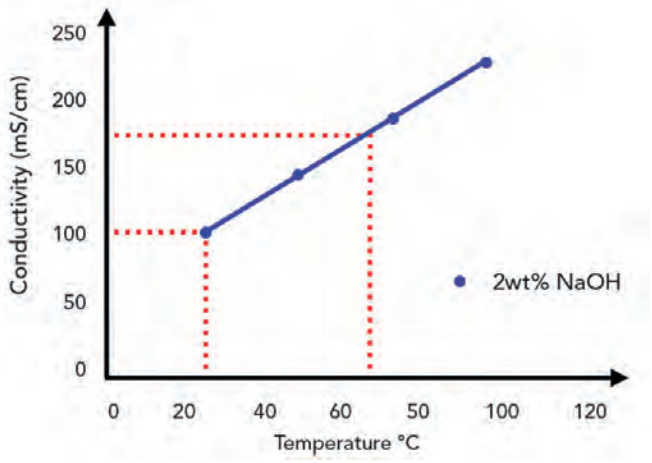

Figure 2: Temperature dependence of NaOH concentration.[2]

For interface detection and the measurement of chemical concentration at the elevated temperatures present in a CIP process, a sensor that is sanitary, robust and reliable is required. For this application, toroidal or inductive conductivity sensors are ideal. In addition, when connected to an appropriate smart transmitter, it is possible to convert and display the chemical concentration locally.

The measurement principle of such a conductivity sensor (Figure 3) is based on an inductive signal, whereby a generator (1) generates an alternating magnetic field in the primary coil (2) which induces a current in the medium (3). The strength of the induced current depends on the conductivity and thus the ion concentration of the medium. The current flow in the medium generates another magnetic field in the secondary coil (4). The resulting current induced in the coil is measured by the receiver (5) and processed to determine the conductivity.

The benefits of inductive conductivity measurement are:

- There are no electrodes, and therefore no polarisation.
- They offer accurate measurement in media or solutions with a high degree of soiling and a tendency to deposition.
- There is complete galvanic separation of the measurement from the medium.

Conductivity and optical sensors that come in contact with CIP cleaning solutions should be designed according to 3-A sanitary standards or EHEDG guidelines. They also need to be able to withstand contact with acid and alkaline cleaning chemicals without damage.

PEEK (polyetheretherketone) is a common material used in the contact elements of instruments, being chemically, thermally and mechanically resistant to the cleaning chemicals. The inductive conductivity sensor is therefore considered to be a non-contact sensor, since the measurement coils are encased in the injection-moulded PEEK body. PEEK allows for a smooth surface finish (Ra <0.8 µm) and guarantees biological safety, as pathogens are unable to stick to the surface.

Contact time

The period of circulation depends on the degree of fouling and the type of equipment being cleaned. Typically, 20 minutes of caustic circulation is required for pipework and vessels.

In dairy processing, pasteurisers and UHT plants that suffer from higher levels of fouling may require up to 40 minutes of caustic circulation. Acid circulation is normally 10 minutes.

Of course the longer the contact time in each cycle of the CIP process (flush, alkaline wash, rinse, acid wash, rinse), the more pumping energy is used, the more heating energy is used and the more water and chemicals are used and need to be recycled. It is therefore essential that each stage of the CIP process is shortened to only as much time as is necessary to get the job done.

The contact time is dependent on correct temperature and flow rate, and on the right chemical balance during the wash cycles. Minimising the necessary contact time for effective cleaning therefore depends solely on optimising the flow rate, tempera-

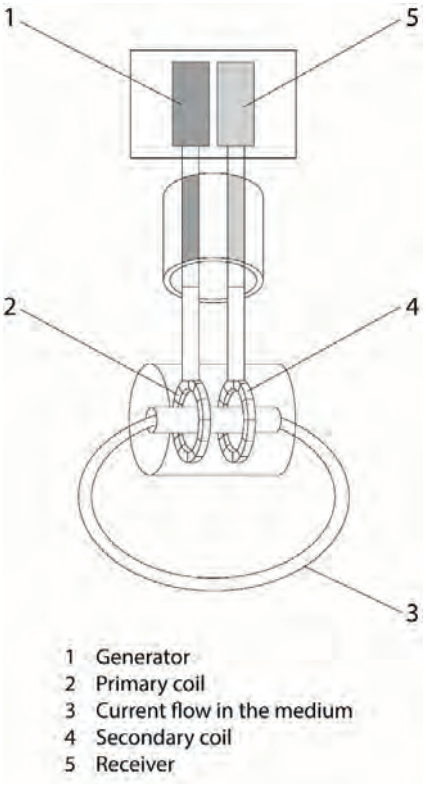

Figure 3: Inductive conductivity measurement.

Figure 4: A typical vibrating fork level switch designed for sanitary applications.

ture and chemical concentrations — as well as detecting when cleaning has completed — as described in the above sections.

Other required measurements

CIP chemicals such as NaOH and HNO_3 are, of course, toxic and need to be stored carefully, and at the correct concentrations ready to use. In modern multi-use CIP systems, the recycling of filtered chemicals for re-use also does not result in all chemicals being returned, and so the storage vessels will need to be replenished from time to time.

Maintaining an accurate inventory as well as automating the filling and low level detection for chemical storage vessels are therefore also important aspects of managing a CIP system. Instrumentation that can be used to assist in the management of chemical inventory include:

- Conductivity and temperature sensors to detect concentration.
- Level limit switches to detect high and low level.

The choice of instruments will need to take into consideration their chemical compatibility with the chemicals they contact, as described previously.

Vibrating fork level switches designed for hygienic applications and with a protection class of IP69K are simple to commission (no calibration, specific know-how or tools are required for their set-up) and work with all types of liquid media found in the CIP process. Such sensors can be used in areas where other measuring principles are not suitable due to conductivity, build-up, turbulence, flow conditions or air bubbles — all of which are found in the CIP process.

In vibrating fork level switches, a piezoelectric drive causes the tuning fork to vibrate at its resonant frequency. When the tuning fork is immersed in a liquid, its intrinsic frequency changes due to the change in density of the surrounding medium. The electronics system in the point level switch monitors the frequency and indicates whether the tuning fork is vibrating in air or is covered by liquid.

Level limit switches provide high levels of safety for the CIP process by ensuring reliable over-fill protection as well as avoiding pump damage by preventing dry running.

Conclusion

Cleaning process equipment is a necessary and important part of food and beverage processing — for food safety and to maintain product quality. CIP systems, designed and operated correctly, can eliminate the need to dismantle equipment and manually clean it.

Operating CIP systems in the most cost-effective and efficient way requires accurate cleaning data at all steps of the process. The correct choice and application of process instruments can assist food and beverage operators to optimise their cleaning process, reducing chemical use and minimising energy consumption.

References

1. Tetra Pak, *Cleaning in place: A guide to cleaning technology in the food industry*.
2. op cit.

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WELD NUT SENSORS

Metal detection in the automotive industry requires more compact sensor technology to manage constant change in metals and application variations as parts move through the line. Turck's low-profile weld nut sensor is a compact solution for applications that require reliable detection for the presence or absence of a nut welded to sheet metal on various vehicle components.

Like the other sensors in this family, Turck's low-profile design uses magnetic inductive technology and can be simply programmed to detect the presence of a metallic nut. An optional teach pendant can be used to program the sensor to differentiate between the sheet metal material and the weld nut. When the nut is properly placed, the sensor sends a signal to the PLC, which allows the robotic welder to weld the nut to the sheet metal.

The low-profile weld nut sensor measures 61 mm, with a probe tip diameter of 4 mm to accommodate down to a 5 mm weld nut. The sensor has a titanium nitride coated probe for greater strength and protection in harsh applications. The cable version includes a robust TPE-style jacket with a moulded M12 connector for flexible mounting possibilities and a four-way LED for visibility from multiple sides.

Other sensors in this series will sense nut diameters of 6–12 mm and 10–20 mm, respectively, and are available with integral M12 connectors. All Turck nut sensors are IP67 rated.

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WIRELESS ROUTERS

Control Logic has introduced a range of wireless LAN and 4G LTE modems by ORing. Designed for industrial environments, they provide high-speed wireless connectivity via IEE 802.11n.

ORing's IAR dual wireless router range is available from 3G and 150 Mbps wireless up to 4G LTE and 300 Mbps wireless with dual SIM card slots. All include a strong DIN rail-mount metal enclosure of IP30 to IP67 and have an operating temperature range of -25 to +70°C on 12–48 VDC with the option for PoE power.

Featuring dual ethernet ports, they are available in either 100 Mbps or gigabit network speeds and support the full range of routing and secure protocols such as OpenVPN, PPTP and IPsec tunnelling. They are suitable for deployment in industrial M2M networks such as water/wastewater, manufacturing, mining, IP surveillance, intelligent transportation systems, rail rolling stock and track-side applications where reliability is paramount.

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COMBUSTION CONTROL OXYGEN ANALYSER

The XZR500 combustion control oxygen analyser from Michell Instruments is designed to perform just one specialised function: to monitor the oxygen levels in combustion processes. Its purpose is to determine the optimum amount of air needed for combustion, ensuring the fuel is used efficiently, potentially saving thousands of dollars.

The XZR500 uses Michell's zirconium oxide oxygen sensor, which has a metallic sealed reference (MSRS) to give long-term reliability. The combination of this type of sensor, placed in an isothermal oven within the analyser (not the probe), negates the effects of varying, high temperatures as well as the corrosive nature of the gas.

The XZR500 has a control unit which can be placed at ground level for convenience, a sensor head close-coupled to the stack for ease of installation and quick response, and a variety of probe materials allowing a wide range of applications to be addressed.

For most applications the probes use the Pitot effect to extract non-conditioned sample gas from the process to the sensor head and back to the flue. Placing the probe as close to the burner as possible gives the most accurate readings, so the XZR500 has ceramic probes capable of operating effectively in temperatures up to 1300°C.

Typical applications for the XZR500 include combustion efficiency for boilers, industrial waste incinerators and crematoria. When operated in extremely dirty applications, such as coal-fired power stations, the XZR500 can be offered with a blow-back mechanism for increased reliability in readings and reduced manual intervention.

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SCALING UP

HOW SMES CAN GROW INTO LARGER FOOD MANUFACTURING FACILITIES

*Peter Taitoko**

For small- and mid-sized food manufacturers, one of the biggest challenges is how to start scaling up operations. Today there is an endless amount of information available but interpreting this and making the best choices for your business is not simple.

There are plenty of opportunities today for Australia's small- to mid-tier food manufacturers, especially for companies that are agile and manufacture high-quality products. However, the entrepreneurial spirit that saw owners start businesses can easily be replaced with uncertainty as organic growth leads to the need to scale up. Lack of knowledge about how to scale up is frequently the main obstacle to growth. The initial entrepreneurial 'nothing-to-lose attitude' makes way for a defensive risk management strategy and while in the food industry this is critical, it doesn't need to stand in the way of growing businesses safely and even improving risk management along the way.

Scaling up can start by simply optimising and sweating your current assets or adding a shift or two, but as demand continues to build along with operational costs then the options start narrowing towards the need for a larger, newer facility. Often manufacturers at this stage become almost paralysed by the challenges: "What do I do now, how much will it cost and how long will it take?"

Control scale-up for great results

If there is good news then it is this: the transition, when planned properly, can lead to an extremely controlled scale-up with great results. The strategy must be planned with precision yet the execution must allow for flexibility along the way as demand changes course.

The more you can define where you want to drive growth for your business and define your target market, the easier it will be to gain direction. It's important to be clear up front what controls and regulatory requirements need to be in place from your existing and future customers and collaborate closely with their quality teams to ensure that you are designing food-safe facilities and processes.

One important thing to keep in mind is that the food safety auditors are unlikely to accept 'unfavourable practices' in your current facility to continue in a newly designed facility.

When reviewing expansion options, you may be lucky enough to already have enough room in your factory or on your site to expand into. If not, the next best option is to find an existing site with the building in place (often referred to as a brownfield site) as typically this will be a lower cost option, even if you need to completely strip out the existing fit-out and flooring to renovate. If finance allows, then a new site and new building (referred to as a greenfield site) can give you the best long-term results and allows a blank canvas approach.

Design fit for purpose

Probably the biggest challenge for manufacturers when scaling up is working out where the capital should be spent.

> ...AS DEMAND CONTINUES TO BUILD ALONG WITH OPERATIONAL COSTS THEN THE OPTIONS START NARROWING TOWARDS THE NEED FOR A LARGER, NEWER FACILITY.

Factory

For the facility, thankfully there are not too many options to confuse you with when choosing drainage, flooring, internal walls and ceiling materials, doors and lighting. It is critical that the materials and installation all comply with current food safety standards and are installed by industry experts that can demonstrate excellent track records specifically within the food industry. When designed and executed properly, your new facility will be of a world-class standard and export ready.

Consider the following practical ideas for your facility upgrade:

1. Sub-floor works such as drainage must be well designed and should not be compromised. Consider the impact of high-care rooms and the integration of drainage. A high-care room may not be required today but future opportunities or changes in food safety standards can lead to issues with unsuitable drainage plans in the future.
2. The drain points and floor slopes must be designed accurately to prevent water pooling. Ensure that the drain points are well positioned around equipment. Strip or trench drains should be avoided as they provide a greater risk of microbial growth problems. Some retailer standards will not allow these types of drains in some rooms. If the floor slopes are correctly designed and installed you should not have any water pooling concerns with point drains.
3. Ensure that walls and ceilings comply with food safety requirements as well as fire codes. Consider using FM approved fire-rated wall and ceiling panels.
4. Consider ventilation, room pressures and temperatures. Navigating through the food safety requirements for HVAC is difficult and an area where you should most certainly seek advice from industry experts.

Process

The process and packing lines are often the starting point for manufacturers when starting to evaluate options for scaling up operations. This can be a daunting task as competing suppliers can often provide solutions without seeking enough detail about the project, and that can lead you into a state of confusion with the direction you need to take.

Firstly, develop a plant layout that reflects your long-term 'wish list'. This will help to futureproof your factory footprint. Then determine which equipment is going to give you the best investment return at start-up and which equipment is the hardest to acquire quickly if demand exceeds your post start-up forecast (and it often does!).

Typically, these items are one and the same and may be high-speed filling machines or a spiral chiller or even retorts. Automated packing lines tend to be more modular and easier to add on later

Concrete slab pour at brownfield site.

Retort factory.

Product and CIP line fabrication.

when cashflow allows, but you also need to understand how you will redeploy or scale up your workforce at start-up if considering this type of option.

Again, ask for examples, videos and referrals from suppliers when discussing process and packaging options. Remember that there are some great local equipment manufacturers in Australasia but one supplier alone does not usually have the silver bullet solution for your entire process and packaging requirements.

Retort factory.

Process automation

One of the best decisions that you can make when scaling up your facility will be to automate tasks throughout your plant to guarantee repeatable, accurate and efficient processing. Properly executed process control allows your operators to focus on high-value dynamic tasks that require flexibility. Automation can provide some of the best returns for your business as it can significantly reduce labour costs as well as facilitate simple scaling up of processes and services for the future.

Consider the following when designing your processes:

1. Develop a plant layout incorporating future lines and design from an operator's perspective of how the factory will be controlled safely.
2. Design for hygiene — ensure that all equipment and rooms can be easily cleaned. Involve your quality managers early in the project.
3. Consider allergen control and elimination of cross-contamination from warehousing to processing and filling.
4. Automate where practicable to reduce labour costs and waste. Integrating key equipment and ancillary equipment will also minimise unnecessary line stoppages.

Services and infrastructure

Factory and process services must be designed with further scale-up in mind so try to establish what additional capacity will be required in the future. It is worth investing a bit more up front as modifying and upgrading services once the facility is operational will be far more costly and time consuming, especially for services such as steam or gas supply. Consider the following when evaluating a potential site:

1. Check that there is enough power to service the new site with growth in mind. The upgrade or replacement of a substation can be the longest lead time item on the project so it's important to establish the requirements early.
2. Check the gas supply to the site. If one or more new boilers are to be installed then it is important to check that the gas meter and gas line into the site are adequately sized.
3. Check that the town water supply and line sizes are adequate. Upgrades are normally inexpensive and can be carried out relatively quickly.
4. Engage a town planning consultant to check that your plans will meet the planning conditions.

Financial and resource assistance

There are a number of government and private sector groups that will review your project, conduct a business health check and provide assistance by way of grants for items such as consulting fees, equipment purchase, loans for working capital and resources to advise on business matters such as scaling up, marketing and exporting. It is well worth exploring all of these options.

So finally, if you are considering expanding or upgrading your manufacturing facility, remember that it doesn't need to be a long stressful journey. Plan for the long term and plan for success. Once you have a visual plan and financial strategy on the table then seek help from industry experts to execute your plan.

The right advice up front will allow scaling up to happen quickly, cost-effectively and safely, and make it a highly successful and rewarding journey!

**Peter Taitoko is General Manager at RMR Process. The company designs and builds food manufacturing facilities and processes for SME food manufacturers transitioning through scale-up — from facility and process design through to validation, training and ongoing facility support.*

RMR Process Pty Ltd
www.rmrgroup.com.au

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WIRED HART LEVEL DETECTOR

Emerson Automation Solutions has launched the Rosemount 2140 wired HART vibrating fork level detector.

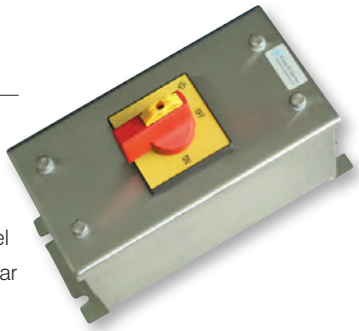
The Rosemount 2140 is designed to perform in applications with high temperatures and harsh conditions unsuitable for other level monitoring devices. The device is virtually unaffected by flow, bubbles, turbulence, foam, vibration, sediments content, coating, liquid properties and product variations. It can be used to monitor not only liquids but also liquid-to-sand interface, which enables the build-up of sand or sludge deposits in a tank to be detected.

Compatible with the HART 5 and HART 7 hosts, the Rosemount 2140 enables operators to continuously monitor electronic and mechanical health. Frequency profiling functionality immediately detects any build-up, fork blockage or excessive corrosion, indicating maintenance may be required and allowing this to be scheduled during periods of downtime. In addition, power advisory functionality monitors voltage and current drawn over the device's lifetime with a process alert for potential issues that could become a problem, such as corrosion.

An optional integral LCD display shows switch output states and diagnostics so an operator can inspect the device locally. Also, selectable Media Density and Media Learn functions help configure appropriate density settings to calculate and maintain optimum and consistent switching points in fluids of unknown properties.

For safety-critical applications, a dedicated version of the Rosemount 2140 certified to IEC61508 is available with a 97% safe failure fraction and 96% diagnostics coverage.

Emerson Automation Solutions
www.emersonprocess.com.au



STAINLESS STEEL ENCLOSURES

The Kraus & Naimer 6S Series of stainless steel enclosures provide protection for vital switchgear with the same footprint as plastic versions.

Suitable for food and beverage industries, the enclosures can withstand aggressive environments such as marine, sewerage treatment plants, mining, material handling and conveyor systems.

The enclosures are Australian manufactured, constructed from 1.6 mm 316 stainless steel and are rated to IP66. The enclosures have bottom threaded entries and four screw cover fixings with or without external mounting feet.

Many standard sizes are available or custom designs can also be produced.

Kraus & Naimer Pty Ltd
www.krausnaimer.com.au

SENSOR RANGE

Hamilton offers measuring solutions for a complete measurement loop, including sensors for pH, dissolved oxygen, conductivity, cell density, ORP, as well as related accessories and consumables.

With the Hamilton Intelligent Arc sensors, the functionality of a traditional transmitter has been replaced by a microprocessor integrated within the sensor head. With the micro-transmitter integrated, Arc sensors offer a fully compensated, converted digital (Modbus) and 4-20 mA signal directly to the PCS. They offer fully online wired and wireless options for seamless monitoring, configuration, documentation and calibration.

The ArcAir mobile application comes with additional reporting functionality within the GMP guidelines for measurement values, calibrating Arc sensors and configuring various parameters with the unified user interface. It communicates wirelessly with up to 30 Arc sensors simultaneously. The Arc Bluetooth adapter provides the wireless communication between the Arc sensor and the mobile device. Additionally, Hamilton provides validation software (GMP Compliance Package BT) that offers central management functionality for users and validation reports for calibration, verification, configuration and communication within the GMP guidelines.

Hamilton Arc sensors keep the installation and maintenance costs comparatively low while offering considerably easier and tighter process control. After SIP, CIP or autoclaving, these sensors recover quickly with no offset and drift.

Bio-Strategy Pty Ltd
www.bio-strategy.com

IO-LINK WITH INTEGRATED SAFETY

Safety over IO-Link combines automation and safety in one system and represents efficient safety concepts from one source. Safety over IO-Link offers IO-Link advantages such as simple data transport and information exchange, high flexibility and universal applicability.

Safety over IO-Link from Balluff is open to the sensor level: Balluff safety components as well as safety devices from other manufacturers can be connected to the Balluff-developed I/O module, the yellow safety hub, using standard M12 cable. Even standard components such as binary sensors can be bundled via the safety I/O module. The module is connected to an IO-Link master, with safe communication with the control level provided by Profisafe/Profinet. Safety-relevant data is transferred through the master directly to the safety controller using the so-called tunnelling procedure. Safety requirements up to PLe/SIL3 can be achieved.

Parameters are configured centrally using the programming interface of the controller. The simple and transparent system structure saves time and money in cabling, reduces the space requirement in the control cabinet and enables leaner system concepts. The high degree of standardisation results in savings over the entire life cycle of the machine. With Safety over IO-Link, applications can be adapted quickly and easily to changing requirements. Both equipment manufacturers and users thus benefit equally.

Balluff Pty Ltd

www.balluff.com.au

BUSTING THREE IIoT MYTHS

*Dan Matthews**

There is no doubt that the IIoT market is evolving quickly, but there are several misperceptions, or myths, regarding the IIoT that are making decision-makers hesitate and sometimes delay or stop an IIoT project altogether.

In the report *'Digital Transformation — an Internet of Things Perspective'*, IDC predicts that the installed base of IoT endpoints will grow from less than 13 billion units at the end of 2015 to 30 billion by 2020. The industries that IDC predicts will spend the most on IoT solutions are manufacturing, transport, energy and utilities, and retail, with a wide range of IoT use cases.

In other words, the Industrial IoT clock is ticking, and businesses not already addressing the opportunity offered by IoT need to create and implement their plans — quickly! So why are some companies still hesitating? One answer is that there are several misperceptions, or myths, regarding IIoT that are making decision-makers hesitate and sometimes delay or stop an IIoT project altogether. A heavy focus on standards, exorbitant expected costs and the fear of big changes are all cited as reasons for not pursuing IIoT projects. Let's take a closer look at these in more detail.

Myth 1: We should wait for standardisation

Unlike consumer markets where standardisation, formal or by market dominance, is key to success, for IIoT standardisation won't be a concern for decades. Sure, there are multiple emerging standardisation initiatives in IIoT, and yes, it is not yet possible to know which will grow or be marginalised. But the thing is, it doesn't matter. Unlike consumer markets where new standards for, say, NFC chips in smartphones can roll out and get near full market presence in the few years it takes for people to replace their phones, industries are run on equipment that is anything from years to several decades old. This equipment has been provided by tens or hundreds of different suppliers.

Even if the equipment manufacturers 'IIoT enable' their latest generation according to some IIoT standard, it will take decades before industries have replaced all their existing equipment and assets with new IIoT-standardised versions. For industries wishing to pursue IIoT, it is just something to accept that for the foreseeable future there won't be any standards on how to connect up all their things. Instead, industries should expect and plan for doing bespoke integration development or even retrofitting of other sensors and communications capabilities to equipment and assets in order to get them connected.

Myth 2: IIoT would be a giant leap for my business, demanding a lot of work

IIoT success is all about choosing small, actionable steps that will improve your business today — not giant leaps that will transform your industry tomorrow. For many people, the IoT still brings to mind disruptor companies like Uber or Netflix. But in most cases IIoT develops, rather than disrupts, the entire business. According to the previously mentioned IDC report, the main drivers behind the IIoT are to improve day-to-day operations, including improving productivity (14.2% of companies), improving quality and time to market (11.2%), improving process optimisation (10.2%), reducing costs (9.9%) and improving decision-making (9.3%).

A look at the vast majority of companies who have already operationalised the IIoT shows that the successful ones have often started with a few well-chosen processes and pursued incremental change. It can begin with connecting just one piece of equipment. Earning a little more revenue from this can then inspire us to take a bigger step — what would happen if we integrated these findings with input from another data stream? External events, such as weather forecasts or temperature changes for instance? How could changing operations on this machine according to these inputs optimise its performance?

The key is to ask "how can we make this a little more efficient?", not "how can we revolutionise our whole business?" Incremental change is the name of the game. IIoT is about improving performance.

Myth 3: IIoT will be expensive and capital-intensive

A few years back this statement might have been true, but three key developments have made IIoT implementation more affordable than ever before:

1. **The falling price of IIoT hardware and software:** Everything from the smallest sensors to the largest gateways has fallen in cost. There is now a range of smarter, cheaper sensors and gateways available to all industries, increasing your level of software control. Take a forklift truck as a typical example. Ten years ago, connecting one of these would have cost at least $1500 — out of reach for most logistics and manufacturing operations running several of them. Today, a single forklift could be connected for not much more than a $20 note.
2. **Cheaper, broader internet access:** This has made it ever easier to connect a broader range of machines and equipment across a wider geographic area at a low cost. New developments such as 5G mobile networks and LoRa technology will make sure this trend continues.
3. **Cost-effective IoT cloud platforms:** On the platform side we've seen big, exciting changes. Ready-to-use, cloud-based IoT platforms that can handle massive scale, storage and computing are now more available than ever before.

These three changes have made it possible for companies to get started with IIoT projects quicker and with lower risk than before, enabling more experimenting to reach success.

Operationalising data — the key to IIoT success

In addition to these IIoT myths, there is still one factor many companies tend to overlook — and that is how their IIoT data should be operationalised. In order to get returns from IIoT investments, it's important not to stop at only collecting and analysing IoT data. By just doing that, you still haven't made a cent. To benefit from IIoT, the knowledge and insight needs to be turned into action that optimises your business — whether that is a more optimal maintenance plan, higher service levels, improved logistics, engineering better products or developing entirely new business models.

This can be done in several different ways, but one key step in operationalising your data is automating the right processes based on gathered data. To illustrate with an example: sensors capture data about temperatures which are too high. Instead of just collecting, registering and manually acting on this data, a process is created for automatically dispatching service personnel to replace a part that has suffered overheating, thus preventing future catastrophic failures. Operationalising and automating — this is when the true power of the IIoT comes to life and can generate significant revenues.

**As Chief Technology Officer for global enterprise applications company IFS, Dan Matthews researches, formulates and communicates the strategic direction for IFS Applications and manages IFS's technology partnerships.*

IFS Australia

www.ifsworld.com/au

INDUSTRY 4.0 ADVANCED PRODUCTION SYSTEMS FOR BEVERAGE MANUFACTURING

Gebo Cermex has released the Agility 4.0 Advanced Production Systems program for beverage manufacturing plants.

The program increases performance via four steps in its asset management model: design, build, maintain and improve.

In design, the company brings the virtual factory, enabling it to accurately simulate daily operations in a production plant, and develop and test new production models.

In the build step, the energy consumption simulation tool can be used to audit existing installations or to assist in the design of new ones, enabling beverage producers to test a wide range of possible configurations, validate design variants and optimise energy-saving proposals.

Focusing on water management, particularly in relation to tunnel equipment such as pasteurisers, is also an important part of the sustainability equation.

To maintain systems, and achieve the lowest total cost of ownership, effective and connected maintenance and troubleshooting help to reduce downtime. The conveyor monitoring software gives real-time views of the whole line's status, providing preventive maintenance instructions and automatically generating email alerts.

Remote Video Assistance uses video, audio and augmented reality technology to allow a better understanding of the issue through real-time viewing from a remote location.

To improve efficiency, the packaging line Efficiency Improvement Tool is a real-time supervision system, monitoring key machine performance indicators, product flows and accumulations, as well as consumptions. The tool handles production issues to meet ongoing challenges and also anticipates them through trends and forecasts based on historical and multiplant analysis.

Gebo Cermex at Tetra Pak Marketing Pty Ltd
www.gebocermex.com

DRY CLAW PUMP

Atlas Copco's DZS vacuum dry claw pump range is based on innovative design featuring simplicity, robustness, efficiency and contamination handling capability. Designed and built with the demands of the end user in mind, the dry claw pump provides a trouble-free and cost-effective solution.

Built to last with materials and coatings that will last the life of the pump, the pump features easy maintenance and long-lasting bearings and seals. Separate and isolated pumping elements are designed for quick access to the pumping chamber, allowing for easy cleaning in the event of product carryover.

The versatile product can be ordered as a dry vacuum pump or set up as a 2.5 bar lower pressure blower.

Atlas Copco Compressors Australia
www.atlascopco.com.au

DOUBLE SEAL VALVE

SPX Flow's APV DELTA SD4 double seal valves are designed for safe media separation applications. Their hygienic characteristics and long seal life make them suitable for use in the food, beverage, pharmaceutical and chemical industries. The valves are designed for shut-off, changeover or tank bottom valve applications with other configurations available on request.

Safe media separation is provided by the valve's design that contains two seat seals. The hygienic characteristics of the valves are primarily due to their ball-shaped housing, crevice-free sealing and leakage discharge valves which enable drainage as well as cleaning of the neutral cavity.

To maximise operating life and maintain process integrity, the valves need to be routinely maintained. The company has released a video providing a step-by-step guide for the upkeep and maintenance of the valves.

The video provides users with an in-depth walk-through of standard maintenance procedures, including a step-by-step guide on how to disassemble and assemble the valves; replace the seat seal; and preserve the seal from leakage.

SPX Flow Inc
www.spxflow.com/au

DAF WASTEWATER SYSTEMS FOR LARGE PROJECTS AND SOLUBLE CONTAMINANTS

Aerofloat has added to its range of dissolved air flotation (DAF) wastewater treatment systems with the development of models for larger installations and for soluble contaminants, resulting in a complete offering for the food and beverage industry.

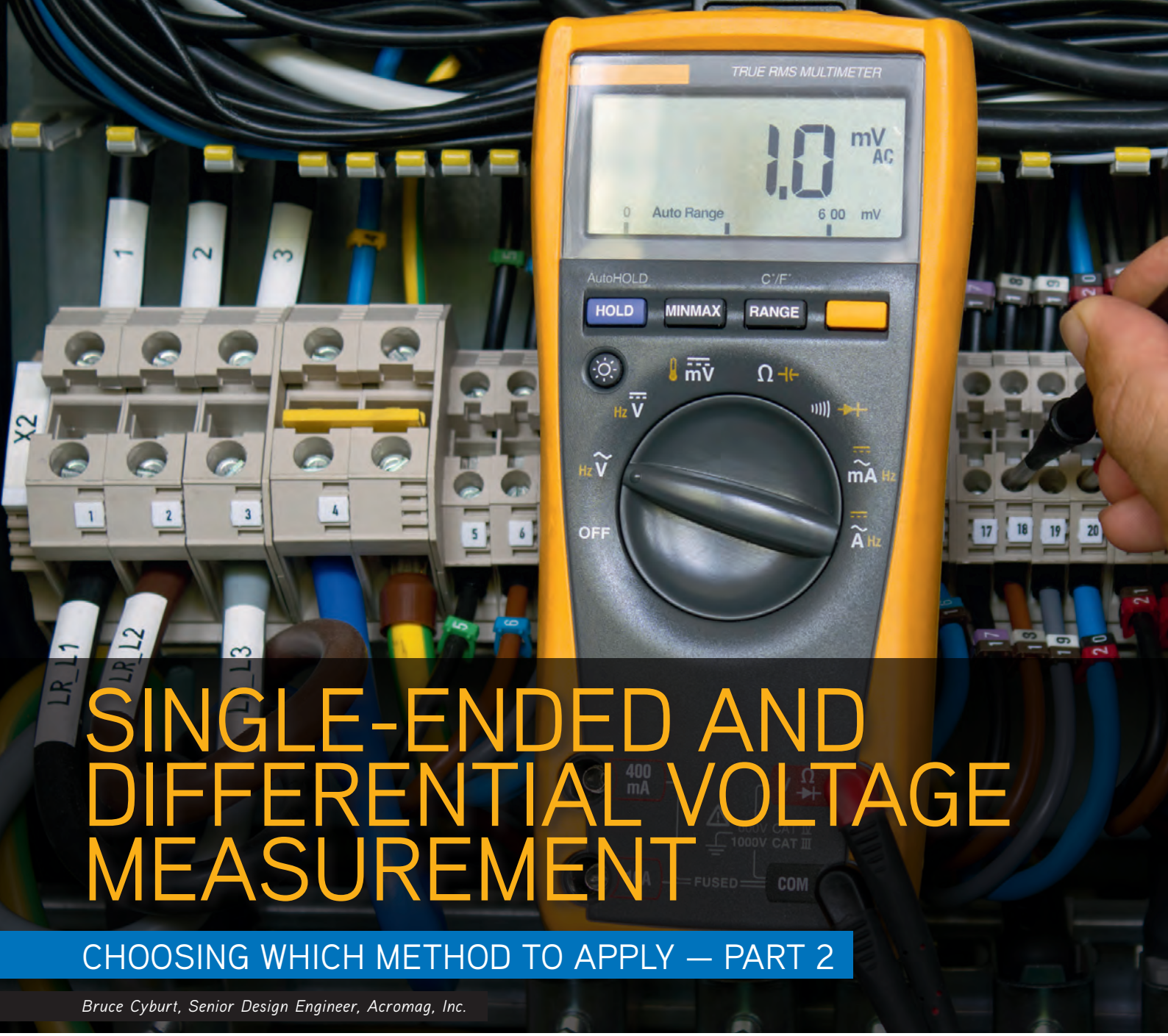
The original Aerofloat DAF was designed to be compact, odour-free and energy efficient, and due to its design, the system could not simply be made larger. In a number of projects, two or three systems were installed in parallel to increase the overall plant capacity, so company engineers set out to design a new concept to increase the capacity.

The result is the Modular Aerofloat DAF, which can treat up to 50 m^3/h and beyond. The design minimises moving auxiliary componentry to keep costs low, while still ensuring the core principles are incorporated to achieve superior effluent quality.

The DAF can remove up to 98% of suspended solids and fats, oils and grease, and is an enclosed and vented system, which all but eliminates odours.

While DAFs are effective for the removal of fats, oils and grease and suspended solids, they will not remove any of the soluble contaminants. In the case of dairy products, for example, which has approximately 12% organic solids, approximately 7.5% of the solids (fats and proteins) can be removed with DAF. However, the remaining 4.5% of the solids are soluble (lactose), and this can only be removed biologically. Aerofloat MBBR is a cost-effective and maintenance-friendly version of the Moving Bed Biofilm Reactor wastewater technique.

Aerofloat (Australia) Pty Ltd
www.aerofloat.com.au



SINGLE-ENDED AND DIFFERENTIAL VOLTAGE MEASUREMENT

CHOOSING WHICH METHOD TO APPLY — PART 2

Bruce Cyburt, Senior Design Engineer, Acromag, Inc.

The difference between single-ended and differential voltage signal measurement is a subject that is not always fully understood. The focus of this article is to try to make the difference clearer and provide tips on achieving the best results.

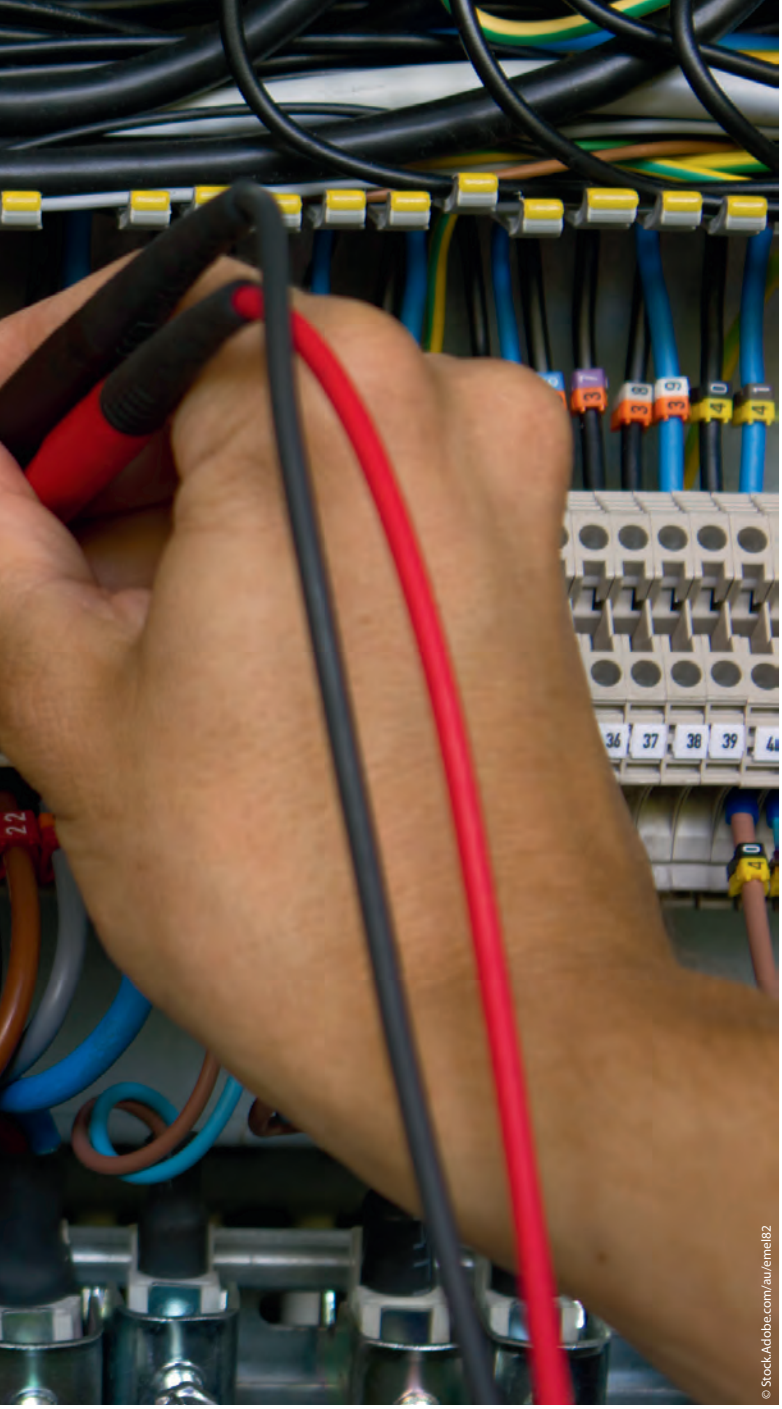
Voltage is a difference in electric potential between two points and is a measure of the force for current flow in a conductor or circuit. You can choose to measure voltage single-ended, or you can measure voltage differentially. Part 1 of this article reviewed single-ended voltage measurement.

Differential input voltage measurement

Like the single-ended input discussed in Part 1, a differential input also measures the voltage difference between two points, but in this instance, one of the points is not necessarily a fixed common reference point or return. The key differentiator here is that both leads connect to variable potentials and a third connection breaks out the circuit common. That is, a differential input will actually have at least three input connections: signal high or positive, signal low or negative, and a third connection for the signal return or common (return is usually shared by other differential input channels of the same circuit and its connection may be optionally made internal to the circuit if not provided on a third terminal).

The differential input offers more freedom when connecting to earth grounded or non-grounded (isolated) signal sources than the single-ended input, because its signal connections may be offset and separate from signal return, which may or may not also connect to earth ground. However, an earth ground path to return must still be made, and you should be careful not to provide more than one earth ground connection to return to avoid creating a ground loop circuit that could offset or interfere with your measurement.

In Figure 1a, each channel pair is differentially multiplexed to an instrumentation amplifier. A third lead carries the input circuit common or return, which may or may not also be connected to earth ground. Figure 1b shows a differential output connected to a differential input with the third leads (the I/O return leads) connected together. A connection to earth ground at return will help to keep the signals from floating and is also needed for protection purposes, but making two connections to earth ground should be avoided — as described in Part 1, ground loops can have detrimental effects on your measurement. Unfortunately, for most applications,



outputs will not connect to differential inputs this simply and Figure 1b is perhaps an ideal case that rarely happens in industry. That is, differential inputs usually connect to single-ended sources having only two signal leads with no separate return lead as shown in Figure 2.

Differential input myths

You may have read something like: a differential voltage is floating, in that it has no reference to ground. This definition is partially correct, but misleading. The term 'floating' should not be used to describe differential input measurement. The differential potentials must have an indirect or direct reference to the input measurement return lead. This is because no differential input potential can truly float, nor is it good practice to allow an instrument's inputs to float. In fact, no meaningful measurement can even be made if either of the differential input potentials is floating.

Another common misconception regarding multiple differential input pairs is that they are somehow isolated, because they can be offset from one another. Differential inputs are not isolated — instead this refers to the degree to which they may be offset from each other and from the circuit return. As already stated, multiple differential inputs of the same circuit actually share a common signal reference point in a required extra connection (usually return)

> THE DIFFERENTIAL INPUT OFFERS MORE FREEDOM WHEN CONNECTING TO EARTH GROUNDED OR NON-GROUNDED (ISOLATED) SIGNAL SOURCES THAN THE SINGLE-ENDED INPUT, BECAUSE ITS SIGNAL CONNECTIONS MAY BE OFFSET AND SEPARATE FROM SIGNAL RETURN, WHICH MAY OR MAY NOT ALSO CONNECT TO EARTH GROUND.

and none of the differential input pairs can be converted without a direct or indirect reference to that point.

In other words, do not leave the third connection (return) floating: the I/O signals must be referenced to it as shown in Figure 2.

Making that third connection

Differential outputs with three wires will wire directly to differential inputs with three wires without confusion. But problems arise when the third return connection is not made. When a third connection cannot be easily identified, it is likely that the circuit is making an indirect connection to its return for you. Be aware that a sensor or instrument with a differential output (three wires) can be wired single-ended by connecting its signal low lead (OUT-) to the signal common reference or return. And a differential input that connects its input low (IN-) signal directly to its common reference or return is essentially wired for single-ended input. For some of our differential instruments, the following instruction may be present in the manual:

IMPORTANT: If your input source is not already grounded, connect IN- to return and connect input return to earth ground.

This only addresses what can be done to connect a floating or isolated single-ended output signal to a single differential input and will actually make the differential input single-ended by connecting IN- to signal return. Applied to all the differential inputs, it prevents the separate input channels from measuring offset from return and each other.

Unfortunately in practice, the output signal you wish to measure differentially is often not differential at all and may only have two leads (the differential input is instead connected to a single-ended output that may be floating). Connecting differential IN- to return yields a meaningful measurement, and additionally connecting return or common to earth ground ensures the signal will never float and is needed for protection purposes (connecting it to earth ground is not required to convert the signal).

To avoid confusion when you try to discern a differential from a single-ended input by looking for the third connection to return, please note that some differential products will not include a third wire connection to differential input return. Rather its connection to the differential input is hidden from the user and an indirect reference to return is made internally. For example, some differential circuits may separately multiplex the ±channel inputs to a differential A/D converter while simultaneously measuring a CJC reference (for thermal measurement) or a voltage reference with respect to return to get a stable measurement. These circuits will usually include small input bias leakage paths to return at each input lead via filtering that helps keep the inputs from being free-floating when not connected to the A/D converter — acting similar to using weak pull-downs to return as illustrated in Figure 2a. Because the

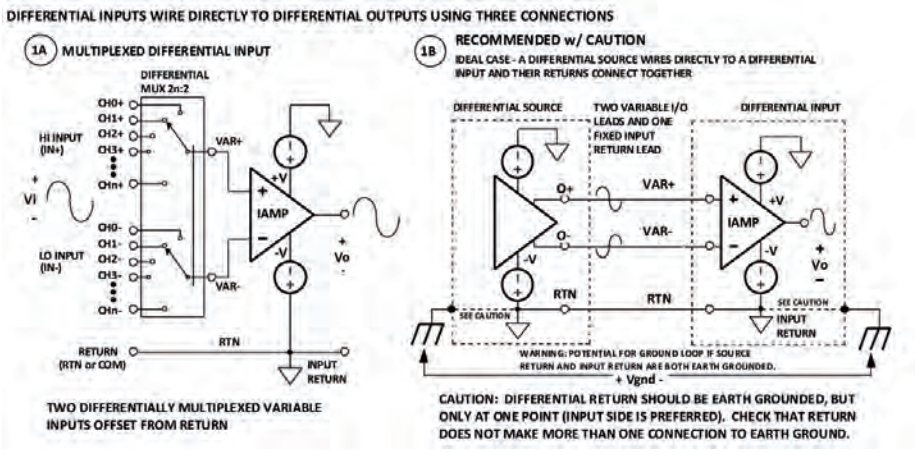


Figure 1: Simplified differential input connections.

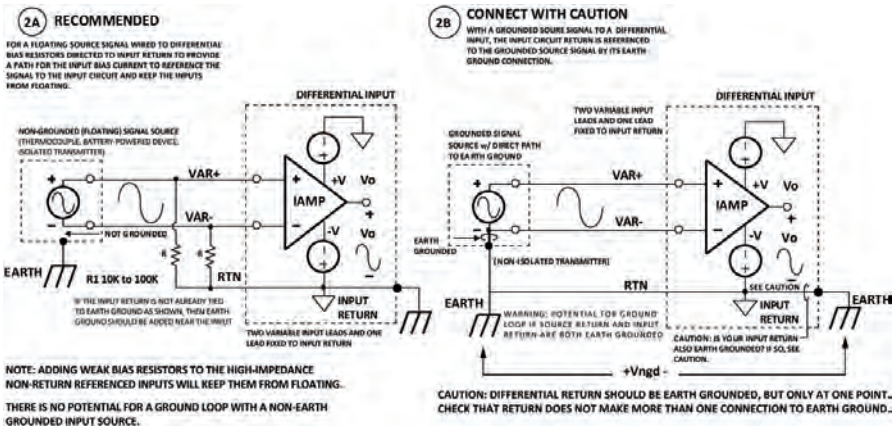


Figure 2: Differential inputs most often connect to non-grounded or grounded single-ended sources.

input pairs connect to the A/D converter separately, they may still be offset from each other.

Common-mode rejection

Noise in any circuit will generally permeate the circuit entirely and appear on both I/O leads of differential inputs making it common mode. Even an earth grounded sensor can induce noise on both differential leads from a less than ideal connection to earth ground.

A good instrumentation amplifier is designed to amplify the differential normal-mode signal and reject the common-mode signal (the noise) common to both inputs. The common-mode rejection ratio (CMRR) is a measure of the instrumentation amplifier's ability to reject common-mode noise (look for 100 dB or better). Think of CMRR as equivalent to the multiple of gain applied to the differential signal relative to gain applied to the common-mode noise A CMRR of 100 dB is equivalent to 100,000:1 signal-to-noise ratio. This means that the common-mode noise that can appear at the output is reduced to one part in 100,000, or less than 1 lsb of a 16-bit signal (1 lsb of 16 bits=1/65535). Unfortunately, CMR normally starts to roll off above 100 kHz and may not be effective for very high frequency common-mode noise.

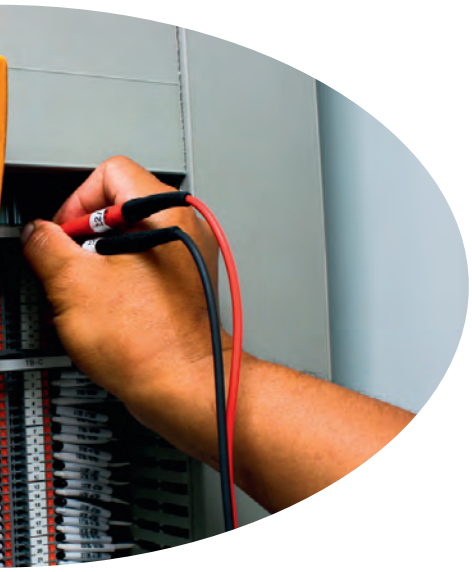
To maximise the positive effect of common-mode rejection with differential inputs, it is best to wire a signal source to the input using a wiring scheme that helps to couple the noise equally into both leads (that helps to make the noise common-mode). This is best accomplished with shielded twisted-pair wiring as shown in Figure 3. As shown in Figure 3a, connect the shield of the twisted-pair cable to the negative lead and to the earth ground at the earth grounded single-ended source. At the differential input end of the cable, connect the shield to the third lead of the differential input (its return lead) and to earth ground. Note that return uses the shield to reference differential input return to the earth grounded output signal and the shield current is very small. While it's normally not accepted to allow two separate connections to earth ground, in this instance, connecting earth ground to the cable shield at both ends has been shown to significantly reduce noise levels and is the recommended approach of many instrumentation amplifier manufacturers (this can also lower radiated emissions by the circuit).

Best performance is obtained using isolated sources with no direct-connection to earth ground as shown in Figure 3b.

Common-mode range

A differential input will only measure the voltage between two individual points within its common-mode range. The common-mode voltage range is defined as the maximum allowable voltage swing on each input with respect to the signal return of the measurement circuit (the third connection). This parameter will be very important to your application as it defines your window of possible signal measurement.

It is helpful to think of a differential input as having a window of voltage measurement defined within a larger window of measurement corresponding to its common-mode range as illustrated in Figure 4. Think of the differential measurement as a smaller window inside the larger common-mode range window and completely overlapping it. You are restricted to measuring voltage between any two points inside the larger window. If either of your measurement points



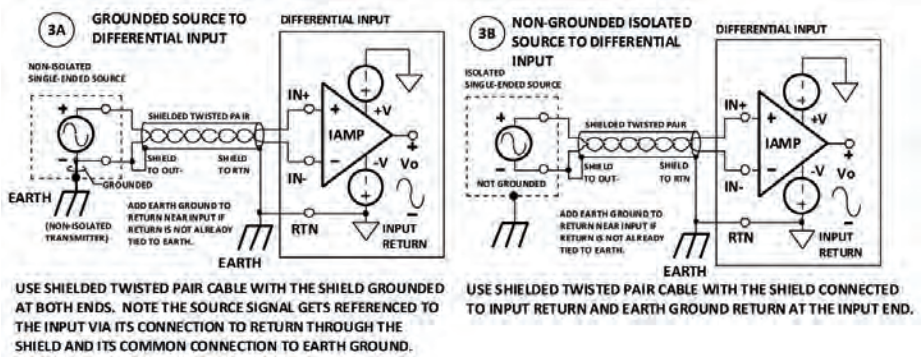


Figure 3: Simplified differential input connections to non-isolated sources using twisted-pair cable.

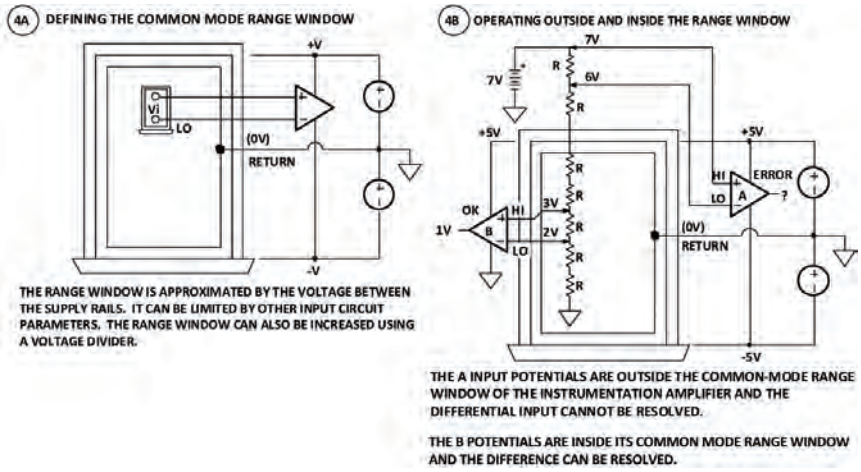


Figure 4: Common-mode range window of measurement.

result in potentials outside of the larger range window, measurement error or failure will occur and you may permanently damage the input circuit.

You can usually find the common-mode range of your input by referring to the specifications, or optionally the schematic. The outer boundaries of the differential input window are partly dependent on the voltage rails to the input amplifier as illustrated in Figure 4B. You could increase the effective common-mode range by connecting your input voltage using a voltage divider, but it may still be limited by the part itself and input protection circuitry. If the input is an A/D converter, then the common-mode range will be limited by the magnitude of its voltage reference, or ±reference for a bipolar A/D converter. You can refer to these specifications to ballpark your input common-mode range, but always make sure the input potential at each input with respect to return does not go outside of this range.

Causes of failure

It is very easy to exceed the common-mode limit of many devices with modern applications, unless the differential input device has been specifically designed for high common-mode voltage levels. This is partly because most modern instruments have trended to the use of lower voltage rails, like 3.3 V or 2.5 V. The reason some of these devices are still able to convert input voltages well above their voltage rails is because they typically employ voltage dividers at their front-end, followed by high-gain amplifiers or high-resolution converters (allowing them to divide inputs down to lower voltages). Instruments with differential current inputs can be problematic in this regard, because they do not employ voltage dividers in their front-end circuits. Rather, they often use current shunt resistors, like 50 Ω or 100 Ω, to convert small DC currents to voltage at the input of their amplifier or A/D converter. For example, using 50 Ω shunts and a 20 mA full-scale current (0.020*50 = 1 V), then you realise that you cannot connect more than two or three channels in series before the input common-mode range window limit is reached for an instrument front-ended with a low voltage rail like 2.5 V or 3.3 V. If the input is really an A/D converter, perhaps with a 1.235 V reference, then only one channel could be converted, as two in series would force one input potential outside the 1.235 V full-scale limit of conversion.

Forgetting to connect earth ground to differential return can also cause damage. In most cases the circuit will continue to measure properly with or without adding an earth ground connection on the return, but high impedance inputs like those of instrumentation amplifiers can be made to float in the presence of high levels of EMI, and inputs could be driven to levels outside their common-mode range (they have very low bias currents as a result of their high input impedance). Connecting return to earth ground helps to ensure the input will not float outside of its input range in the presence of high EMI. But equally important, adding earth ground gives the input circuit a low impedance path for shunting transient energy or fault voltages safely to earth ground away from the sensitive input components.

Metromatics Pty Ltd
www.metromatics.com.au

NEW PRODUCTS

WEIGH HOPPER WITH A FILL/PASS VALVE

A weigh hopper with a fill/pass valve for dilute-phase pneumatic conveying systems has been introduced by Flexicon. Suspended from three small-scale load cells, the gain-in-weight hopper delivers higher accuracy than loss-of-weight systems requiring higher capacity load cells.

Single or multiple hoppers can be positioned along a common vacuum or positive pressure pneumatic conveying line for discharging of dry bulk solids into single or multiple process equipment, storage vessels or downstream use points by weight. Downstream of the last fill/pass valve, the conveying line can be routed to the original material source point or into a dust collection device.

The system's controller weighs a batch by changing the position of the valve, which diverts conveyed material into the hopper. As the hopper fills, load cells transmit weight gain information to a PLC. Once the batch weight has been reached, the valve redirects material away from the hopper. The controller then actuates a slide gate valve to open, discharging the weighed batch.

Rated for the pressure differentials associated with pneumatic conveying, the conical hopper is eccentric with a vertical sidewall to promote complete discharge of weighed materials for batching accuracy.

The unit is constructed of stainless steel finished to industrial or sanitary standards to suit virtually any chemical, mineral, plastics or food processing application.

Flexicon Corporation (Aust) Pty Ltd
www.flexicon.com.au

ETHERNET SWITCH

The ORing IGS-1050A Ethernet switch is an unmanaged gigabit switch with five 10/100/1000base-T(X) ports and a 1000base-X SFP port. It supports jumbo frame packets, making it suitable for use with Ethernet-based camera systems.

With a rigid but slim IP30 type housing, it measures 26 mm in width, 95 mm in depth and 144 mm in height. Users have the option to either DIN-rail or wall mount to provide maximum installation flexibility. Enabling or disabling warnings can be done via its hardware DIP switch and a relay output indicates fault status, which allows easy monitoring by control systems. The ORing switch features redundant power supply inputs that can take a wide voltage range from 12 to 48 VDC, with overload current and reverse polarity protection, and an operating temperature range of -40°C to 70°C.

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

IIoT SOLUTION MEASURES PROFITABILITY IN REAL TIME

Developed through a partnership with Seeq, a leading provider of software and services that enable data-driven decision-making, EcoStruxure Profit Advisor uses big data analytics to measure the financial performance of an industrial operation in real time, from the equipment asset level of a plant up to the process unit, plant area, plant site and enterprise levels. On-premise or cloud-enabled, it works seamlessly with any process historian to mine both historical and real-time data. It then processes that data through Schneider Electric's proprietary segment-specific accounting algorithms to determine real-time operational profitability and potential savings.

Because current cost accounting systems only measure the financial performance of the industrial operation at the overall plant level, it is difficult for companies to truly understand the financial impact — both positive and negative — that operational changes have on business performance. Profit Advisor allows plant personnel to see and understand the ROI and business value their actions, activities and assets are contributing to the business in real time.

Profit Advisor layers real-time accounting models onto the Seeq Workbench to become a scalable, repeatable and easy-to-implement solution for multiple segments, enabling users to both measure and control their profitability. And because it can be integrated with Schneider Electric's simulation and modelling software in a digital twin environment, users are further enabled to forecast profitability under different conditions or if changes to the operation are made.

Overall, the software provides: historical data review, real-time performance indication and profit planning.

Schneider Electric
www.schneider-electric.com.au

FLUSH-MOUNT PRESSURE SENSOR

While most pressure sensors are limited to a 1 kHz natural frequency, the Futek PFT510 miniature pressure sensor features natural frequencies between 6 kHz and 100 kHz. Weighing only 10 g, the product has a pressure range of 225–10,000 psi and utilises foil strain gauge technology. Designed with a flat, flush-mount diaphragm, the model avoids clogging at the installation port.

When coupled with strain gauge analog amplifiers, USB solutions or SENSIT test and measurement software, the product can be utilised in applications such as differential pressure measurement or pressure monitoring in rockets, allowing aerospace engineers to monitor pressure changes and take action before critical failure can occur. The PFT series of pressure sensors focus on miniaturisation and output options, providing a sensor that integrates easily into a number of platforms and environments.

Metromatics Pty Ltd
www.metromatics.com.au

AC DRIVES

Allen-Bradley PowerFlex 755T drives provide harmonic mitigation, regeneration and common bus system configurations. The latest drives introduce Rockwell Automation's TotalFORCE technology that is designed to deliver improved motor control through precise, adaptive control of velocity, torque and position for electric motors. The technology incorporates several features that are designed to help optimise a user's system and maintain productivity.

The expanded drive range now includes the PowerFlex 755TL low-harmonic drive, PowerFlex 755TR regenerative drive and PowerFlex 755TM common DC bus drive system, all compliant to the IEEE 519 specification. These drives offer the additional advantages of a world-class footprint, comprehensive diagnostic and maintenance features, and simplified start-up and installation.

The PowerFlex 755TL uses active, front-end technology and an internal harmonic filter to reduce harmonic distortion. The drive is available from 160 to 1250 kW.

Delivering power from 130 to 2300 kW, the PowerFlex 755TR drive includes both regenerative and harmonic mitigation solutions. The drive helps reduce energy consumption and costs by delivering energy back to the incoming supply, resulting in a more energy-efficient solution.

The PowerFlex 755TM drive system allows users to build the system that best fits their needs for regeneration and coordination of multiple motors in common bus configurations. To optimise their system requirements and meet power consumption needs, users can select from a series of predesigned modules with a power range from 130 to 2300 kW.

Rockwell Automation Australia
www.rockwellautomation.com.au

INDUSTRIAL PoE SWITCHES

Antaira Technologies has expanded its industrial PoE networking infrastructure family with the LNP-0500G and LNP-0500G-24 series of Ethernet switches.

The rugged LNP-0500G Ethernet switch comes with a 48 to 55 VDC high-voltage power input and is suitable for applications surrounding surveillance systems, data centres, research labs or any location that requires simple gigabit speed network expansion, eg, quality inspection systems within factory automation. The low-voltage input and ability to provide high-power PoE allows the LNP-0500G-24 switch to fulfil transportation, factory automation vision inspection, solar and remote location surveillance applications. It features a 12 to 36 VDC low-voltage power input by comparison.

Each unit is designed with five gigabit Ethernet ports that are IEEE 802.3at compliant (PoE+) on ports 1–4 (data and power output maximum 30 W/port) and are also backwards compatible with IEEE 802.3af. Both product series provide high EFT, surge (2000 VDC) and ESD (6000 VDC) protection to prevent any unregulated voltage. There is also a built-in relay warning function to alert maintainers when power failures occur.

Both series are backed by a five-year warranty and are IP30 rated, compact, fanless, DIN-rail and wall mountable. Each series is built to withstand industrial networking hazards like shock, drop, vibration, electromagnetic interference (EMI) and temperature extreme version options for either a standard (-10 to 70°C) or extended (-40 to 75°C) operating temperature range.

Antaira Technologies
www.antaira.com.tw

HIGH-LIFT BOX TIPPER

The TIP-TITE high-lift box/container tipper from Flexicon discharges dust-free into vessels 1830 to 3050 mm above the plant floor.

Boxes and other containers are loaded at floor level and hydraulically seated against a discharge hood. The assembly is then hydraulically elevated and tipped, causing the discharge hood spout to seat against a gasketed receiving ring installed on any receiving vessel or process equipment. Opening of a pneumatically actuated slide gate valve at the spout outlet allows controlled, dust-free discharge, while closing it allows partially empty boxes and containers to be returned to the plant floor.

The unit accommodates boxes and other containers from 915 to 1220 mm on a side, and 990 to 1117 mm overall height. Constructed of stainless steel finished to food, pharmaceutical or industrial standards, it is engineered to perform under constant use in demanding environments. It is also available constructed of carbon steel and offered with optional receiving hoppers configured with the company's mechanical or pneumatic conveyors to transport discharged material to any plant location.

Flexicon Corporation (Aust) Pty Ltd

www.flexicon.com.au

WALL-MOUNT DC POWER SYSTEMS

Eaton has launched a wall-mount power system suitable for users in the industrial control, electrical switching and telecommunications industries where the capability to access and monitor reliable battery-backed DC power is required.

The systems are packaged in a format that consumes minimal space and with a form factor that better suits industrial control and electrical switching boards as well as small service closets. It additionally provides sophisticated monitoring and control capabilities.

It can be configured for either AC mains or solar PV power, providing the convenience of a single power system. Battery backup and redundancy supports systems that use PLCs, valves, solenoids, switches and sensors that are powered from 24 or 48 VDC.

It is suitable for a range of applications including oil and gas, mining, commercial buildings, rail and transportation industries, as well as system integrators and switchboard builders.

Eaton Industries Pty Ltd
www.eatonelectric.com.au

HYGIENIC LED SIGNAL TOWER

WERMA's CleanSIGN LED signal tower is suitable for use in food and hygiene areas. The tower's compact construction means there are no uneven surfaces, grooves or joints where dirt could collect and potentially cause contamination.

The 30° chamfer of the upper housing and bracket ensures the rapid drainage of liquids, quick cleaning and easy inspection. The tower's cleaning-friendly design reduces cleaning times and reduces energy and cleaning agent consumption.

The polyamide housing is approved by the FDA and is consequently food safe and resistant to cleaning and disinfectant agents. The tower's connection element and mounting bracket are all of one piece, avoiding joints where dirt could collect. The 'Pine Tree Clip' quick-action fixture enables quick and simple mounting, and attachment and connection of the tower is carried out from the rear, which means the housing is completely closed and drill holes are avoided.

The LED technology has a life duration of up to 50,000 h. The addition of an integrated high-volume buzzer ensures the signalling of all people outside the visible range.

Balluff Pty Ltd
www.balluff.com.au

NETWORK MANAGEMENT SOFTWARE

Today's Industrial Ethernet networks are growing and changing quickly, and it is increasingly difficult to manage and secure them. The latest version of Hirschmann Industrial HiVision is designed to address this challenge with features that make it easier to control and take action on factors that impact security.

A Network Dashboard provides a snapshot of network health and makes it easy to identify and fix problems. With an enhanced MultiConfig, users can simultaneously configure hundreds of devices, from any manufacturer, even while they are in operation.

Industrial HiVision 7.0 provides at-a-glance visibility of key network performance and security indicators with a visual Network Dashboard. It can be used to configure hundreds of SNMP-enabled devices from any manufacturer simultaneously — not just those from Hirschmann and GarrettCom — with a powerful MultiConfig feature, and integrates all SNMP-enabled devices into the management system, including any device-specific properties. Industrial HiVision is also capable of recognising and accurately visualising network topology automatically, and generates alerts when unauthorised changes are made, rogue devices are added or MAC/IP address pairs change. Security functions are applied with just a couple of clicks through a security lockdown feature.

Belden Australia Pty Ltd
www.belden.com

HANDHELD RAMAN SPECTROMETER

The Metrohm Mira M-3 is a handheld Raman spectrometer that is barely larger than a smartphone, enabling true single-handed operation. It meets the regulatory requirements of FDA CFR 21 Part 11 making it the preferred solution for fast, straightforward QC in the pharmaceutical industry.

Operating procedures can be customised on the Mira M-3 to allow sampling flexibility. Routine users start their measurements at the push of a button to verify the identity of materials with a pass/fail result in a few seconds.

Dedicated sampling attachments such as a vial holder (for powders and liquids) and a tablet holder (for tablets and pills) are part of the Mira M-3 and can be used without any further laser protection (Laser Safety Class 1). Point-and-shoot attachments are also available for contact measurements through barriers (eg, glass bottles).

The Mira M-3 is fully compliant with FDA 21 CFR Part 11 providing multilevel access control, audit trails, secure electronic records and other features to exceed regulatory requirements.

MEP Instruments Pty Ltd
www.mep.net.au

TURBIDITY SENSOR

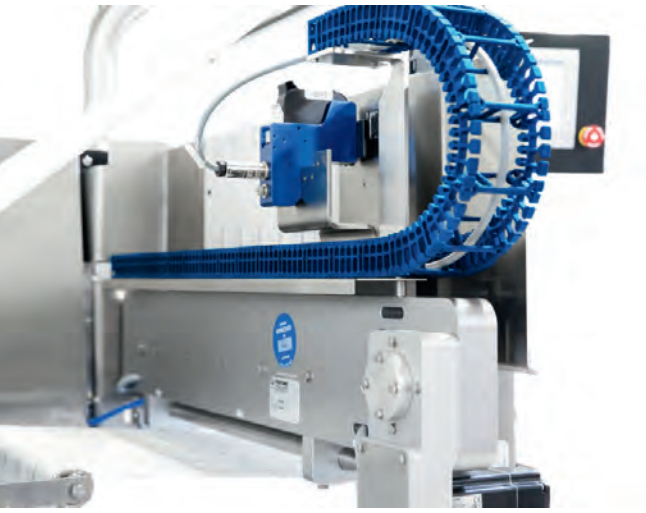
With advanced optical infrared (IR) sensing and intelligent electronics, the Triton TR6 turbidity sensor from Electro-Chemical Devices (ECD) measures turbidity or suspended solids and can be combined with ECD's 2-channel C22 analyser to monitor pH, ORP, DO, conductivity, plon and more.

The sensor measures turbidity or suspended solids in four selectable dual ranges, featuring preset low and high ranges from 0 to 4000 NTU. Its optical IR sensor emits a beam of 850 nm (near-infrared light) into a water sample, where it is scattered by particles suspended in the water. It provides turbidity measurement in mg/L, ppm and per cent solids to volume depending on the size, shape and composition of the suspended solids in the water. Turbidity measurements (NTU, FNU) are calibrated to the specific user application environment with standards such as Formazin, StablCal or SDVB beads.

The sensor is temperature compensated to achieve accuracy of up to 2% of reading or 5 NTU (whichever is larger), features a drift rate of less than 1% per month and operates at pressures up to 50 psi. The sensor body is constructed with stainless steel (AISI 316 Ti) and rugged epoxy. The process connection is a 1″ NPT nylon fitting and features an optional waterproof cable. It can be installed in either an inline flow cell or a submersible configuration up to 500 m in depth.

Featuring a choice of either side- or axially front-mounted optics, the sensor addresses the fact that external reflective surfaces in the emitted light's range can distort readings.

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



HYGIENIC ENERGY CHAIN

igus has released a plastic energy chain designed according to hygienic design guidelines. With an open design, the chain is easy to clean, and the use of round corners and no threaded connections means that dead spaces and germ formation are avoided.

The energy chain features a blue material, which is typical for the food industry, and is FDA compliant. It is also highly resistant to aggressive cleaning agents and chemicals.

The chain can be used wherever hygiene requirements are very high and cables and hoses have to be guided safely and securely. They are suitable for packaging, as well as for food and beverage filling machines.

Treotham Automation Pty Ltd
www.treotham.com.au

IP69K PANEL PC

To satisfy the stringent cleanliness requirements of industries such as food and beverage manufacturing and pharmaceuticals, Advantech has announced the release of a fully sealed IP69K rated stainless steel multi-touch panel PC.

The 21.5″ widescreen IPPC-5211WS touch-panel computer is the latest model to use the Intel Celeron J1900 Quad Core 2.0 GHz Processor. Featuring iDoor Technology, a truly flat screen and multiple lockable IO ports, the PC is able to operate in a wide range of temperatures.

The stainless steel corrosion-proof chassis and SGS certified IP69K waterproofing allow the product to be cleaned using water, harsh detergents and acidic/alkaline disinfectants with temperatures of up to 80°C and pressure of up to 30 Bar. These qualities ensure that the IPPC-5211WS satisfies the sanitation requirements of food manufacturing, clinical areas and chemical or pharmaceutical laboratories.

The PC uses regular connectors and a special clip for the USB port and is waterproofed when using the optional flange adaptor, with Rittal Specification connector, which seals the IO ports from water ingress and allows the PC to be attached to foot and arm systems for added flexibility.

With an Intel HD Graphics processor, and a ratio of 16:9, the models are suitable for displaying more graphics on the screen. The flat and seamless design of the PC provides easier maintenance and avoids mis-touches, even when wearing gloves.

4 GB DDR3L SDRAM is included, and the devices can be used with a variety of Microsoft Windows operating systems and Advantech software applications such as WebAccess, Panel Express and SUSIAccess.

Advantech Australia Pty Ltd
www.advantech.net.au

ABB robots support Australian homeware icon

Decor has been manufacturing plastic homeware products in Australia for more than 50 years. A homegrown success story, the company specialises in a breadth of homeware solutions that combine aesthetics, functionality, affordability and durability.

From its base in Scoresby, Victoria, Decor manufactures an innovative range of plastic fridge containers enjoyed by customers around the world — from local department stores and supermarkets to export outlets across Europe, America, India and Japan. With global demand rising for its fridge container range, Decor required a high-end robotic solution that was reliable and flexible enough to grow with its manufacturing requirements.

Decor required a robotics partner that could work with the company to design, build and integrate a system incorporating automation equipment, robotics and machine vision systems with minimal lead time and called on the assistance of A&RT, an automation equipment specialist and ABB Authorised Value Provider based in Bayswater, Victoria. A specialist in robotic-based solutions that integrate robotics, automation and machine vision systems for applications in food, pharmaceutical, packaging and other industrial areas, A&RT was able to apply ABB products to provide Decor with an affordable robotic solution to meet its specifications.

Decor Managing Director Graeme Wilson said his company chose to work with A&RT as their supply partner for robots due to the organisation's strong reputation in the industry.

"They came very strongly recommended, and they are a local company," Wilson explained.

A&RT Managing Director Dale Collinson said the company's expertise in the food and beverage industry made it the perfect partner to meet Decor's requirements.

"We do most of our work for the food and beverage industry, and in some offshoots as we are with Decor," he said. "We're really proud to be working with Decor Australia — such a household brand — and helping them achieve more market success in such a competitive market.

"We've worked with ABB over many years now, and with the background and history we've had with ABB, it was quite an easy choice in the end given the range of product, the fact that they're in Australia in their own right and we can get global support wherever our systems go."

A&RT was tasked with providing a turnkey system to manufacture and process Decor's plastic tubs from the basic assembly, right through to complete palletisation.

"The system consists of four main cells — the first system being a valve assembly cell which integrates high-end vision and an IRB 120 robot to assemble the valves into the lids, forming up stacks of the lids," explained Collinson. "Those lids are then moved to the second system. This is a tub assembly system that also uses an IRB 120 robot, which assembles the lids on to the tubs.

"From that stage, they get conveyed through into a case packing cell. The case packing system uses the new IRB 1200 robot — this robot has proven to be a great asset for ABB and has been fantastic for us to integrate into our systems for case packing."

The IRB 1200 is a new offering from ABB that is 15% smaller and 10% faster than previous machines. The compact robot is flexible, fast and functional, and was designed to address the requirements of the material handling and machine tending industries for flexibility, ease of use, compactness and short cycle times — while still maintaining large working envelopes.

"The speed has been better than what we expected, giving us fantastic flexibility and a really good asset into the case packing range," said Collinson.

"From that point we move on to the palletising system where we're using an IRB 660 — a four-axis palletising robot — to palletise all of the product. Because of the slightly lower rates, we're also handling pallets and slip-sheets within the system."

According to Collinson, by using ABB equipment the team was able to successfully provide a turnkey system which required minimal labour from start to finish.

"Throughout the process, we overcame various unique technical challenges which were driven by the Decor product range, including the various colours that we had to manage as well as the variety of different cartons, lids, tubs and valves," he said.

"Integrating with third-party equipment, such as vision systems, really was critical to the success of the system, and that has been a major benefit with the ABB robots and the connectability they offer."

Graeme Wilson said the most important benefit Decor received from the project is reduction in manufacturing costs.

"The robot system — even though quite expensive — has an amortisation of less than eight months, which is excellent for us, and has reduced the monotony for our staff," he explained.

ABB Australia Pty Ltd

www.abbaustralia.com.au

HMI PANELS

Beijer Electronics X2 pro panels include a wide range of high-performance industrial panels, from ultracompact 4″ to 15″ panels designed for demanding applications. All include ARM Cortex-A9 processors, the latest screen technology and a wide range of connectivity options to cover all automation needs.

The series offers high performance through single- and dual-core ARM Cortex-A9 processors delivering fast program execution and screen change.

X2 pro panels operate in the wide temperature range of -10°C to +60°C. The panels offer strong IP65 and NEMA 4 ingress protection for any industrial environment. The range holds all the certificates needed to perform in the field through UL, CE, FCC and KCC certification and extended classes of marine certifications.

The panels can be used straight away with the standard version of iX HMI software and the latest WARP Engineering Studio. iX combines high-quality graphics and smart functions that provide intuitive operation and a broad range of connectivity options.

Global Automation Asia-Pacific
www.globalautomation.com.au

MAGNETLESS LINEAR POSITION SENSORS

The SS-7 Series linear position sensors are designed to be used to measure the ram position of hydraulic and pneumatic cylinders in industrial, mobile or subsea applications. This model features a no-magnet design, reducing installation and cost of ownership without sacrificing accuracy specifications.

The sensors come in four versions: ME (embedded version), MR (port-mount version), MHP (port-mount 25 mm hex housing) and SS-7 (subsea port-mount), and fit into a gun-drilled cylinder similar to how a magnetostrictive sensor would be installed but without the counterbore necessary for the magnet.

The SS-7 Series can operate to a depth of 3600 m. The typical measurement range is from 25 to 600 mm, with a choice of DC voltage or current output. Housings are IEC IP67 aluminium or stainless steel, while maximum operating temperature is 85°C (with 105°C versions available).

Bestech Australia Pty Ltd
www.bestech.com.au

CHEMICALLY RESISTANT ULTRASONIC SENSORS

The pico+TF sensors are the smallest chemically resistant ultrasonic sensors available from microsonic. With four different detection ranges, they cover a measurement range from 20 mm to 1.3 m and are available with both analog and switching outputs and an IO-Link interface. The analog output versions are available with a voltage output of 0–10 V and a current output of 4–20 mA. Each sensor with IO-Link can communicate with the IO-Link master via the IO-Link interface in a digital point-to-point connection below the field level.

The compact dimensions of the sensors makes them suitable for distance measurement in restricted installation contexts. The ultrasonic transformer is protected by PTFE film while the exterior PVDF coating with its M22 x 1.5 external thread seals the ultrasonic transformer from the sensor housing, allowing their use in surroundings with an overpressure of up to 3 bar.

A typical application for the ultrasonic sensors is fill level monitoring of aggressive paints and inks such as those used in the digital printing sector, which often contain ketone. The sensors can be used at an operating temperature of between -25°C and +75°C.

The sensors are fitted with the microsonic teach-in function to enable all settings. This makes the ultrasonic sensors adaptable and suitable for a range of applications. The flexible filter settings are also used for fill level monitoring, with an internal ‘averaging filter’ setting that enables the compensation of peaks caused by waves and ripples.

Balluff Pty Ltd
www.balluff.com.au

COMMS 2017 CONNECT

Events for critical communications users and industry

Important dates for your diary ...

Sydney
7-8 June 2017
Sydney Showground

Melbourne
21-23 November 2017
Melbourne Convention and Exhibition Centre

Comms Connect WELLINGTON

11-12 April — Te Papa Museum

In association with the *Radio Frequency Users Association of New Zealand* (RFUANZ), Comms Connect Wellington, a two-day conference and exhibition, returns to Te Papa Museum on 11-12 April, 2017.

A series of case studies, technical presentations and workshops are supported by an extensive exhibition of local and international suppliers and manufacturers. Day one sees networking drinks on the exhibition floor followed by the very popular annual RFUANZ Gala dinner and awards night.

By registering to attend this year's conference and exhibition in Wellington, you'll hear what the experts have to say, advance your understanding of critical communications and the land mobile unique industry event — do not miss this once-a-year opportunity!

Registration Open — visit www.comms-connect.co.nz to register or for more information.

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RFUANZ Radio Frequency Users Association of New Zealand

In conjunction with the RFUANZ Gala Dinner and Awards Night
11April – Te Papa Museum, Wellington
Book your tickets with your conference package or visit www.rfuanz.org.nz

For further information regarding speaking or sponsorship at Comms Connect events in 2017 please

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AS I SEE IT

INDUSTRY 4.0 IN THE MINING SECTOR

The mining industry is under pressure. When commodity prices were high it was largely a matter of trying to get product out of the ground as quickly as possible. Now they have had to shift their focus to improving the productivity of existing operations. However, and despite the fact that the boom and bust cycle of mining has been the same for decades, productivity has not improved. Analysis by McKinsey & Co shows global mining productivity has actually declined 3.5% per year over the decade from 2004–2013.

The stresses and strains placed on mining equipment result in frequent breakdowns. Operators have to be transported to site then moved underground or to the rock face, and this consumes valuable time. Digital technologies have the power to unlock new ways of managing this variability through the large-scale adoption of modern technologies.

The embedding of sensors in machinery to collect data and enable communications between machines is increasingly affordable and accessible. Mining companies already produce vast amounts of data, and extracting relevant data about machinery, processes and ore bodies is now more important than ever before.

Complex mining tasks such as geomodelling, day-to-day scheduling and predictive maintenance are increasingly handled by smart analytics software packages, while smartphones and other handheld devices have transformed the way that workers interact — not only with each other but with machines. Work clothing can also incorporate sensors that transmit employee locations and trigger warnings about hazardous situations, improving safety outcomes.

Advances in robotics and sensor technology are also now making guided equipment much more affordable and effective. The use of teleremote, assisted control and fully autonomous equipment is becoming increasingly widespread in the mining industry.

These technologies will enable a fundamental shift in the way we mine. There will be reduced variability in decision-making and more centralised automated operations that reduce variability in execution.

Through a better understanding of the resource base — knowing exactly what is in the ground and where — and integrating geological information into one universal database enables operators to optimise drill and blasting operations, creates better mine plans and helps avoid resource quality issues. Deploying remote-controlled machinery such as UAVs or underground vehicles with laser scanning technologies can cause a step change in productivity, and the 3D modelling data provided by these robots can inform engineers in remote locations and avoid the dangers of sending geologists to just-blasted mine faces.

Real-time data and better analysis tools also make possible improved scheduling and processing decisions, while fitting smart sensors to equipment facilitates the prediction of failure of components. But possibly the biggest benefit of real-time data is knowing the state and location of every piece of equipment at any time, making possible sophisticated decision-making in real time that takes into account the whole operation and not just localised operational silos.

Much of the value creation in mining has already shifted from how well companies move material to how well they collect and act on information to move material more efficiently. But much remains to be done. In the fullness of time, mining will evolve towards an industry where knowledge will be used to solve the same problems as today through different means. Mining companies that recognise this and adopt new technologies and ways of thinking now will be prepared for tomorrow.

Sean Carter is a 27-year veteran of the Australian electrical industry and has served in a number of roles as diverse as applications engineering and design, through to sales and marketing. After a spell managing the Victorian manufacturing facility of an Adelaide-based company, Sean is now a product manager with SICK Pty Ltd (Australia/New Zealand) and currently manages their identification and measurement devices.

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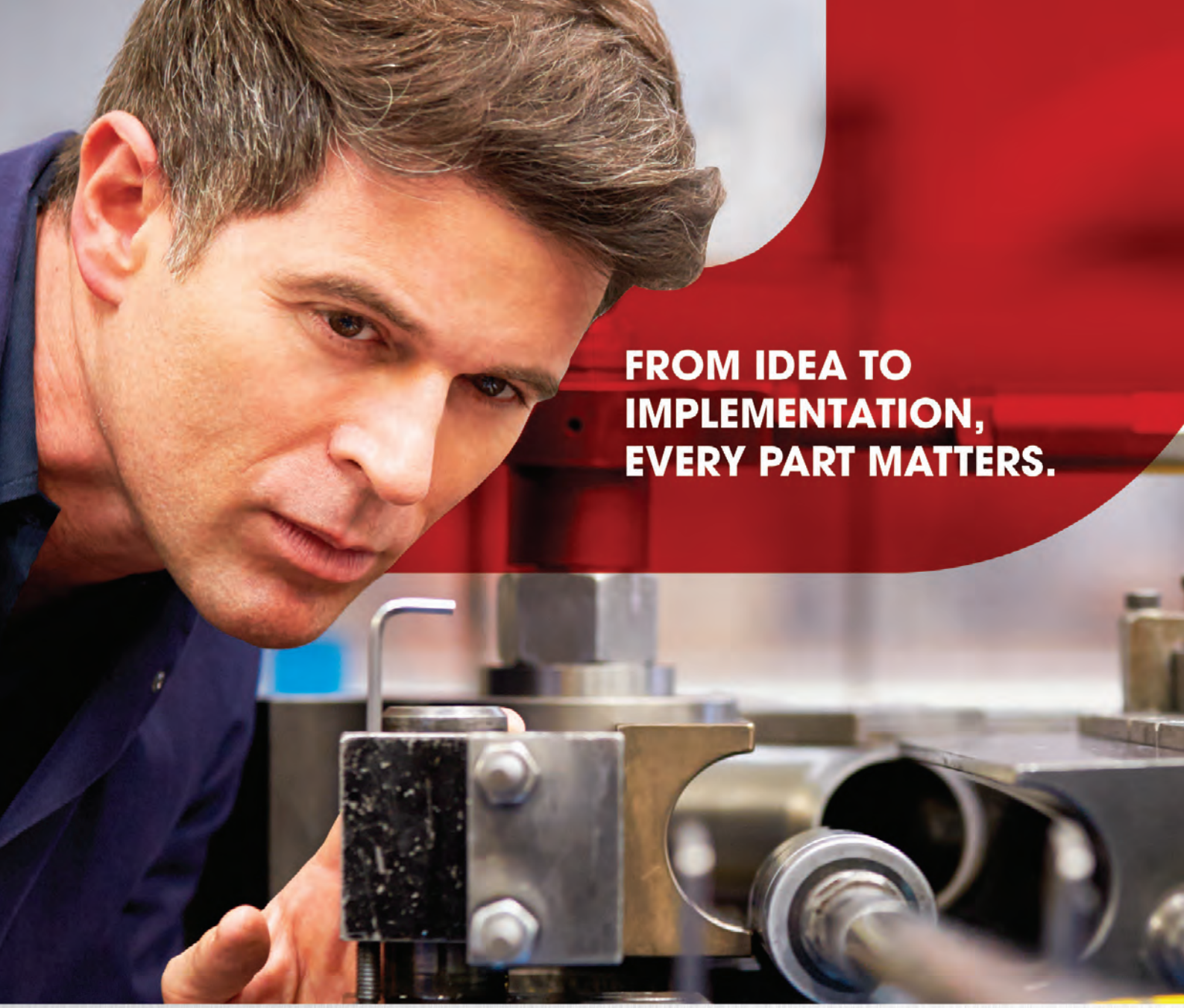

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