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New Automation Technology **BECKHOFF**



Fluke's three-phase power logger, the 1738, gives users the data needed to make critical power quality and energy decisions in real-time. **Read more on page 37.**

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The only thing that remains certain ...

Did any of us ever imagine a situation where decisions seem to be stifled by the pall of angst – hanging over almost every facet of our lives? Paralysis seems to have set in.

A colleague said, just the other day, that the only thing that remains certain is the sun will rise each morning. And so it is.

It also reminds us that energy must be the highest priority for those of us still able to think clearly.

And be aware – the fact that the sun rises each morning over this beautiful country really must provide us with a clue as to what needs to be in the mix. Equally, we need to consider the least-harmful way of providing that base load – and there are a few options.

One thing is certain... solar will be part of that mix – it has to be. Coal will be with us for a while – and continentally, nuclear is inevitable.

However, no matter how we imagine this future, the deployment of energy across the African continent will be unique – simply because the place is so darned big! Forget the scenario where base load is available to feed each user. It will not happen.



So the mix and blend of systems and sources is fertile ground for innovation. That the sun is there to serve this continent is one aspect requiring, frankly, far deeper thought. Imagine your industry only running when the sun shines?

It will imply the need to consider what type of industry can exist, where, and how we mix and match.

Imagine rethinking the way business runs to be reliant on the sun? Of course it can be done – but best we kick away that box that restricts our thinking. Whereas we tend to think of our various supplies ending up hooked into some or other grid, what that means is likely to change.

It also means that, frankly, we probably do not yet know what 'smart' really is.

Watch this space.

As fast as we see so many things compromised by inaction based on a fear of making decisions, I suspect that this area of technology is one where we will be making some big and smart decisions – which is good, indeed.

Ian



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Security Requirements on Mission Critical Control Networks

Tim Craven, H3iSquared

TAKE NOTE!



- 1 Network security is the most important aspect to consider when planning Mission Critical Networks.
- 2 No network will ever be completely secure from outside attacks.
- 3 In planning Mission Critical Networks, one needs to think like an attacker and decide whether the payoff is worth the effort involved in implementing the security.

The modern day Internet has become unsecure, and having strong security measures in place is essential for small office networks, and certainly, for large scale control networks.

As a demonstration recently, a device was connected to the Internet with direct port forwarding and no firewall to control or block traffic. Within a few seconds the device had automatically locked down all of its access interfaces, including – not only unsecure interfaces such as Telnet – but secure interfaces such as SSH. This service lockdown was caused by an overload of incorrect login attempts from various locations around the world. These login attempts were not targeted,

but simply a way to show how many automated software programs are running 24/7 around the world, and randomly testing different connections for unprotected access interfaces. This was a small yet highly effective demonstration of just how unsecure the modern day Internet has become, and why having strong security measures in place is essential for even small office networks, never mind large scale control networks.

Background

The introduction of Ethernet networking into the utility and industrial worlds was a definite milestone and brought about

the ability to fully control huge enterprises across large geographical locations without the need for thousands of individual hardwired connections and additional hardware such as signal repeaters or amplifiers. Ethernet allows for much more granular remote control and monitoring of both digital and analogue data over a single infrastructure. As the standards were widely adopted, the rest of the industry followed closely, with IEDs, PLCs and other end devices quickly being developed to directly support various Ethernet based control technologies, such as ModbusTCP (for the industrial side) or IEC61850 [1] (for use in utility networks).

At first these networks were mostly isolated, smaller networks servicing just a single plant, substation or factory, but this quickly expanded to interconnect these smaller sites, with the end goal being a single network to cover all of a company's assets. In some cases this interconnection is accomplished through company-owned infrastructure, such as long distance fibre optic cabling between sites. In most cases the cost required for these large scale WANs greatly exceeds feasible budgets, not to mention the hassle required in installing, monitoring and maintaining such infrastructure. In these cases the only other options are to use existing infrastructure from an existing ISP.



Using third party infrastructure can be accomplished in a dedicated manner, meaning that secure tunnels through the ISP's network are dedicated to a single customer. Once again, the cost for this sort of service can be restrictive. The third option is to use an existing network that covers the geographic location in question, which in most cases means using the Internet.

All options to be properly secure

Whilst using a dedicated company network is the most secure method and using the Internet is the least secure, all of these options must be properly secured to ensure that data and devices are properly protected from a variety of attacks, whether directly targeted or random, and whether they are maliciously intended or simply the result of human or machine error. For the purposes of talking about security on mission critical networks, an attack should be considered anything that could adversely affect the data on the network, the legitimate users of the network, and any device connected to the network.

Network security: Physical level

The first level to look at when considering network security is the physical level, which should already be in place as it applies to any type of security. We are of course talking about things like access security and physical disaster recovery. Making sure that unwanted users cannot access physical network devices is obviously a priority, and can be easily accomplished using standard security measures such as walls, fencing, locked buildings etc. Physical disaster recovery is quite straightforward, and includes things like automated or manual firefighting systems, back-up UPSs and similar. While this is definitely a highly critical part of network security, it is too obvious and general to warrant more than a quick mention.

Logical security

Next we need to look at the logical security of the network, which can be roughly broken down into local security (attackers who can get direct physical access to the network and logically access devices that way) and remote security (attackers who are physically connected outside of the local network, and are instead trying to logically breach the network). While these are greatly intertwined and related, it is logical to approach security from a bottom-up approach in most cases. This means we will address local security first.

One of the most prolific breakdowns in local security comes from the tendency of users to not change the default authentication details of net-

working devices and attached devices. This means anyone can find the login details with a model number, Google and about five minutes of searching. While it is convenient to not have to record and remember a number of passwords, it is important to remember that a certain level of convenience has to be forsaken in order to have a properly secure network.

Virtual Local Area Networks (VLANs)

This leads us to VLANs and their use on networks, as VLANs are probably among the greatest causes of confusion in any industrial or utility grade network, and as such are often only partially implemented leading to messy and inefficient networks. A rough breakdown of the need for and operation of VLANs is required.

Broadcast

One of the fundamental communication types in TCP/IP networks is a broadcast, where a device sends a packet to every other device within its subnet. The problem is that switches, as layer 2 devices, will flood this packet out of every port besides the one on which it is received. This means that even devices that are not in the originating device's subnet will still receive this broadcast packet, even though they are not interested in it. These devices will simply discard the packet, however they first must receive, error check and inspect the packet, which takes up resources. The amount of resources consumed will be tiny, but in very large networks these small bits of wasted resources add up, and can seriously affect critical network traffic. For this reason a method of segregating devices into separate broadcast domains is needed.

Routers

Routers will separate broadcast domains, but are not feasible for this application for a myriad of reasons that are irrelevant to this discussion. Instead we require an option to segregate traffic based on a logical configuration of the switches, which can be adjusted as required and is not hardware based. The solution is VLANs. As the name implies, VLANs logically (virtually) separate the network into different LANs, even though at a physical level these VLANs are still connected. This means that broadcasts will not be sent to devices in a separate VLAN at all, as the switch will be configured to not send them, meaning the end devices do not have to assign any resources to inspecting unwanted traffic.

Will the cost and time saved by not implementing a certain level of security outweigh the potential loss if the security is breached?

ABBREVIATIONS

HMI	– Human Machine Interface
IED	– Intelligent Electronic Device
IP	– Internet Protocol
IPSec	– Internet Protocol SECurity
ISP	– Internal Service Provider
PLC	– Programmable Logic Controller
PSK	– Pre-Shared Key
SSH	– Secure Shell
TCP	– Transmission Control Protocol
UDP	– User Datagram Protocol
VLAN	– Virtual Local Area Network
VPN	– Virtual Private Network
WAN	– Wide Area Network

In order to communicate between VLANs, a router is required. This router will be configured to have an IP interface within each of the relevant VLANs, meaning that it can act as an intermediary and will pass packets from one VLAN (with a unique IP subnet) to another (with a different IP subnet). Most routers will offer some form of firewall, which is effectively a list of rules of what traffic can pass between subnets (and VLANs). This is where the security benefits of VLANs come to light. With the correct configuration and access control, users connecting to the network will only have access to their relevant devices, meaning that they could not adversely affect other parts of the system. This could even be extended to the level of putting all users into an engineering VLAN, and then only allowing access through the firewall to certain services or features on end devices. The router could possibly be set to record auditing data of these connections, showing who connected to what and when.

Engineering access solution

This thought process can be further extended with the introduction of an engineering access solution. These software solutions are used to manage, control and monitor user connections to network connected devices, whether actual networking hardware (routers, switches etc.) or the attached end devices (PLCs, IEDs, servers, HMIs etc.). They provide features such as having users log into the engineering server, which then manages which end devices that user can connect to, often to the level of automatically logging into the end devices with the correct access rights and so forth. These systems will closely monitor users, and can perform levels of network maintenance and management, including backing up configurations of devices before and after any change, monitoring of exact changes users make, firmware management and more. Another added benefit from these systems is that users only have to remember a single login and password for the system, which then automatically and transparently manages end device passwords, ensuring that users cannot easily bypass the access system.

From secure to unsecure networks

The next step is to look at the paths from the secure network to any unsecure networks, whether the unsecure is the Internet or even the company's corporate network, which should be considered unsecure as once again an attack does not have to mean malicious intent. A corporate user could connect a flash drive from their home onto

the corporate network to copy a file, inadvertently transferring a virus over to the corporate network. If the connection from the secure mission critical network to the corporate network is not fully secured this could then mean the virus is able to transfer to the secure network. For this reason any other network must be considered unsecure.

Port forwarding and standard routing

There are many different options for external users to connect to devices on the internal network. Two of the simplest (and least secure of these) are port forwarding and standard routing. Port forwarding simply means allowing external users to connect to the router for a certain service (defined by the TCP/UDP port they connect to), which will then be forwarded directly to the internal device. Routing of course simply means they connect directly to the internal device's IP address via a router. While these methods can both be secured to a degree, they are notoriously easy to circumvent any security and should never be used between secure and unsecure networks, rather they should only be employed within the secure network itself.

VPN Technology

The next options we will look at involve connecting to the network using some kind of VPN, or Virtual Private Network, technology. There are a variety of different methods and protocols to establish VPN connection, but all of them effectively provide the same end result, which is a virtual tunnel through an unsecure network (typically the Internet) that secures traffic against outside interference or snooping. This is done by first authenticating the user and establishing a cryptographic exchange which can then be used to encrypt traffic between the two end points. This means that even if an attacker manages to intercept the traffic stream, they will not be able to easily interpret the traffic or be able to pretend to be a legitimately authorised end device (a process known as spoofing or man-in-the-middle attacks).

While commercial VPN technologies exist that are easy to install and set up, these generally work by communicating out to a cloud solution for the tunnel establishment and encryption. One such example that is commonly used for personal and commercial use is TeamViewer. While these solutions are generally secure and stable, they are still not as secure as a completely in house managed solution, and should not be employed on mission critical networks. Rather a manually configured and maintained VPN solution should be implemented. This will require more initial invest-

ment and commissioning time, as well as deeper technical knowledge. The trade-off includes both increased security that is completely under your control, as well as better auditing, monitoring and ease/speed of maintenance as you are not reliant on a third party solution.

VPNs to consider

Host-to-site

The next question then becomes what type of VPN to use and what protocol/s to use to establish the tunnels. In response to the first question there are two major types of VPNs that can be considered. The first is known as a host-to-site and is the more commonly referred to option when users speak about a VPN. This option involves a single user (the host) connecting from a remote location to a secure network (the site) via an unsecure network (normally the Internet). The user runs software on a laptop that speaks to the VPN server hardware/software on site to establish the VPN tunnel. From this point it will be as if the user is directly connected to the LAN, and the actual VPN tunnel will be transparent to other software on the laptop. This is the most common VPN tunnel type that is used to allow engineers to connect to the network from home or a hotel in another country and perform maintenance, configuration or troubleshooting remotely.

Site-to-site tunnel

The second type of VPN is known as a site-to-site tunnel. In this case, as you may expect, the tunnel is established between two secure networks via an unsecure network, such as in the case of connecting a remote substation to a control room via the company corporate network. The tunnels can be temporary created as required, but are more often left open as permanent tunnels which effectively are used to semi-permanently expand the network across geographical locations. Once again in these set-ups the VPN tunnel will be transparent to end users and devices, which will simply see a standard routed network infrastructure.

Protocol/s for VPN tunnel establishment

The final decision to make is to determine which protocol/s to use for the VPN tunnel establishment. Once again a variety of options exist, however by far the most secure currently is IPSec (Internet Protocol SECURITY), which is a VPN protocol that works over a two phase tunnel establishment. Without going into too much detail this involves first an authentication phase where the end devices perform a back-and-forth handshaking process that ensures

they are both who they claim to be. This authentication can be done using a few different methods, including just standard PSK (Pre-Shared Key, basically a password exchange) or by using secure certificates (digital files that are used to uniquely identify end devices). Once this phase is complete phase 2 establishes the cryptographic set-up to ensure proper encryption of the traffic. IPSec caters for a variety of different authentication and crypto standards that can be used depending on the end devices capabilities. By using external authentication and crypto standards it makes the protocol suite more future proof as hopefully future changes and improvements can be included without requiring a complete overhaul of the IPSec standard.

Conclusion

We have glanced at some of the most salient points to consider when planning, designing and implementing security on Mission Critical Networks, however this is a field with just as much depth as it has breadth, and which could be discussed for months without scratching the surface. Network security is without a doubt one of the most important aspects to consider when planning Mission Critical Networks and should not be approached lightly. A final thought to keep in mind is that no network will ever be completely secure from outside attacks, especially when the network is connected to an external network. The process of implementing network security rather becomes a case of deterrence. This means that one must think like a potential attacker, and determine if the payoff is worth the security, or if more security is needed as a proper deterrence. A single firewall may be more than enough to protect most home networks, but a lot more security layers are needed when considering a country-wide smart power grid network, for instance. Always ask the question: 'Will the cost/time saved by not implementing a certain level of security outweigh the potential loss if the security is breached?'

Reference

[1] IEC 61850. Power utility automation.

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Manufacturers Move to the Cloud

Information provided by EOH Cloud Solutions

The status of each sale, as well as the profitability of each deal can be tracked.

TAKE NOTE!



- 1 The pressure on manufacturers to improve accuracy and process speed is relentless.
- 2 Cloud solutions allow IT practitioners to free up and allocate computing power to those areas that need it the most.
- 3 Cloud computing can offer the latest technologies, with top functionality at lower capital and operating costs.

Manufacturers have one thing in common – they need to make themselves hassle free from a supply chain, distribution and services point of view. Many manufacturers are looking to cloud computing to improve their process, supply chain management, R&D as well as front and back office functions.

The pressure on manufacturers to improve accuracy and process speed is relentless, says Richard Vester, director of EOH Cloud Solutions. “Fast-paced product lifecycles and short time-to-market schedules are no longer the exception, they are the rule. In a competitive market place, being the first to deliver is the difference between thriving and closing doors.”

Ideal for manufacturers

He says a manufacturing strategy built around the cloud allows manufacturers to add Business Intelligence (BI) and knowledge management all along the supply chain, right up to sales. “On premise systems have this ability to a certain extent as well, but cloud is infinitely faster and more customisable. Although manufacturers are not known for investing in the most advanced technologies, cloud computing is ideal for manufacturers, particularly for lowering capital expenditure, and reducing human resources and labour costs.”

He cites one reason as being that the responsibility for running on-premise solutions, hardware and software now lies with the cloud provider, and all associated hassles, which would usually fall on the shoulders of the manufacturer, are removed. “This includes maintenance, upgrades and so on.”

Ease of use and flexibility

Over and above the lowered hassles and expenses, he says manufacturers who adopt cloud can look forward to faster deployment, improved ease of use and flexibility. “Cloud solutions allow IT practitioners to free up and allocate computing power to those areas that need it the most.”

In addition, through cloud, these entities can use analytics and BI to capture intelligence across the manufacturing chain, and use this information to enhance planning and decision making. “This also assists with quickening the introduction and development of new products. Cloud can be extremely

helpful, particularly in high tech manufacturing environments, as time-to-market pressures require more and more collaboration, earlier and earlier in the process and design cycle.” In terms of the sales and marketing process, Vester says indirect and direct channel sales can be managed from one cloud platform that tracks sales against quotas and targets, from the individual sales person, to a group, to a division. “The status of each sale, as well as the profitability of each deal can be tracked.”

Marketing automation delivers results

For marketing, cloud-based marketing tools can plan, carry out and track the results of each and every marketing campaign. “With marketing budgets getting smaller and smaller in tough times, any spend of this nature is under tremendous scrutiny. Marketing automation delivers results, and can gauge the success or failure of a campaign, as well as whether the marketing spend is resulting in a return or not.”

Boosting customer service is another benefit seen by manufacturers who adopt cloud. “Once customer service and support is automated, it is far easier to track the status of orders online. In addition, these systems can be integrated with distribution, pricing, content management and similar platforms,” Vester explains.

Lower capital and operating costs

Cloud-based systems are being used by all types of manufacturers to streamline key areas of their business, to free up time and resources to invest in the future. “Cloud computing can offer the latest technologies, with top functionality and flexibility at far lower capital and operating costs than on-premise solutions. It allows for collaboration among mobile and remote workers, vendors, suppliers and other stakeholders in the supply chain, and offers quick, secure and easy access to information as and when needed to boost operations and make data-driven decisions,” he concludes.



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Hydraulic Positioning Software Powers Production Machines

Wilfried Osterfeld, Beckhoff Automation

This means a tremendous speed advantage in terms of product and process development.

Lightweight yet strong construction materials are required for building ships or mobile homes. Beckhoff was involved from the start in the development of the new machines required for producing this material.

The lightweight construction material Lisocore, manufactured by Lightweight Solutions GmbH, in Bad Aibling, Germany, is used for a number of highly innovative applications where conventional wooden materials reach their limits. For example, lightweight yet strong construction materials are required for building ships or mobile homes. Beckhoff was involved right from the start in the development of the new machines required for producing the material – with PC-based control, and in particular with TwinCAT Hydraulic Positioning for seamless integration of hydraulic servo axes.

Lightweight Solutions was established as a start-up business with a background in university research. Initially, their core process – the production of an innovative, lightweight construction material – had to be tested for readiness and implemented in series production within a short timeframe. Beckhoff was involved right from the prototype phase. The deciding factor for the selection of PC-based control technology was Lightweight Solutions' intention to start prototype production as quickly as possible, and with maximum software flexibility.

At the time, PC-based control proved to be a great advantage, as the approach enabled a direct fieldbus connection between the I/O system and valve control without any additional hardware. In addition, the synchronisation control for the hydraulic drives on the twin-punch press and the control of the supply unit were easy to implement based on the TwinCAT Hydraulic Positioning library. The first three-dimensionally shaped core structures were produced with a press built entirely by Lightweight Solutions as early as 2006. The machine not only provided prototypes for testing and sampling, but produced series parts over several years.

High potential for innovation

Today, a spacious production hall houses four much larger successors to the first press, which are networked via EtherCAT and each controlled by a C6920 Industrial PC from Beckhoff. They form the end stations in the production lines where the core structures are assembled to create finished products. In the meantime, the TwinCAT Hydraulic Positioning library has been ported to TwinCAT 3, while retaining the tried and tested functionality.

In the new machine generation, operational reliability was further improved. In two- or four-punch presses, there is a risk of the powerful cylinder drives damaging the machine if a valve failure remains undetected or is detected too late. In order to identify developing problems at an early stage, the hydraulics library provides software functions that are used for monitoring the valve operation. The fact that not only the encoders benefit from EtherCAT interfacing, but also the valves, has proven to be advantageous. In this way, a variety of diagnostic data, including the current slider position, are available without additional effort. Comparison with a model calculated in the hydraulics library enables analysis of the valve behaviour, so that warnings or alarms can be issued as appropriate. Problems can then be recognised and addressed proactively, such as malfunctions in a pilot valve supply or a main stage blockage caused by accumulated particles from the process.

Controlling complex production processes

In the highly-automated lines, cover layers are joined with the Lisocore core structures to form sandwich elements. This process is more demanding than it may appear at first glance. A form-locking connection with a total of 15 000 mounting points is achieved in 20 seconds, which makes highly-dy-





dynamic positioning essential. Since the slabs are continuously moved forward during these operations, the milling units have to synchronise with each row based on the 'flying saw' principle, perform the processing steps and return as quickly as possible so they are ready for the next row. More than 20 servo axes are installed in this part of the plant alone.

Once the protective layers and the core structure have been joined correctly, the 'sandwich material', which is still quite fragile, is transferred to a hydraulically operated, scissor-type lifting table. This table transfers the incoming products to a multi-level press, where the individual elements are joined in a dimensionally accurate, permanent manner with a hardening adhesive.

An undesirable characteristic of such scissor-type lifting tables is their tendency to oscillate. This is difficult to avoid, even in the end position. This creates increased waiting time, which unnecessarily delays the forwarding of the sandwich slabs, resulting in reduced production throughput. It also has a negative impact on the dimensional accuracy, due to a possibly undefined hardening of the adhesive. As a solution to this problem, condition feedback was implemented, in which correction values derived from the chamber pressures of the hydraulic cylinder are offset with the valve control signals. The electronic attenuation generated in this way ensures fast stabilisation in the target position.

Multi-core Industrial PC with TwinCAT 3

The transfer between the scissor-type lifting tables and the multi-level presses requires intensive communication, because there are no fixed rules to determine which of the four levels the next product is conveyed to. In addition, the position of the levels changes continuously, due to the stack-type design of the press. Here, TwinCAT 3 shows its strength in conjunction with the C6650 control cabinet Industrial PC with cutting-edge multi-core CPU (Intel Core i7, 4 cores). This is also found in the numerous other synchronous transfer stations between conveyor belts and processing zones. The realisation of the entire plant software on a single PC-based platform eliminates the need to exchange and transmit data and signals between different controller types.

Even the wide mix of technologies in this plant is no longer a drawback: the hydraulic axes with an adapted technology software library, complex motion control for the Servo Drives, and even the

modules for waste heat recovery work seamlessly together. To this end, almost 900 EtherCAT slaves (IP 20 I/O terminals, IP 67 I/O modules and AX5000 Servo Drives with AM8000 OCT servomotors) are linked via two EtherCAT masters, according to Jens Hülsebusch, Project Manager of Systems Engineering at Beckhoff. The set values for 130 NC axes are calculated within a 2 ms task interval.

Conclusion

"Without TwinCAT 3 and its multi-core support, it would not have been possible to realise such a system," emphasises Michael Schäpers, Managing Partner of Lightweight Solutions. "Four processor cores were available to execute the various tasks separately. Plus, with the integrated EtherCAT-based technology from Beckhoff, we didn't have to worry about the communication routes in the plant. What's more, the process data obtained from the machines can simply be fed back into the plant. This special feature helps us develop new processes and products more easily. It is essential that we operate the machine flexibly and access the controller data easily. Another argument in favour of the Beckhoff system is TwinCAT 3 Scope. This software oscilloscope can be used to achieve detailed analysis of the process sequence, and it is possible to retrieve all required data for a new process. All in all, this means a tremendous speed advantage in terms of product and process development."

The entire automation technology is already linked to SAP via intelligent solutions. Looking ahead, Michael Schäpers notes that: "As manufacturers of special purpose machines, we will continue to collaborate with Beckhoff on projects by leveraging the concepts of Industry 4.0."



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Wilfried Osterfeld is in Technical Marketing Hydraulic at Beckhoff Automation.

TAKE NOTE!

- 1 Liscore, a lightweight, but strong, construction material (used for ships or mobile homes), is manufactured by Lightweight Solutions in Germany.
- 2 Beckhoff was involved in the development of machines required for producing the material (with PC-based control and TwinCAT hydraulic positioning for seamless integration of hydraulic servo axes).
- 3 Today there are four larger successors to the first press, networked by EtherCAT and controlled by an industrial PC by Beckhoff.

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Managed Security Services

Information provided by DRS, a Cognosec company

TAKE NOTE!



- 1 Managed security services entail outsourcing security services to experts whose sole focus is on information security.
- 2 Managed security services ensure that the latest anti-malware tools are in place.
- 3 With managed security services organisations enjoy network protection at all times, against threats of all types.

Protecting your business from advanced and complex threats such as attacks on the network, social engineering or spear phishing, is a highly complex task.

Today's threat landscape has seen a surge in the complexity and sophistication of cyber threats. Alongside this, security standards are becoming increasingly complex, and security budgets are shrinking, forcing businesses to try to do more, with less.

In addition, bear in mind that the world of technology in a business environment goes way beyond servers and workstations, and is now drowning in a flood of mobile devices and personal applications that today's workers deem essential. The 'BYO' phenomenon is here to stay, and organisations wishing to thrive, need to consider how to protect them, and the impact they can have on enterprise security," says Robert Brown, CEO of DRS, a Cognosec company.

Stress on data security

He says these and other issues such as the Internet of Things and social media are placing a tremendous stress on organisations when it comes to the control and management of data security. "It's all very well having a techie who deals with the daily 'keeping the lights on' tasks when it comes to information security. This may include telling you which software to buy, ensuring that back-ups are running and similar. But add to this the highly complex task of protecting your business from advanced and complex threats such as attacks on the network, social engineering or spear phishing, and they will quickly become overwhelmed."

Unless they are in a cycle of continual training and skills upgrading, they cannot hope to keep pace with the frequency and strength of attacks, he says. "Needless to say, this will mean that other systems are not being maintained."

Managed security providers

According to Brown, this is where managed security providers come in. "Essentially, getting managed services on board means that security services are outsourced to experts whose sole focus is on information security, and who can protect the organisation with a host of resources and training at their disposal - more than any one person could reasonably be expected to provide."

He says managed security services cover a variety of things, including ensuring that the latest an-

ti-malware tools are in place, and that workstations are monitored and cleaned to prevent infections from spreading through the company network. In addition, providers will take control of threat management, using intelligence at their disposal to root out, protect and mitigate against threats.

Compliance management

Compliance management is another area in which a managed security services provider can help. "Any business that handles confidential customer information, or financial data, must be up to date with compliance regulations, which are increasingly stringent and complicated. A provider can help maintain compliance, as well as instruct the businesses leaders on certificates needed and suchlike."

Managing network access and control

Brown says that managing network access and control is another major area that needs professional expertise. "Keeping threats out without compromising usability is no easy task. Managing network access means having a handle on encryption, endpoints, data leakage prevention, and hardening devices. Firewalls need to be maintained too, as does network monitoring, and analysis to pinpoint any anomalous behaviours that might be indicative of an attack."

Network protection at all times

Then there's the question of responding to an incident in the unfortunate event that one occurs. Someone needs to have a response plan in place and know exactly what the steps to follow are in case of a breach. A provider will be able to conduct forensics, get the correct logs, isolate a particular machine on the network - and will be available to do this 24/7, he adds. "With managed security services, organisations can enjoy network protection at all times against threats of all types, without the distraction, vast expense and complexity of dedicated, in-house technical staff," Brown concludes.

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Connectivity in Remote Areas

Information provided by Benton County Electric System

With a fully-reliable network in place, BCES has been able to complete the rollout of its automated metering infrastructure

TAKE NOTE!

- 1 An American company began an initiative five years ago to install automated metering infrastructure in rural Benton County that would collect meter data every 15 minutes.
- 2 Owing to the unreliable cellular coverage of the rural environment, the company faced many challenges.
- 3 The BGAN M2M satellite communication service designed for this project provided connectivity, security and the effectiveness necessary for the project to be successfully completed.

BCES began an initiative in Benton County (USA) five years ago to install automated metering infrastructure that would collect meter data every 15 minutes.

Benton County is in Northwest Tennessee, bordering the western branch of the Tennessee River and often referred to as the gateway to Middle Tennessee. Aside from the city of Camden, the only other largely populated areas are the agrarian communities of Big Sandy and Holladay.

The county's electricity requirements are met by Benton County Electric System (BCES), whose 38 employees work to deliver power to more than 10 000 customers. BCES's philosophy is to offer fair and equitable rates for all. To accomplish this, BCES began an initiative five years ago to install automated metering infrastructure that would collect meter data every 15 minutes. Having near-real time access to this data would allow BCES to better respond to customer needs, expedite engineering analysis, and provide holistic data of the electric system for a cost-based rate design. The company would be able to remotely connect and disconnect services, monitor power outages across the county, and offer new services such as prepay. Moreover, reducing its reliance on manual meter checks with automated meters promised to save countless travel hours for BCES's staff.

The company faced several challenges in rolling out its automated metering infrastructure due to the patchy and unreliable cellular coverage typical of rural and remote locations. Scott Owens (BCES) explains: "We initially adopted a hybrid connectivity model for our meters, connecting our collectors on our fibre-optic network in certain areas, and private cellular networks in others. However, there were gaps in the network where neither of the two services were available or feasible, meaning that some isolated meters still had to be read manually, draining time and resources. We needed a connectivity solution that would enable us to fully utilise the integrated automated metering infrastructure."

Solution

BCES set about finding the right partners who could provide a reliable alternative to their existing connectivity methods. BCES chose Network Innovations,

a key partner of Inmarsat, and a leading provider of BGAN M2M satellite communication services.

Powered by Inmarsat's global 3G L-band satellite network and optimised for lower bandwidth and throughput than the standard BGAN offering, with a minimum billing increment of 1 kilobyte, BGAN M2M provides a reliable, IP-based real-time connectivity service that seamlessly integrates into any network. It supplies a reliable, always-available service and connects monitoring and control applications in remote, unmanned locations, giving full visibility and management of dispersed assets across an entire operational area. "We listened to and fully understood Benton County Electric's unique challenges and goals. Our extensive experience working with BGAN M2M and designing solutions for the utility industry, ensured the project was a success," said Eric Verheylewegen, Executive Vice President Global Land Sales, Network Innovations.

Results

With a fully-reliable network in place, BCES has been able to complete the rollout of its automated metering infrastructure. This has enabled the successful implementation of a fair and equitable rate design for every customer. The network has also ensured the success of prepay services, which reads/ disconnects/ connects meters daily, giving BCES's customers more choices and information than ever before. Scott Owens, Director of Communications and Technical Services at Benton County Electric System, says: "The BGAN M2M service has given us the connectivity, security and cost effectiveness that we needed to complete this project. Inmarsat stood out for its reliability and ease of set up. The installation was so straightforward that if you can point a compass, you can install the small size BGAN terminal."

Conclusion

The BGAN M2M solution continues to serve reliably and efficiently, providing BCES with the peace of mind that meter data is always being collected.

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Intuitive Robotics Add Flexibility



Information provided by Omron

With the focus shifting from mining to food production on the African continent, there is a strong demand globally for world class South African produce.

More food processors are looking into the latest technology to fully capitalise on these developments and opportunities. It is said that by 2025 the world's population will grow to 8 billion and by that time the world's food consumption will be 75% higher, according to figures released by the International Population Conference that was held in Cape Town at the end of 2016.

South African meat has gained a reputation throughout the world for its high quality. But how do we, as a meat producing country, maintain that quality? That is the big challenge for the industry.

Advanced technology

Through advanced technology, the food and meat processing industry can address major issues such as quality control, improved efficiency and productivity, worker safety, traceability and operating simplicity.

"A modular approach to a packaging line makes it possible to design a complete line by bridging the different machines interconnected in the most efficient way. With more than 50 years of experience in assisting our customers to reach high production objectives, Omron can offer a complete solution in automating packaging lines," Evert Janse van Vuuren, Omron automation expert, explains. "Increasingly, embedded robots and robotic modules are integrated into packaging machines to enhance the adaptability to new processes and even permit automating manual tasks. Omron's Sysmac automation platform provides complete control from vision through to robotics by combining motion and kinematics calculation."

Robotic pick-and-place systems

With the utilisation of robotic pick-and-place systems, many meat processing plants can realise the benefits and improvements in the total cost of ownership for primary meat owners. The business drivers for using robotics in primary packaging have many industry players thinking about customisation, hygiene, brand protection, improving

traceability, reducing overall costs and bridging the skills gap among company employees. "Robotics are helping businesses to acknowledge the consumer demands for range formats- formulations, information and quality in the products that they are buying from companies. The regulations are becoming more complicated and demanding and pressure is mounting on large scale investments in terms of return on investments," Laetitia de Jager, Omron South Africa Marketing Manager, notes. "This is creating concerns about protection and improvement of many brands' image and reputation."

Advantages in meat processing

The arise from using robotics has many advantages for the meat processing industry- such as speeding automation processes, precision in operations as well as reliable operations while performing repetitive tasks. Robotics assist in flexible packaging as product components are placed in the proper tray compartments and food is kept safe from pathogens during direct contact. "Omron is the world leader in robotic Pick- and place systems and can offer a complete customisable solution for each and every client," said Janse van Vuuren.

The Quattro

Omron's solution to the challenges faced in the Food and Beverage sector, is the best Delta robot available – The Quattro. This robot has a unique patented 4 arm design and is designed to avoid the 'pooling' of water and to withstand multiple cleaning solutions at 60°C. Using Pick- and place robots have many benefits. These can include everything from quality improvement, cost reduction, increased output, flexibility, repeatability of product placements, eliminating manual errors.

Total automation solution

Janse van Rensburg emphasised the need for greater simplicity in the meat processing supply chain. "Sysmac integrates control, motion, safety, robotics and sensing technologies into one platform."

TAKE NOTE!



- 1 With the strong demand for South Africa's world class food produce, food processors are looking into up to date technology to capitalise on this opportunity.
- 2 Meat processing plants can benefit from robotic pick-and-place systems.
- 3 This company's solution to the challenges in the Food and Beverage sector is the best Delta robot available – the Quattro.

With Omron's Sysmac system, using the NJ series controller and the Delta Quattro Robot, you will have a total automation solution.

Laetitia de Jager
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Sensor and RFID Tag in one

Turck's HF-RFID/sensor tag records and stores measured values such as temperature and pressure and can be read without contact Controls. Turck can develop and produce application-specific RFID tags with an integrated sensor function. The sensor tags record and store process values such as temperature or pressure in moving components. The sensor element can be replaced and can also be used to measure humidity, magnetic fields, reed contacts or inductive sensors. The sensor tags are supplied with power and read via an HF-RFID read/write head. Even the data recording without contact to the read/write head is possible using a separate energy source. Depending on the frequency and type of measurement, as well as the ambient variables, measuring cycles can be run and recorded over several hours.

Turck's sensor tags are suitable, both for applications in which measuring values or other data have to be monitored and stored without contact, as well as for use on moving elements that previously had to be connected with slip ring solutions, which required a high degree of maintenance. One example is the identification of rollers, including the storage of process-specific parameters. Fur-

thermore, they can also be used where data has to be collected without contact from sealed interiors or from inaccessible locations. The user can also use the conventional RFID function for the identification of objects in the usual way.

Each application places different requirements on the use of sensor tags – from their mechanical properties to the physical measured values right through to the sensing range and resolution. Turck therefore develops the HF sensor tags individually for the specific customer application.

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Iritron achieves Wonderware Endorsed System Integrator Status

Wonderware Southern Africa's System Integrator Partner Iritron, has achieved Wonderware Endorsed System Integrator (ESI) status.

Located in Pretoria, Iritron has an extensive track record in the fields of Plant Automation, Simulation, Optimisation and Information Systems. The company's engineering expertise is extensive in these fields, focusing mainly on, but not limited to, mining and mineral processing and related industries, food and beverage as well as the water and wastewater industries.

"Iritron has an in-depth understanding of the domains and cultures of its clients and can point to many success stories proving their ability to manage projects efficiently, while producing high quality results," said Deon Barnard, Managing Director, Wonderware Southern Africa. "Only companies with proven technical excellence, high levels of customer service, integrity and multiple years of certification and project management experience with Wonderware solutions are eligible for ESI consideration. We look forward to working with Iritron in providing our customers with solutions that increase their operational efficiencies."

The purpose of the Wonderware System Integrator Partner Program is to attract, support and retain skilled System Integrator partners to deliver highly productive solutions to end-users. Wonderware Southern Africa regularly works with around 70 South African SIs who are actively involved in supplying Wonderware solutions.

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Handheld communicator

Emerson's AMS Trex Device Communicator has added new enhancements that improve response time to operational changes through best-in-class visibility of field changes. Auto Sync technology makes AMS Trex the first handheld communicator to automatically synchronise field data with a facility's AMS Device Manager database. By connecting field data with decision makers, maintenance and operations personnel will now have even faster access to field changes and an accurate audit trail for compliance and analysis requirements. Before the AMS Trex, when changes happened in the field, information about those changes was often incomplete, inaccurate, or delayed. The communicator eliminates this risk of inaccurate data, by logging and timestamping all changes as they occur. With the resulting audit trail, organisations know not only what was changed, but when and by what device, simplifying change-related troubleshooting and providing easily accessible data for compliance audits. Even if a technician is servicing a stranded device far from the asset database server or in a Wi-Fi dead zone, changes are cached locally on the communicator and uploaded as soon as the handheld automatically connects with the system, either wirelessly, or via USB cable connection.

Enquiries: Rob Smith. Tel. +27 (0) 11 451 3700 or email Rob.Smith@emerson.com



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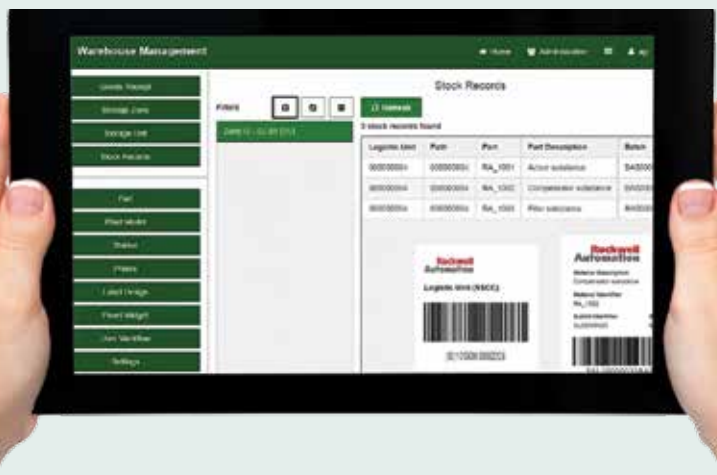
Expanding MES applications for entry to smart manufacturing

Rockwell Automation has introduced a new suite of capabilities which has improved functionality across its portfolio of scalable MES applications based on the FactoryTalk ProductionCentre platform from Rockwell Automation. The portfolio includes FactoryTalk Production, FactoryTalk Performance, FactoryTalk Quality and soon FactoryTalk Warehouse applications.

"We are delivering on what we promised – improvements in usability and flexibility – while adding entirely new applications," said Christo Buys, Business Manager for Control Systems, Rockwell Automation sub-Saharan Africa. The line-up is as follows:

- **Improved User Experience, Time-to-Value:** The latest updates to FactoryTalk Production, FactoryTalk Performance and FactoryTalk Quality applications provide a simplified, visual drag-and-drop tool to build out new workflows – no coding needed. This means product changeovers can happen more quickly and allows more flexibility for new product introductions
- **New FactoryTalk Warehouse Application:** The latest MES application, FactoryTalk Warehouse, streamlines warehouse logistics to allow fast, precise inventory management and tracking capabilities from goods receipt through stock records and goods issuing
- **Increased Integration for Process Applications:** An expanded, out-of-box integration tool in the FactoryTalk ProductionCentre MES application portfolio gives users access to more production data across systems, greatly reducing the barrier to entry for connected and smart manufacturing
- **Expanded Delivery Options:** Rockwell Automation provides infrastructure-as-a-service offerings via pre-configured and managed industrial data centres and will soon provide SaaS offerings via the FactoryTalk Cloud platform

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Effective plant asset management

With its Simatic PDM Maintenance Station V2.0, Siemens is providing the ideal solution for efficient monitoring of intelligent field device statuses independently of the automation and control system used. Their integration is based on DD (Device Description)/EDD (Electronic Device Description) technology.

Diagnostic, parameterisation and status data from the field devices is read out cyclically and depicted in a clearly arranged format. The collected data can also be transferred using an export function for further processing in enterprise asset management or cloud-based condition monitoring systems. Version 2.0 has been further developed to comply with Namur recommendations NE 105, NE 107 and NE 129.

The Simatic Process Device Manager forms the basis for data and status monitoring of smart field devices in the maintenance station. Simatic PDM is a universal, manufacturer-neutral tool used for project engineering, parameterisation, commissioning and monitoring of intelligent field devices and field components.

It supplies diagnostic data, status data and parameter data to the Simatic PDM Maintenance Station, where the information is processed and supplemented by functionalities such as overview or work progress lists, overview, segment and detailed images, status logs, parameter data archiving, global and device-specific message lists as well as cyclical functions for reading out or exporting field device information.

The maintenance and servicing system is designed for use by small to medium-sized enterprises or production plants used for processes such as hybrid or biogas, wastewater treatment, painting lines in the automotive industry or paper manufacturing. The Simatic PDM Maintenance Station can also be used in specific plant sections. Version 2.0 of the Simatic PDM Maintenance Station can be used wherever intelligent field devices are in operation. The system is optimised for up to 500 field devices, and it is also possible to combine several Simatic PDM Maintenance Stations within one plant.

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RJ45-connectors with right-angled grip body

ESCHA, Supplied locally by RET Automation Controls, offers high-grade RJ45-patchcords with right-angled grip body. The right-angled versions facilitate an optimal cable run for applications with limited space conditions. The overmolded grip body averts snapped off- or broken cables and thus guarantees a faultless data transmission according to Cat5e. ESCHA RJ45-patchcords meet IP20 protection class requirements and are especially adapted for automation solutions within the switch cabinet.



More patchcords in tight space

The advanced system decentralisation makes smaller and smaller switch cabinets necessary. Therefore, patchcords must be installed in tighter and tighter spaces. This can cause snapped off- or even broken cables consequently leading to a lower data transmission, loss of data or standstill. Cables can be particularly space-saving installed with ESCHA right-angled RJ45-patchcords. The overmolded grip body provides for safety, stability, and guarantees a safe data transmission. In order to satisfy all individual requirements, ESCHA offers the new RJ45-patchcords in 'right-angled on right-angled' as well as 'right-angled on straight' variants. Thanks to UL-certification, all patchcords can be used on the North American market.

Original accessories

For RJ45-connectors deeply placed in ports with their release lug hard- or not at all accessible, the connectivity specialist has had the ESCHA multi-clip on offer already for a long time. This is quite easily plugged onto the grip body providing for fast unlocking and locking. The ESCHA multi-clip is available in eleven colours and does not only fit on the previously available straight grip bodies, but also on the new right-angled variants.

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Laser sensor and distant measurement sensors

The O5D with time of flight technology (PMD = Photonic Mixer Device) combines the following advantages: long range, reliable background suppression, visible laser light and high excess gain. In the same price range as standard sensors, it is a clever alternative.

The switch point is set easily to the nearest centimetre via '+/-' buttons and display or alternatively via IO-Link, allowing read-out of the actual value.

Polished, matt, dark or light objects of any colour: The O5D features reliable background suppression. The unit allows any angle of incidence and thus flexibility of mounting. This simplifies installation and saves costs. Some applications for these sensors include detection on a conveyor or belt in the confectionery industry, identification and detection of interchangeable tools and the loading condition of conveyor belts.

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Slurry Density Control

Mbongeni Ndlangamandla, Ensign Energy Solutions

A typical mining operation spends over R1 billion a year on electricity bills and uses about 820 million litres of water a year.

TAKE NOTE!



- 1 Water scarcity and electricity price hikes have put the mining industry in South Africa under pressure.
- 2 Innovative ways to save electricity and conserve water have become a priority for mining companies.
- 3 The project described in this article has achieved spectacular savings of 88 393 MWh energy, which equates to R56 M and water savings of 3 646 ML – in the period May 2014 – May 2017.

In recent years, the mining industry has been put under considerable pressure due to an increase in the price of electricity and the scarcity of water. Water as well as electricity are used for agricultural, industrial, domestic and recreational activities and are essential elements to modern society's development and security.

Electricity is produced using fossil fuels which contribute to pollution, particularly greenhouse gases. Saving energy on a site amounts to reduced electricity consumption and therefore less pollution as well as reduced electrical bills.

Water scarcity and electricity price hike

Mines use water for transporting and processing minerals. Due to the water scarcity and electricity price hike, innovative ways to save electricity and conserve water have become a priority for mining companies. This is where Ensign Energy Solutions (further referred to as the company) has found numerous ways to assist companies in developing and implementing energy (electricity, gas etc.) as well as water saving and optimisation initiatives.

Slurry

Water in a mining plant is generally used to transport minerals in a slurry form. Slurry is a liquid containing solid particles. Transportation of a slurry requires more factors to be taken into account than a pure liquid. The benefit of a slurry is that the density of the slurry can be altered which allows for optimisation opportunities. It is however critical to understand the boundaries of the system within which the slurry is transported to allow for the most effective optimisation opportunities.

The density of the slurry will determine the energy that is required to pump the slurry and the amount of water that will be required to fluidise the slurry. If you control density you can reduce the energy used for pumping and reduce water consumption.

One particular project that we are carrying out at a leading titanium mine in South Africa, is

the control of slurry density. This project not only saves vast amounts of water and energy but has also proven to improve throughput and process efficiencies as well as reduce maintenance costs.

High Material Concentrate (HMC)

The area of the mine that will be focused on in this case study is where the raw material is gathered. The raw material in this case is the HMC which is acquired from sand dunes using a dredger to break the material down and form a slurry. The slurry is collected in a central area, referred to as a feed bin (buffer), and pumped to the Materials Concentrator Plant (MCP) for further processing. The central collection area is key to ensure a constant volume and quality of product so that it can be transferred to the MCP.

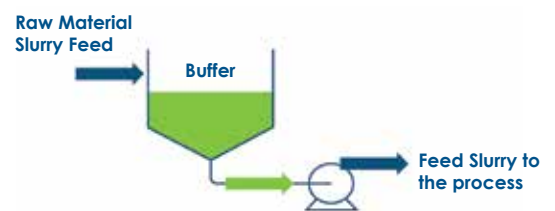


Figure 1: Basic outline of the process. There are four different areas from which the sand is collected.

Process

To start, the company's team set about understanding the mine pond recovery process in detail. Specifically investigating the purpose of the system and how it was currently performing. This investigation was done with the help of the operators responsible for the process as well as the technical support team and maintenance crews. The current operation was then compared to the original system design as well as industrial standards. It was the team's responsibility to identify any variance from the original design, the causes of this variance as well as any wastage that could be observed. It was also important to take note of any operation or production changes that had oc-

ABBREVIATIONS

- CV** – Carrying Velocity
HML – High Material Concentrate
MCP – Materials Concentrator Plant
OEM – Original Equipment Manufacturer
SG – Specific Gravity
TPH – Maximum Throughput
VSD – Variable Speed Drive



curred deviating from the original design. After this understanding was obtained, the team set out with the onsite production and maintenance teams to evaluate all the possible optimisation opportunities. The teams debated the feasibility of each opportunity and how they'd implement them to maximise energy and water reduction.

What was found

It was discovered that the Original Equipment Manufacturer (OEM) specified that the slurry's Specific Gravity (SG) should be at 1,5 at a flowrate of 3,0 – 3,5 m/s. However, analysis of the current operational data showed that the slurry's SG was at 1,2 – 1,3 SG and at flowrates of between 3,5 – 4,0 m/s. This showed that the process was operating differently from the original design and indicated room for possible saving opportunities.

Throughout the team's evaluation, it was also found that the plant was running all the pumps at low densities and increased speeds so as to achieve maximum throughput (TPH) irrespective of the actual material movement. This was done without prioritising efficiency, resulting in the plant consuming significantly more energy needed to produce each ton of HMC. A factor that was also taken into account when deciding which changes to implement was that the quality of the HMC is sometimes negatively affected by the metallurgical constraints of each system.

How it was solved

The approach taken by the team was incremental. The system was first restored to the original design as there were no changes made to the intended design however the operating parameters had changed over time. The team discovered that the specification of the flowrates and SG had changed – they had potentially drifted over time or changed due to some challenge experienced in the past but had never been reverted back after the challenge had been overcome. After these changes, other areas of wastage were investigated and eliminated or reduced as far as possible.

The SG was restored to the original specification of 1,5 by first making sure that the feed of the material to the buffer was sufficient. The solids

in the bin needed to be maintained at a specific level to ensure a sufficient buffer for downstream processing. To address the flowrates which were higher than specified, the possibility of slowing down the pump was investigated. Through the use of a Variable Speed Drive (VSD) the flowrates could be managed effectively. Energy consumption of the pumps would be significantly reduced as an added bonus.

The pumps were slowed down to reduce the flowrate or stopped when not required to run (no feed). When slowing down the pumps the critical Carrying Velocity (CV) of the mineral sand needed to be considered as going below the CV can cause settling and lead to blockages. In order to achieve this and as a safety measure, when the feed was off or there was no sand for 20 minutes the pumps reverted to the critical carrying velocity to ensure maximum energy saving. If after 20 minutes no sand was processed in the plant, some equipment was even switched off to reduce the energy consumption further.

An important factor for the team throughout the evaluation and implementation process was to ensure that the changes made did not affect the mines production output at all. The company's primary focus was to implement management of change projects before capital projects were considered.

Conclusion

This project has achieved savings of 88 395 MWh of energy which equates to R56 M and water savings of 3 646 ML from inception to date (May 2014 – May 2017). Furthermore, throughput increased by 20% and maintenance breakdowns reduced by 50%. The company remains on site at this particular mine and, to date, has achieved over R261 M worth of savings for the company through its energy saving and optimisation projects – translating into 164 000 tonnes of greenhouse gas emissions saved.

This project has resulted in R261 M savings for the company through its energy saving and optimisation projects – translating into 164 000 tonnes of greenhouse gas emissions saved.



<<AUTHOR>>

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Project Disruption and its Invisible Cost to Electrical Contractors

Information provided by ZEST WEG Group, Enl Electrical

TAKE NOTE!

- 1 Disruption occurs when the normal working methods of the electrical contractor are interrupted, reducing their productivity on site.
- 2 If the resultant cost leaves the contractor 'out of pocket', in theory there is recourse for compensation from the party contractually responsible.
- 3 This company is on a concerted drive to improve industry practice through the way it approaches its contracts – from bidding to the completion of work.

Disruption occurs when a disturbance or hindrance interrupts the normal working methods of the electrical contractor, reducing their productivity onsite.

Electrical contractors are often disadvantaged – both operationally and financially – when their planned contribution to a construction or engineering project is disrupted, but are seldom able to claim compensation for their losses. Disruption to contractors is becoming an even more common occurrence as a result of budget cost cutting on projects, resulting in inadequate engineering and lack of planning early on in the project.

According to Russell Drake, general manager operations at ZestWEG Group company Enl Electrical, disruption occurs when a disturbance or hindrance interrupts the normal working methods of the electrical contractor, reducing their productivity on site.

“When a contractor bids for work, their price is based on a scope of works in a clearly defined environment – where the employer’s guidelines and rules are clearly defined,” says Drake. “The contractor expects to carry out the work in terms

of a specific set of norms that determine each unit installation rate.”

This rate is set in line with the ‘bill of quantities’ for rateable works, which are industry norms; the price that is estimated assumes that production will be continuous – in other words, it makes no provision for disruption.

“This tender price also assumes that the management and supervision team performs in the manner necessary to complete the project with the operational resources allocated over a period of time,” he says. “This role is carried out according to the ‘direct field labour’ planned for the project.”

In theory, there is recourse to the employer for compensation when disruption leaves the contractor ‘out of pocket’ – if the expense resulting from the contractor’s loss of productivity is caused by disruption events for which the other party is contractually responsible.

View of the milling circuit at Loulo Gold Mine in Mali where Enl Electrical undertook work.





Russell Drake,
General Manager
Operations, Zest
WEG Group
company Enl
Electrical.



Creative cabling rack
installation by Enl
Electrical at Maseve
Platinum.

“The problem is that many of the factors behind lower-than-anticipated productivity do not justify a legal claim for compensation for disruption,” says Drake. “These include poor supervision or planning, re-work due to defects, or the inadequate coordination of sub-contractors.”

Enl Electrical highlights, for instance, the negative effects of piecemeal access to the work site, where access ‘on the ground’ does not match the access projections promised by the employers. This disrupts the production environment and destroys the validity of the assumptions contained in the original guidelines and rules of the contract – placing the contractor in a difficult position.

“If the access is forecast to be delayed for some time, the contractor may choose to terminate their excess labour – but this is not often done due to the cost, time and effort,” says Naude. “Another option is to remove the surplus labour from the site, and submit a claim for standing time; the danger here is that some progress is lost – and at a higher cost to the contractor and indirectly, the employer.”

He also points out that the labour force could become negative when some have to work and others stand idle. “This negativity further compounds unproductivity.”

“The option often taken by the contractor is to continue applying their resources as best they can, in an attempt to meet the employer’s completion dates,” he says. “However, the process is inefficient and costs more than what the contractor provided for in their tender.”

So, while it is possible for a contractor to demonstrate where disruption of their work has occurred – by applying analytical methods and techniques to quantify the financial loss – they will often delay the disruption claims in an effort to maintain the relationship with the employer. Unfortunately, this can result in even more disputes.

“Electrical contractors who rely on relationships with their customers can become exposed to contractual risks and lose revenue as result of disruptions,” says Drake. “The risks are exacerbated if the client and contractor do not timeously identify and agree on the impact of potential dis-

ruption. The longer the delay, the greater the risk to the contractor’s profitability and the client meeting its completion dates.”

Enl Electrical as a contractor is committed to transparency and to manage the ‘inevitable scope changes’ where these are exploited by many contractors to benefit financially. The company is working to transform the culture of the local contracting fraternity, and spends significant time and effort in developing its teams with strong business and ethical leadership.

“We are on a concerted drive to improve industry practice through the way it approaches its contracts – from bidding through to completion of the works,” he says. “Teams will reflect the size of the project, but Enl Electrical teams’ leadership differentiates the company on site; they are not only technically competent, but also understand the business of construction and are effective in multiple areas. This, the company says, is vital to successfully manage and complete projects.”

Conclusion

Enl Electrical’s open and transparent communication with its customers is also applied within the company, with in-house conferences held annually to share on-site experiences and improve contract performance. “We do not shy away from examining and discussing what has not worked to its benefit, and how it could improve in these areas – even if this means breaking conventional construction mindsets,” he says.

The company’s results tell their own story: Enl Electrical has recorded growth rates of over 400% since 2010, and enjoyed record revenues in 2015 when most of the economy was struggling. As importantly, it based its success on customer satisfaction, as about 60% of its work is generated by repeat business.

Enl Electrical has recorded growth rates of over 400% since 2010, and enjoyed record revenues in 2015 when most of the economy was struggling.

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Turbo machines demonstrate electro-mechanical solutions capability

ACTOM Turbo Machines demonstrated its ability to provide complete electro-mechanical solutions with the installation of 150 MW turbo generator sets for a mine in the Donoso District, Republic of Panama. The turbo generator sets will power this new large open-pit copper mining operation.

Securing what was the first international contract to have been won by ACTOM Turbo Machines can be attributed in part to the longstanding relationship between **Marthinusen & Coutts**, also an ACTOM division, and the customer, as well as its established track record of successes on previous projects for this mining company. It is also noteworthy that this contract was secured against tough international competition.

ACTOM Turbo Machines was contracted for the mechanical installation of two Skoda Doosan (Czech Republic) 150 MW turbo generator sets, which each comprised an integrated high pressure and intermediate-pressure turbine, a low pressure turbine, a Siemens generator, a radial condenser, and auxiliaries.

Richard Botton, Marthinusen & Coutts's CEO as well as ACTOM Turbo Machines' managing director, Chris Bezuidenhout and eventual site manager, John Squire, took several trips to Panama to review the scope of work, drawings and site conditions to compile

the proposal, which resulted in Marthinusen & Coutts' first international installation. ACTOM Turbo Machines was responsible for the installation of the centreline of the turbo generator sets, which started with the inspection of the civil works, followed by the systematic assembly of the turbo generator's in the form of transportable components and sub-assemblies. As the original equipment manufacturer (OEM) only supplied an Installation Quality Controller, ACTOM Turbo Machines installation crew's expertise was pivotal to the successful installation of the turbo generator sets.

The tropical region's high rainfall and open building also placed extreme strain on the schedule. The turbo generators' house was largely open, and only equipped with a 40 ton overhead crane, whereas the larger assemblies and components, such as the HP-IP double turbine and the LP turbine components weighed 125 and 161 tons, respectively.

Weather permitting, ACTOM Turbo Machines made use of crawler cranes to install these larger components. To avoid fouling of the equipment due to the high humidity, ACTOM Turbo Machines had to practice extreme caution when handling and preserving components during installation.

The remoteness of the site required ACTOM Turbo Machines to carefully plan and supply certain essential equipment, such as highly specialised laser leveling and alignment equipment.

The project also proved bureaucratic difficulties, as ACTOM Turbo Machines' personnel needed police clearance and temporary citizenship in Panama to be able to work on the project.

According to John Squire, ACTOM Turbo Machines' site manager, projects like these require technical crews with in depth knowledge of rotating equipment, and the ability to perform with high-precision in remote sites.

"All challenges were overcome by ensuring that we had the necessary resources available on site and on time, as well as readily having the appropriate people with the correct skill sets." Squire concludes.

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The turbine generator set showing the Siemens 150 MW generator and the low pressure and high pressure Skoda Doosan turbine set.



Actom Turbo Machines fitting the 15 ton, 150 MW Skoda Doosan turbine rotor.

Solar powered VSDs for remote borehole applications

Farmers are making increasing use of photovoltaic solar panels and variable speed drives (VSDs) to get clean and continuous power to their boreholes in remote locations, cutting out the need for costly infrastructure and cables to link with the main grid.

Zest WEG Group, a subsidiary of leading Brazilian motors and controls manufacturer WEG, supplies these stand-alone electrical solutions so that users in the agricultural sector can immediately benefit from 'free' solar power for pumping water.

As a key element of this arrangement, the VSD protects the motor from the fluctuating energy flow of the solar panel, allowing the motor speed to vary as the strength of the sun's rays changes with weather and times of day. This ensures maximum system operation during the day while protecting the motor and VSD. In addition to this, the VSD also offers a variety of other motor protection features such as over voltage, under voltage, phase imbalance, phase loss and over current which would normally have had to be done by other external equipment.

The appropriate model of VSD is selected from the range of WEG units, to suit the size of motor and pumping capacity required. Typically, the photovoltaic option is chosen for motor sizes up to approximately 5,5 kW, but larger motors can also be

catered for by installing more solar power capacity. The added value in WEG's VSD includes the company's in-house software that allows its highly skilled technicians to optimise the performance of the motor and pump, according to the application. The solar powered option also eliminates the potential voltage drop over extended lengths of electrical copper cable between the source and the motor, as well as the possible theft of this cable and the resulting disruption and added cost.

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Contactless Energy Transfer system to Sasol Wax

SEW-EURODRIVE has supplied its MOVITRANS Contactless Energy Transfer system to Sasol Wax, a major manufacturer of a comprehensive range of mineral-oil based and synthetic paraffin waxes, petroleum jellies, and liquid paraffins, using a proprietary gas-to-liquid (GTL) process.

Sasol Wax produces a range of hard and medium waxes, all with different product codes, colours, hardness, and other special properties. As soon as a pallet is loaded, it is conveyed towards the aligned transfer trolley. The pallet then moves across to align with the exit conveyor, which takes it to the pallet-wrapping machine.

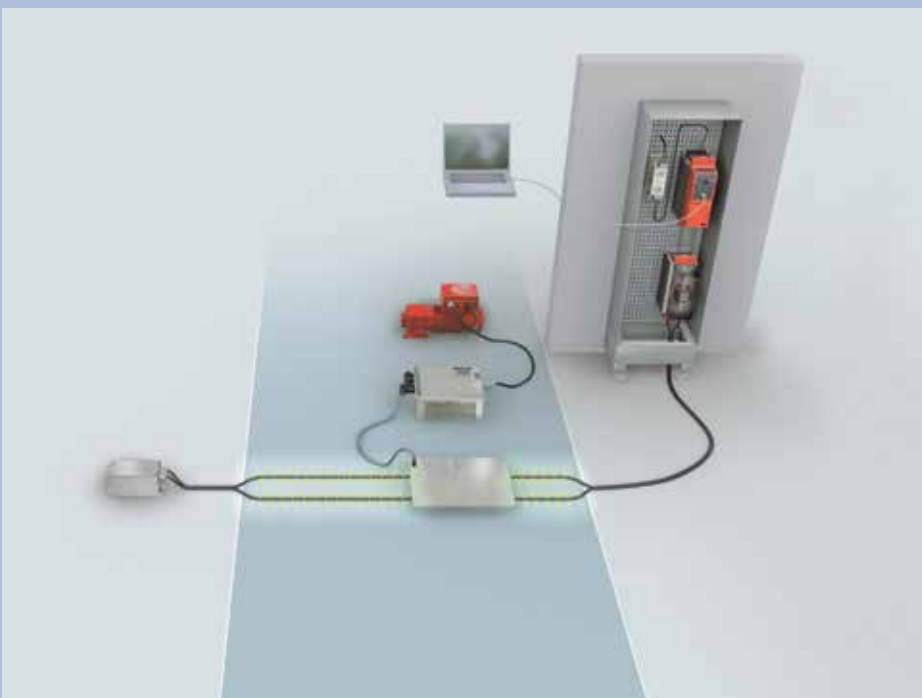
The two transverse trolleys each service conveyor lines from one of the packing robots, which were powered traditionally by drag chains in the centre of the rails. The transverse pallet trolleys each have two motors, one to drive the conveyor rollers,

and the other to move the trolley along the rails. These were powered traditionally via a drag chain that carried the power and communication cables. This was not an ideal solution, as the chain links would become clogged with wax, impeding their free movement. Operators were required to step into the cell when this happened to align the trolleys properly, often stepping on the chain inadvertently and causing it to break, resulting in costly downtime for repair or replacement.

This is where the MOVITRANS Contactless Energy Transfer system from SEW-EURODRIVE provided an ideal solution, comments National Sales Manager Norman Maleka. The system is based on the principle of inductive energy transfer, whereby electrical energy is transferred without contact from a fixed conductor. The electromagnetic connection required is made via an air gap, which means it is not subject to wear, making it maintenance-free and therefore much more cost-effective. Another important advantage of this type of power supply is that it is emission-free, and therefore environment-friendly.

SEW-EURODRIVE installed its MOVITRANS® Contactless Energy Transfer system in two phases, commencing with the instrumentation and communication side.

SEW-EURODRIVE National Sales Manager Norman Maleka.



A wireless PROFIBUS system (Process Field Bus) was installed to send control signals to the moving trolleys to avoid the need for communication cables in the drag chain. PROFIBUS is a standard for fieldbus communication in automation technology, championed initially in 1989 by BMBF (the German Department of Education and Research), and later deployed by Siemens.

In addition, a laser-based direct line-of-sight optical system was adopted to send signals to the moving trolleys. At the same time, the trolleys were modified to operate off SEW-EURODRIVE's MOVIMOT gearmotor drives. This is a compact modular VSD-driven system that uses the PROFIBUS-compatible MOVILINK protocol for serial communication. A line-cable loop was installed on the floor of the wax plant, covered by installation plates between the rails of the transverse trolleys to avoid cutting a groove on the concrete floor. This resulted in a quick and easy installation process that was both efficient and cost-effective, with no moving parts that could be damaged.

Two pick-up plates under each trolley transfer the electrical power to the MOVIMOT gearmotor drives. Energy-transfer efficiency is enhanced by generating medium-frequency ac current. Three-phase mains power is converted into 25 kHz single-phase supply, which passes through the inductive loop on the floor. This induces a flow of ac current in the pick-ups under each trolley. The ac supply is rectified again on the trolley, and converted before being passed into the MOVIMOT inverters for use by the motors.

"MOVITRANS is the ideal power-supply system for any mobile application, such as when the equipment in question has to cover long distances, or where there is a particular requirement for a high-speed, maintenance-free energy transfer," Maleka comments. Applications include conveyor trolleys, transport systems in logistics centres, linear-motion platforms with elevating tables or battery-charging supply units, overhead trolley systems, floor conveyors such as Automated Guided Vehicles, and storage and retrieval systems.

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Two pick-up plates under each trolley transfer the electrical power to the MOVIMOT gearmotor drive.

MCCs for Foskor Phalaborwa

Ekurhuleni-based **JB Switchgear Solutions** was recently awarded two contracts for the design, manufacture and supply of motor control centres destined for the 300 ft. area and driers 4 and 5 at Foskor's Phalaborwa operations. All the slurry from the plant comes into thickeners in the 300 ft. area where the water is separated from the slurry. Said water is then sent back into the plant for process requirements, whilst the left over slurry is pumped into the tailings dam via a pump station downstream.

There is a total of six driers on the plant. In this instance the MCCs for driers 4 and 5 are being replaced. The phosphate which is produced goes through the driers to remove excess moisture to achieve the correct level to meet customer requirements. When the phosphate comes from the filter plant the moisture level is typically around 8 – 9%. Once it has passed through the driers the moisture content is reduced to around 1,5 – 2%. A positive spin-off is weight reduction when the product is transported to its destination.

For the 300 ft. area, the MCC was equipped with two 3 200 A incomers and buscoupler, feeding a variety of DOL starters, feeders and large soft starters up to 315 kW. JBSS offered a full Siemens solution with Simocode Pro V intelligent overloads. Component selection complied with the 525 V, 50 kA, Type 2 coordination requirements of the plant. JBSS provided their 'Eagle' series panel in back-to-back configuration. The incomers were top-entry, whilst all starters and feeders were bottom entry.

The MCC's for driers 4 and 5 were equipped with 1 250 Amp incomers feeding a variety of DOL starters, feeders, VSDs and soft starters ranging between 0,75 kW and 160 kW.

Front-and-rear access 'Eagle' series panels were used for the driers, featuring Form 3b segregation and equipment selected for 525 V, 50 kA application. JB Switchgear's 'Eagle' series of motor control centres carry type test certification for compliance with SANS-IEC 61439 and SANS-IEC/TR 61641, with more than 31 000 tiers installed throughout Southern Africa and abroad.

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So, What is Still Wrong With Maintenance?

Mike Sondalini, LRS Consultants Global

TAKE NOTE!

- 1 A part's chance of failure changes with its stresses.
- 2 Less stress slows the degradation rate and the part lives longer.
- 3 Higher stress lifts the degradation rate, and the part's life shortens.

The role of maintenance is to eliminate operating equipment risks. Yet, organisations using Preventive and Predictive Maintenance strategies still have equipment breakdowns.

They have forced outages and stoppages. They consistently get emergency repairs. So, what makes today's Maintenance paradigm so unsuccessful at equipment risk elimination?

Why maintenance can never stop plant and equipment failures

Every part in every machine has a degradation curve. The length and slope of the degradation curve depends on a component's engineering design and how it is cared for during its lifetime.

When parts are new they provide their best service. As a part degrades its performance drops. Curves are monitored and tracked using appropriate condition monitoring methods. The 'P' (Poten-

tial Failure) point is the earliest that we can detect changed performance. This allows the remaining service life to be predicted so the part can be replaced or refurbished as planned maintenance before it is unusable at the 'F' (Functional Failure) point. Breakdowns, forced stoppages, and emergency work happen to equipment, despite using the best preventive and predictive maintenance strategies. Their parts' degradation curves get dramatically cut-short. A part's degradation curve shortens and falls as its material-of-construction is damaged by stress. Those unintended equipment failure events – breakdowns, emergency repairs, forced stoppages – result from excessive stresses in microstructures curtailing the part's degrada-



tion curve. All parts can fail, but not all parts will fail – it depends on the size of the microstructure stresses. A part's chance of failure changes with its stresses – less stress slows the degradation rate, and the part lives for longer; higher stress lifts the degradation rate, and its life shortens.

Keeping parts' microstructure at least stress to minimise the chance of failure initiation is not the focus of a preventive and predictive maintenance paradigm. In a preventive and predictive maintenance paradigm, you let parts go to the 'P' point, and then to the 'F' point. You wait for ill-health. You do repairs. You get breakdowns, forced stoppages and emergency work. Equipment failure involves a multitude of uncertainties. High-stress situations can occur at several points in a part's life cycle (formation, manufacture, assembly, installation, operation, maintenance). During its lifetime, a part can incur high stresses—the worst ones may cause microstructure damage. Once started, the damage can become breakdowns, stoppages, and emergency repairs, IF, the requisite cause-and-effect events occur.

The involvement of uncertainty makes failure probabilistic. The laws of probability mean high stress events will always arise and then degradation curves will get cut-short. When stress changes at random, the date of failure also changes at random. Because random failure events are unpredictable, it is impossible for maintenance based on a failure prevention and prediction paradigm to eliminate breakdowns, stoppages, and emergency jobs – chance dictates that from time to time huge stress events happen, regardless of what maintenance strategies you use. Maintenance can never make your equipment failure-free.

Component Health and Wellness

First parts fail, then equipment stops – if the parts do not fail, the equipment will not stop. When an equipment failure happens is a matter of chance. But the stresses that damaged the microstructure of the failed component were not caused by chance.

There is an alternative to a preventive and predictive maintenance paradigm – a component health and wellness paradigm. The focus of component wellness is the lifetime wellbeing of the part's microstructure. Throughout the life cycle, you proactively create and sustain the conditions that make parts reliable, and you eliminate the possibility of microstructure damaging stress events.

Get control of component reliability, and you get control of equipment reliability. You control parts reliability by controlling material-of-construction degradation. Utmost equipment reliability is

achieved when stresses in components do least damage to parts microstructures. In a component health and wellness paradigm, microstructure stress prevention is the vital outcome you seek.

When you adopt an 'equipment wellness' paradigm, you use Maintenance to keep parts at their least stress condition, and you use operational process control to minimise lifetime degradation. For example, the equipment wellness paradigm choice for machinery is to use Precision Maintenance, because its standards and methods always guarantee reduced stress in parts.

In situations where in-service corrosion destroys a part, the wellness choice is to proactively prevent the corrosion. If you wait for the corrosion to appear and then repair it, you ensure higher operating costs. If corrosion cannot be eliminated, you provide sacrificial deterioration. As the deterioration approaches its limit, the item is replaced or refurbished on planned maintenance.

In the case where dust accumulation on electronic parts cause a short circuit, the wellness choice is to prevent all dust ingress. You do not wait to see if dust collects and then fix a short as a breakdown. For machines that start under high load, the wellness choice is to change the method to least stress start-up. To keep starting at high loads guarantees overload stresses and an emergency job in future.

Conclusion

It is the parts that get their degradation curves unexpectedly cut-short that cause emergency repairs, forced shutdowns, and breakdowns. Maintenance cannot deliver failure-free plant and equipment because it cannot prevent all parts life cycle failure initiation events. To get maximum lifetime equipment reliability you need to create maximum component lifetime reliability. You do that by extending the component degradation curve with life cycle strategies and practices that de-stress parts microstructures. Give your parts' microstructure a lifetime of health and wellness, and you will get the greatest equipment reliability for your operation.

Maintenance is still spectacularly unsuccessful at delivering failure-free equipment – it always will be, unless you change to an equipment wellness paradigm.

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ABBREVIATIONS

CDP	– Climate Disclosure Project
GHG	– Greenhouse Gas
GWP	– Global Warming Protocol
INDC	– Intended Nationally Determined Contribution
IPCC	– Intergovernmental Panel on Climate Change
NAEIS	– National Atmospheric Emission Inventory System

Reporting Regulations: Another Building Block for Carbon Tax Infrastructure

Silvana Claassen, CES South Africa

This year, on 3 April, by publication in the Government Gazette 40762, the National Greenhouse Gas Emission Reporting Regulations (The Regulations throughout this article) were implemented in South Africa.

Whereas reporting on greenhouse gas emissions at company level has been practically voluntary, The Regulations turn this into a mandatory annual activity for businesses. The aim of this article is to explain that methods for establishing voluntary greenhouse gas inventories are not necessarily aligned with the reporting requirements as per The Regulations and that businesses may have to reassess their greenhouse gas reporting systems.

The main objective of The Regulations is to establish a framework for the collection of information which will enable the quantification of South Africa's national greenhouse gas emissions. Globally, many countries have introduced mandatory Greenhouse Gas Reporting Programs, including the United States, Mexico, Europe, Australia, Canada, New Zealand and Japan [1].

Why do companies report voluntarily?


Historically, environmental awareness initiatives have been issues mainly at political and individual levels rather than at corporate level. However, since the beginning of this century this trend is changing and corporates are more and more taking initiatives to address the negative impact which their activities have on the environment. Measurement and disclosure of this impact is becoming the norm instead of a tool to obtain a 'green' image. Examples of such corporate initiatives and coalitions include the CDP (formerly the Climate Disclosure Project), 'We Mean Business' and 'The Science Based Target Initiative'.

Investors and corporates are acknowledging the risk of not addressing climate change. This risk

TAKE NOTE!



- Historically, environmental awareness initiatives have been issues mainly at political and individual levels rather than at corporate level.
- Methods for establishing voluntary greenhouse gas inventories are not necessarily aligned with the reporting requirements as per The Regulations.
- Businesses may have to reassess their greenhouse gas reporting systems.



includes damage to assets and discontinuation of production-lines, increasing constraints to the availability of resources as well as uncertainty with regards to the dynamic regulatory climate. Over and above companies are recognising that if addressed well, climate change is generating a range of business opportunities.

At the basis of a company's climate change risk management system lies an inventory of the greenhouse gas emissions associated with its business-activities; 'because you cannot improve what you do not measure'. Over the years guidance on corporate accounting of greenhouse gas emissions has evolved and globally several protocols for carbon footprint calculating have been established. Widely used guidance for defining a carbon footprint is the Greenhouse Gas Protocol (GHG Protocol, often referred to as the Corporate Standard) [2] and the ISO 14064 standards for greenhouse gas accounting and verification [3].

These protocols and standards provide for rules and methods to account for a company's greenhouse gas emissions. Through the CDP, launched 15 years ago, companies around the world report on their greenhouse gas emissions and the measures they are implementing to control and manage these.

Drivers of voluntary reporting initiatives include: enhancing reputation with customers, investors, employees, communities and civil society; identification of risks and opportunities; cost reduction; and personal motivation.

Scientific and political development both at global and local level has catalysed corporate awareness. For example, The Paris Agreement, which was adopted on 12 December 2015 and entered into force on 4 November 2016, with the objective to 'keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1,5 degrees Celsius' [4]. Corporates are realising that this goal will not be delivered without significant action from businesses and private sector organisations.

At the same time, as an outcome of the Paris Agreement, governments have committed to national contributions to this global effort to fight climate change. South Africa has committed to an

absolute target of keeping emissions within the range of between 398 and 614 Mt CO₂- equivalent by 2025 and 2030, as defined in national policy [5]. The Regulations will facilitate the tracking of progress towards meeting South Africa's commitment and will inform policy-makers on if and how to formulate and implement additional climate change legislation for reaching this target.

Regulatory Requirements

As per Section 21 of South Africa's Air Quality Act of 2004, activities that generate emissions with a negative impact on the environment are 'listed'. Included are activities which are sources of greenhouse gases. For identification of such sources, South Africa follows the categorisation of the IPCC. The IPCC is the leading global body for the assessment of climate change and coordinates scientific efforts to increase climate change-understanding.

Companies that perform, or are in control of, any of the listed activities are obliged to report their emissions when their total installed capacity for that activity is over a defined threshold (e.g. 10 MW, four million bricks a month, 100 000 litres of fuel per year, 10 000 tons of CO₂ per year, 100 hectares of plantations or natural forests, a landfill receiving five tonnes per day or a total capacity of 25 000 tonnes, a waste incineration plant burning 1 tonne per hour or 100 kg/hour in the case of pyrolysis, two million litres of waste water treated per day or 1 000 cubic metres of industrial waste water discharged).

The Department of Environmental Affairs has designed an online National Atmospheric Emission Inventory System (NAEIS), which is the platform where regulated facilities (facilities in control of any of the listed activities) must submit their emissions data. From this inventory system, data is amalgamated into total figures indicating South Africa's national carbon footprint.

The data must be submitted annually by the 31 March for the previous calendar year. Non-compliance to The Regulations can result in a maximum of between R5 M and R 10 M fine and/ or a maximum of 10 years imprisonment.

The introduction of the National Greenhouse Gas Emission Reporting Regulations – as of 3 April 2017 – requires for companies to reassess their carbon-management systems in place.

Voluntary versus mandatory reporting

Even if a company has been reporting its greenhouse gas emissions for years, e.g. as a CDP response or for other (strategic) reasons, this does not mean that these companies are set up for compliance to The Regulations. The extent to which carbon inventories need to be realigned to The Regulations depends on the methodology used for calculating and reporting of greenhouse gas emissions. National emissions inventories are often done based on IPCC guidelines 'to update and maintain a National Greenhouse Gas Inventory'. At company level, the GHG Protocol is typically the standard used for the establishment of a greenhouse gas inventory. The main differences between these protocols are summed up below and are areas that corporates will need to reassess in order to align their voluntary carbon management system to the new Regulations as introduced on 3 April this year.

- Greenhouse gas emissions sources: The Regulations classify emissions sources by the activity generating the emissions; The GHG Protocol uses a sectoral classification for the identification of emissions sources. Why is this important? Because the category of a greenhouse gas emissions source influences:
 - The methodology selected for the inventory
 - The selection and therefore the level of accuracy of the emission-factor
- Global Warming Potential (GWP) values: The Regulations stipulate that data providers are required to use GWP values provided by the IPCC 3rd Assessment Report [6] (<https://www.ipcc.ch/ipccreports/tar/>). The GHG Protocol prescribes that the GWPs from the IPCC 2nd,

3rd or 4th Assessment Report can be used, as long as they are referenced correctly and used consistently. (The global warming potential of a greenhouse gas refers to the quantity of the reference gas, i.e. carbon dioxide, required to having the same impact on global warming as a unit of the gas in question. For example, if methane has a global warming potential of 25, it means that 1 kg of methane has the same impact on global warming as 25 kg of carbon dioxide)

- The use of units: Different standards may use different units: emission-calculation-methods as per The Regulations follow IPCC Guidelines and emissions are reported in Gigagrams (Gg). CDP-submissions are reporting emissions using tonnes. The GHG Protocol does not specify which units to use for reporting of emissions
- Reporting period: The Regulations require that emissions should be reported for a calendar year (1 January – 31 December), while the Corporate Standard does not specify the beginning and end of the reporting period as long as it covers one year

Conclusion

Whether your company has been reporting greenhouse gas emissions in the past on a voluntary basis, or you have not been reporting at all, the introduction of the National Greenhouse Gas Emission Reporting Regulations – as of 3 April 2017 – requires for companies to reassess their carbon-management systems in place.

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Measuring and Regulation Technology in the Brewing Process



Markus Unglert, GHM Group

Sensors and measuring technology have become an indispensable part of nearly all sectors of industry and modern life.

There is not a single industrial sector in which measuring, testing, monitoring or automation is not used. This applies to everything from the recording of process variables in process technology to the analysis of product characteristics in the entire producing industry, such as the food and beverage industry. Sensors are used with increasing success in order to give products competitive features that set them apart without significantly increasing production costs.

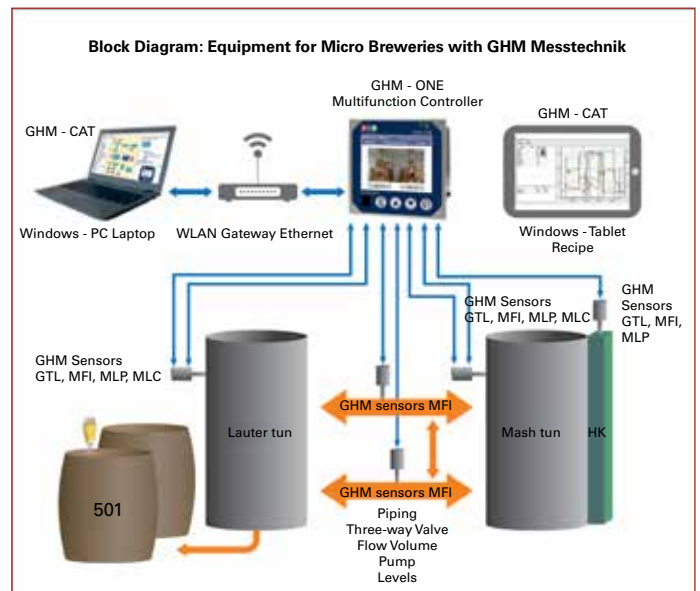
In this high-tech field, Europe and Germany in particular play a leading role in terms of technological standard and global market share. Based on turnover, European providers cover about 35% of world demand for sensor products.

The AMA Association for Sensors and Measurement Systems estimates the number of manufacturers of industrial sensors and measuring systems in Europe to be around 1 000 companies. In total, there are about 3 000 European companies that work in the field of sensors, including manufacturers, retailers, engineering offices and specialised service providers. Against this backdrop, it is clear that measuring technology is a future-oriented sector with a high demand for innovation and is of existential importance for a country like Germany. This also means that companies must combine their strengths in terms of quality, production and innovation in order to succeed in the highly competitive world market. GHM Messtechnik GmbH is one of these companies. In 2007 it developed the vision of combining different areas of expertise and profiling itself as a hidden champion for the development of customer-oriented solutions that are appropriate for the market. The GHM Group, consisting of Greisinger, Honsberg,

Martens, Imtron and the Italian environmental measuring technology manufacturer Delta OHM, currently concentrates on the bundling of synergies of these five tradition-based companies. The Martens location has been focused on producing hygienic sensors for conductivity and temperature for several years. This has been expanded over time into a complete product portfolio of modern and extremely compact sensors for breweries and beverage producers. Two application examples from these areas are described.

"We see many opportunities for our range of hygienic instrumentation in the South African food and beverage market," commented Jan Grobler, Managing Director of GHM Messtechnik in South Africa. "From our hygienic flowmeters, level and temperature measurement devices through to our precise and accurate benchtop measurement, we know that the accuracy, reliability and quality of our technology is what gives GHM Messtechnik the edge in this sector," Grobler said.

Grobler added: "We recently introduced the GHM Messtechnik Turbidimeter, MAT 433/437 which is used for phase de-



tection in the food and beverage industry. The absorption measurement principle, according to EN ISO 27027, is designed to measure very high turbidity. The turbidity is output as a percentage of the maximum measurement value. This value can be converted with an integrated conversion table into material-specific concentrations or into the formazine based unit FAU. This is a very high-tech measurement device which ensures less wastage particularly in the dairy and brewing sectors.”

Yeast monitoring

Multi-function tanks are often used in modern breweries with the objective of avoiding frequent product change. They are also used for the fermentation process. The yeast used in this process settles in layers in the lower portion of the tank. In order to be able to work efficiently and with high quality, the dead yeast cells are separated from the active yeast cells. While the dead cells are no longer used in the brewing process, the active yeast cells can still be used as pitching yeast. In order to ensure this, only the lowest layer of dead yeast is removed from the tank in an initial step. Then the next layers are separated from still fermentable yeast and beer in another step. For this purpose, a turbidity sensor is installed directly at the tank outlet or in the yeast return line. This sensor measures the turbidity of the yeast/beer mixture flowing through it, independently of the colour.

After the end of the storage or maturation time, a majority of the yeast remaining in the tank has now settled as lees. Since this portion of the yeast is decisive for the quality of beer, it should be separated from the beer as precisely as possible when emptying the tank. This task of phase separation is also monitored by the already available turbidity sensor, wherein it is important that the turbidity value is measured as precisely and reproducibly as possible.

Only in this way can the possibility of product contamination and beer product losses be eliminated. As a result, a consistent quality of the beer can be assured. The turbidity value, which is directly output as a 4-20 mA current signal or alternatively via a pre-adjusted limit value contact, can also be used with an external control unit for control of downstream valves, including delivery to a membrane filter unit or in the storage tank.

The MAT433/437 turbidity meter is particularly suited for the above measurement applications.

Small batch production and individual beer types.

For production of small batches and individual types in 50 litre vats, for example, the GHM Messtechnik Group offers new measuring and regulation components for the equipment of small breweries. This makes it possible for dedicated regional beer brewers and private home brewers to achieve a verifiable process with strict adherence to the



Much to do before shouting CHEERS!



recipes that they have created. The desired beer is the result of the individual recipe based on experience and creativity.

For this purpose, modern measuring and regulation technology is used in combination with state-of-the-art communication technology for surprisingly simple and transparent use. A compact GHM-ONE multi-function regulator mounted directly in the system processes all measurements of the sensors certified for food production. These sensors include the durable and precise GHM-GTL series temperature sensors and GHM-MFI flow meters, as well as the GHM-MLP fill level sensor and GHM-MLC limit level switch, which can recognise two different media by their capacitive properties, such as beer and foam. The GHM-ONE can then communicate the appropriate control commands to the heating and cooling units, pumps, three-way valves and stirrers in the system. The colour display of the regulating device shows the operator the current status of the recipe process and the quality of all regulating circuits and provides graphic and text-based instructions for the progression of the process. The operator confirms this locally on the touch display of the GHM-ONE.

A special feature is the individual recipe specification developed for the practitioner with a clearly arranged table with the individual steps and their selected parameters. This shows the brewer their individual recipe 'step by step', as specified for the process. This can take place via a screen of any size in the form of a Windows-based laptop, industrial panel PC or tablet. The independently operating GHM-ONE multi-function regulator communicates with these PCs via its integrated Ethernet interface or wirelessly with the tablet via a standard WLAN gateway. With these devices positioned conveniently alongside the production system, the specially developed GHM-CAT tool runs with the new 'Beer production program editor' function, which simplifies operation of a brewing system. The brewer creates the necessary steps according to their mash method of choice (e.g. comprising more than 60 different variable steps). He enters specifications for the exact parameters of the temperature profiles, holding times and step enabling conditions, the duration and number of pumping processes between the mash tank and lauter tun, the corresponding heating and cooling processes and the freely variable repetition processes for mash processing.

With this clear representation of the recipe in the logical sequence of the process and the corresponding set-points and ac-

tual values, the brewer recognises the successful progression of the brewing process at first glance. In addition to the monitoring of close tolerance ranges for quality control and documented verification, the brewer is also provided with graphic trend representations and selectable process data reports to record batch production data.

Conclusion

This brewing solution offers all creative beer brewers and their system manufacturers a professional and transparent, individual process that is also suitable for small batches. The clearly arranged technology aids in continuously creating new taste experiences from foods and beverages that have been appreciated for hundreds of years and reproducing them in the form of unique recipes.

TAKE NOTE!



- 1 This company recently introduced an instrument which is used for phase detection in the food and beverage industry.
- 2 This is a high-tech measurement device which ensures less wastage particularly in dairy and brewing sectors.
- 3 This brewing solution offers beer brewers and their system manufacturers a professional and transparent, individual process.



<<AUTHOR>>

Markus Unglert has been working exclusively in food technology, dairy, breweries and beverages sectors for the GHM Group, Germany, since 2010.

Jan Grobler, Managing Director, GHM Messtechnik SA.

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the adapter," explains Christian Stremlau, head of the readychain/readycable division at igus. "Customers do not need specially trained personnel and also save twice because they only need to get one type of plug connector, the straight connectors and their harnessing are also significantly cheaper than angled connectors." Users can therefore obtain the identical connector types as harnessed ready cables from igus and also choose the best angle for connecting to the machine later. This saves process and storage costs and above all eliminates errors.

Enquiries: Ian Hewitt. Email ihewat@igus.de



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Clark Masts England offers a portable mobile telescopic mast for every military, civil and telecommunications application. Masts are available in heights of from 3 m to 30 m and head-loads of up to 100 kg. Applications include: surveillance, military communications, civil communications, mobile base stations for cellular telephones and more. Masts are extended by the introduction of compressed air into the base, causing the mast to extend. Accessories include locking collars, which will enable the mast to remain fully extended without air-pressure. Other accessories include; compressors, control valves, vehicle mounting accessories, roof bearings, lockable/turnable bases. Guying equipment is also offered; i.e., guy ropes, guy collars, guy controllers and pickets. Tripods are available for free standing masts.

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Radar products via the new E-direct online shop!

Radar steps into new dimensions! The new free space radar Micropilot FMR10 offers various significant product features in regards to innovation and efficiency. It is a radar measuring device with Bluetooth wireless technology. Commissioning, operation and maintenance are carried out via SmartBlue App. A long sensor lifetime is guaranteed by the full PVDF body. Wireless remote access and its most compact design are ideal for installation in areas difficult to reach or places with limited space. The new Micropilot FMR10 is especially designed for the requirements of the water and wastewater industry as well as for utility applications in all industries. Particularly for measurement in storage tanks, open basins, pump shafts and canal systems. Features for application:

- Measuring range up to 5 m
- Process temperatures from -40 to +60°C
- Process pressures from -1 to 3 bar
- Accuracy up to ±5 mm
- Ingress protection IP66

Additional benefit – Thanks to its best price-performance-ratio in radar measurement, the Micropilot FMR10 joins the E-direct product offering, which offers you more advantages:

- Easy to select: You can easily pick out the appropriate version from a wide range of variants
- High quality: E-direct products meet the well-known Endress+Hauser quality standards
- Cost-effective prices: You get the best value for money as from a single piece on. The prices decrease according to the order quantities
- Fast delivery: The products have short delivery times, clearly indicated next to each device variant

Enquiries: Dëshini Govender. Email deshini.govender@za.endress.com



Take a closer look at the Micropilot FMR10



Discover our complete E-direct product offering

3-Phase Power Logger Gives Comprehensive Power Quality and Energy Studies

Fluke's three-phase power logger, the 1738, gives users the data needed to make critical power quality and energy decisions in real-time. It has more power quality measurement capability than its predecessor, the Fluke 1730, a pure energy logger. For both basic power quality studies and energy studies, the 1738 enables users to measure, capture and log all relevant characteristics of electric power and gives access to management to analyse large data sets.

With the 1738 and Fluke Connect mobile app and software, users can access, measure, capture, log and share all relevant characteristics of electric power data remotely with the team/management. Access to the logger through WiFi maintains safer working distances and allows critical decisions to be made in real-time and reduces the need for protective equipment, site visits and check-ins.

Specifically engineered to conduct energy studies and basic power quality logging, the 1738 automatically captures and logs over 500 power quality parameters for more visibility into the data needed to optimise system reliability and savings. The unit includes advanced limit based analysis (uses EN510160 limits), the capability to connect two Fluke Connect devices for logging of supplementary parameters and a WiFi/ Bluetooth (BLE) dongle.

The 1738's optimised user interface, flexible current probes, and an intelligent measurement verification function, reduces measurement errors by digitally verifying and correcting common connection errors. This makes setup easy and reduces measurement uncertainty. Users can chart and graph measurements to help identify issues and create detailed reports with the included Fluke Energy Analyze Plus software package. Optionally, IEEE519 Reports can be created, giving more insight into harmonic levels, voltage and current distortion, and load current (licence required).

1738's Key features:

- **Key measurements:** Simultaneously measures log voltage, current, power, harmonics and associated values
- **Measures all three phases and neutral:** With four flexible current probes included
- **Connectivity on a portable power logger:** View data locally on the instrument, via the Fluke Connect App or through the facility's Wi-Fi infrastructure
- **Comprehensive logging:** 20+ separate logging sessions can be stored on the instruments. (All measured values are automatically logged for measurement trends)
- **Captures dips and swells:** Includes event waveform snapshot, along with date, timestamp and severity to help pinpoint potential root causes of power quality issues
- **Complete 'in-the-field' set-up through the front panel or Fluke Connect App:** No need to return to the workshop for download and set-up or to take a computer to the electrical panel
- **Convenient instrument powering:** Power instrument directly from the measured circuit eliminating the need to find a power outlet while allowing the instrument to be secured safely inside electrical panels
- **Fully integrated logging:** Connect other Fluke Connect devices to the 1738 to simultaneously log up to two other parameters, virtually any parameter available on Fluke Connect enabled digital multimeters
- **Two USB ports:** One for PC connection – another for quick, simple data download to standard USB thumb drives, or other USB devices for in-place, uninterrupted logging
- **Highest industry safety rating:** 600 V CAT IV/1 000 V CAT III
- **Security:** Safeguard from theft with an optional hefty, durable Kensington lock
- **Power Quality Analyze application software:** Download and analyse every detail of energy consumption and power quality state of health with automated reporting



Enquiries: Comtest
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 or email
sales@comtest.co.za



Technology push for higher power plant efficiency

Siemens is paving the way for the next level of efficiency with the development of its HL-class. Siemens has announced the company will validate the technologies of its HL-class at Duke Energy's



Lincoln County site in the United States of America. This new machine is developed from a proven and robust SGT-8000H technology. The advanced Siemens HL-class gas turbines combine a series of new but already tested technologies and design features with the best of past experience – resulting in a technology carrier to the next level of efficiency and performance. The HL-class is clearing the way to efficiency levels beyond 63% with a mid-term goal to reach 65%.

Furthermore, Siemens is gaining speed to drive technological upgrades and competitiveness by transferring newly developed key technologies to its entire gas turbine portfolio. In the near future, all customers will benefit from further efficiency and performance increases. This approach is part of a series of activities to help.

Siemens' customers compete in a rapidly changing market – working to significantly reduce lead and construction times through standardisation and modularisation. The new Siemens HL-class consists of three engines: SGT5-9000HL, SGT6-9000HL and SGT5-8000HL. In simple-cycle operation the air-cooled SGT-9000HL gas turbine will provide a capacity of 545 megawatts (MW) for the 50-Hertz market and 374 MW in the 60-Hertz version. SGT5-8000HL will provide 453 MW in simple cycle operation. All engines reach more than 63% combined cycle efficiency.

To achieve top performance, the turbines operate at high combustion temperatures. For this purpose, Siemens' specialists have developed advanced combustion technologies, innovative multi-layer coatings, super-efficient internal cooling features as well as an optimised water-steam cycle. Furthermore, optimised sealings minimise cooling and air leakage. At the same time, evolutionary 3D-blading is enabling higher aero-efficiency for the compressor. Predefined and prefabricated solution elements as well as pre-selected vendors and products allow a significantly reduced construction time and a fast start for projects.

The turbines are designed to plug in to Siemens' digital offering for plant operators and utilities alike, incorporating connectivity to MindSphere, the cloud-based Siemens operating system for the Internet of Things.

MindSphere offers access to powerful analytics from Siemens and its partners – using intuitive insights in engine operation and decision support to deliver benefits to customers.

Enquiries: Keshin Govender.
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GENERATORS & STANDBY POWER CONFERENCE

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26 & 27
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Objectives of the conference

- To deliberate on the safety use of generators and standby power
- To deliberate on contractors and installation regulations
- Trends in generators and standby power industry
- To discuss technological innovations in the industry
- To investigate the viability of importing generators
- To discuss risk factors and mitigations plans in generators use
- To highlight the importance of inspection and regular maintenance of generators.
- Address challenges facing the industry

Speakers include:

Kenneth Gaynor
 Generation Director
 Cummins

Aubrey Nkadimeng
 Sales Engineer
 EIE Group

Gerardo Cammarala
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Oscillating beam rig tests low frequency sensors

Accelerometers and velocity meters are used to measure a wide range of frequencies, including low frequency vibrations found in building maintenance. They occur at less than 2 Hz, and can also be useful in monitoring bearing wear in cooling tower fans and gearboxes for example.

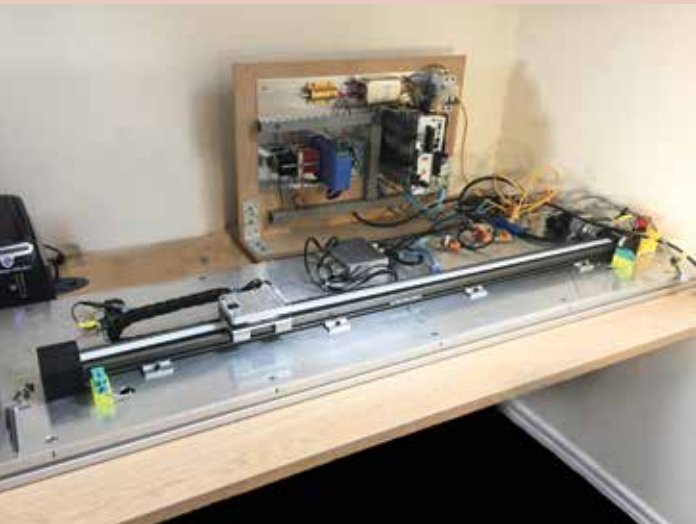
To characterise the performance of its low frequency sensors in that range, which is too low for most test shakers, Monitran, locally represented by **Instrotech**, has developed a new high displacement test rig that can generate oscillations accurately at frequencies as low as 0,2 Hz. The system allows real-time back to back testing between different devices and its own inbuilt, calibrated MEMS sensors.

The horizontal linear beam oscillator has a powerful motion control system that incorporates a precision ac servo with 17 bit encoder feedback. Running on two precision rails, it uses magnetic springs and magnetic damping to ensure smooth operation. Its software produces fast code, at 1,7 milliradians per step, which generates fine sinusoidal motion for the linear track driven by a rotary motor.

The intelligent shuttle, which can carry a sensor payload of up to 0,5 kg, incorporates seven MEMS accelerometers, signal processing and a microcontroller to monitor its motion. It also includes a mechanical low pass filter and has an operating distance of up to 1 000 mm, exerting up to 8 g acceleration to the devices under test. That amounts to over 35 kilometres per hour peak velocity, down to nearly 1/20th of walking speed.

"The new oscillating beam rig gives us accurate extreme low frequency data and is a highly useful addition to our accelerometer test and calibration capabilities," said Andy Anthony, Monitran's managing director.

Enquiries: Instrotech.
Tel. +27 (0) 10 595 1831 or
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Double troubleshooting power lighter load

Fluke, locally represented by **Comtest**, now has the Fluke 787B and 789 ProcessMeter that doubles the troubleshooting capabilities by combining the power of a safety-rated, digital multimeter and mA loop calibrator into a single, compact test tool.

Based on the trusted measurement capabilities of the Fluke 87 DMM, the new 787B and 789 add the ability to measure, source and simulate mA with the accuracy and resolution that can be expected from a Fluke mA loop calibrator, giving users the ideal tool for troubleshooting and calibrating current loop applications. The 787B and 789 key features:

- 20 mA dc current source/measure/simulate
- Simultaneous mA and % of scale readout
- DMM designed to meet 1000 volt IEC 61010 CAT III and 600 V CAT IV standards
- Precision 1 000 V, 440 mA true-rms digital multimeter
- Frequency measurement to 20 kHz
- Min/Max/Average/Hold/Relative modes
- Diode test and continuity beeper
- Manual step (100%, 25%, Coarse, Fine) plus Auto Step and Auto Ramp
- Externally accessible battery for easy battery changes

The 789 has the additional features of 24 V Loop power supply and HART mode setting with loop power (adds 250 ohm resistor).

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Smarter CIDER Production

Natlee Chetty, Endress+Hauser

15m high tanks containing 2 200 hl of cider.

Consumers in South Africa have become more discerning and demanding of cider.



Ciders have been growing in popularity over the past few years. South Africa has experienced robust year-on-year growth in volume terms. With the variety of imports available to the South African consumer, Food and Beverage manufacturers have now added pressure to produce their products in an even more competitive way than before, and at the same time responding to consumers' desires for new and appetising products, which are also environmentally friendly. The primary concern of any design engineer is to gain increased production and consistent product quality by employing the benefits of effective process automation.

The company High-Tech Processing is a breweries, beverages, alcoholic and soft drink plants solutions provider and consultant. They offer comprehensive, integrated engineering solutions to Food and Beverage manufacturers, while consistently meeting production quality standards. Well renowned for their work with the big names in alcohol and beverage production, such as SAB, Distell and Coco-Cola. High-Tech Processing was recently involved in a huge plant expansion for an international beverage manufacturer in South Africa. With Endress+Hauser, they were able to prime integration capabilities between products, system solutions and services to create a more efficient, cost saving operation for the customer.

With almost 50 vessels to engineer and commission, this was no small task for High-Tech Processing's lead E&I Engineer, Reinhardt Grobler. When asked what their main challenges were, which they encountered during the project, Reinhardt said; "In building a beverage process plant, one of the engineer's primary objectives is to gain increased production and consistent product quality by employing the benefits of effective process automation. The key in meeting this objective is by selecting suitable instrumentation which is capable of producing an accurate and repeatable indication of the process status. This may seem like an obvious statement, but with an overwhelming choice of techniques and wide variety of designs, on what basis does the engineer select the 'ideal' instruments?"

High-Tech Processing
lead E&I engineer,
Reinhardt Grobler.

Well known as the leaders in instrumentation in the Food and Beverage Industry, Endress+Hauser was able to provide expert advice on reliable, quality measurements that would supply the necessary data for the ideal process. The application involved the measurement of volume in 15 m high tanks containing 2 200 hl of cider. The tanks were equipped with an agitator and the product would often form thick layers of foam. The Deltapilot (FMB70) was selected for level measurement in the tanks. It is not affected by foam and is perfectly adapted to fast changing process conditions. The patented hermetically sealed CONTITE measuring cell is condensate and climate resistant. The sensor shows best performance and long-term stability and accuracy even following CIP/SIP cycles. Hydrostatic level transmitters are probably the simplest to use and apply. A sensor converts the pressure of liquid head acting on a process diaphragm into an electrical signal. When the density of the liquid is known, this signal is a direct indication of the level. Hydrostatic level transmitters are the most commonly used level measurement in the Food and Beverage Industry.

However, when the customer decided to use the tanks for a variety of different products: With a change in product characteristics, the calculated volume was affected by the changes in density. To overcome the challenge of the changing densities, and to gain more accuracy of the volume measurements, a density computer was used. In conjunction with the tuning fork, Liquiphant M, the density computer FML621 returns a continuous measured density value. The volume of the tank can now easily be calculated since the density and hydrostatic pressure is known.

The new volume calculation, with the corrected density, now resulted in a $\pm 1,5\%$ inaccuracy of the total volume of 2 200 hl. There was a decrease in lost production time since production was also able to optimise their packaging process to plan better due the more accurate volume measurement. With the changes in density previously affecting the calculated volumes, packaging could not plan efficiently. The number of bottles to be packaged did not correspond to the volumes in the tank. As a result the line would have to stop and wait for more bottles so that the tanks could be emptied out or on counter side, bottles remaining empty on the line with the tank running empty earlier than expected.

With the now density compensated volumes, the plant was able to decrease the amount of product sent to drain, and as a result decreased production costs and wasted product. The taxes



on alcohol drove plant management to focus on more accurate stock take measurements to eliminate taxes on false volumes. The density compensated volume measurements made this task much easier, resulting in fewer internal loses.

Profibus DP was selected as the communication protocol. Reinhardt preferred the use of digital communication which simplified commissioning and helped ensure efficient operation. "Profibus allowed more information to be available to optimise the process, for example; the density sensor was also used to detect the low level in the tank as well as measure the changing density. It also ensured that possible losses over an analogue line are eliminated and thus resulted in a more accurate data value transfer between the Density Computer and the PLC. With intelligent communication, information can be used to monitor instrument diagnostics and therefore ensure optimum performance"

Conclusion

With a satisfied end customer and a project well done, the only thing left to do was to repeat the solution. High-Tech Processing already has plans to use the system on a new project involving the volume measurement in 20 new tanks.



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TAKE NOTE!

- 1 In building a beverage process plant, one of the primary objectives is to gain increased production and consistent product quality.
- 2 To achieve the objectives, effective process automation is employed.
- 3 Effective process automation requires suitable instrumentation, capable of producing accurate and repeatable indication of the process status.

With intelligent communication, information can be used to monitor instrument diagnostics and therefore ensure optimum performance.



<<AUTHOR>>

Natlee Chetty is the Industry Manager, Food & Bev, at Endress+Hauser.

Economical FLOW Monitoring

Oleg Greber, WIKA

TAKE NOTE!



- 1 The latest generation of flow switches is the most powerful and intelligent yet.
- 2 A flow switch based on the calorimetric measuring principle consists of a measuring probe with two temperature sensors.
- 3 Unlike other switch types, calorimetric flow monitors have no moving parts in the medium.

Flow switches based on the calorimetric measuring principle can represent a genuine alternative compared to classic flow meters.

When it comes to flow control in pipelines, flow switches are an efficient and economical solution. They are increasingly based on the calorimetric measuring principle. Users can choose between digital output signals and continuous analogue outputs.

That classic flow meters can also perform the role of a flow switch is beyond dispute. However, this sensor type is mainly used to measure the exact flow rate per time unit, for example in order to determine water or fuel consumption. Volume or mass flows are recorded with an error of 2% or less. Flow switches are unable to match this extreme precision: on the other hand, flow meters require an appreciably higher investment owing to their specific design, extensive electronics and comparatively complex installation.

If the sole objective of the application is to monitor whether or not, and if so to what extent, a medium is flowing, flow switches or flow monitors represent a much cheaper – not to mention more compact – alternative. They detect the flow and trip a switching mechanism if the measured value exceeds or falls below a defined velocity. Precision is not a key priority: between 2 and 5% non-repeatability is the norm for contact switching. In

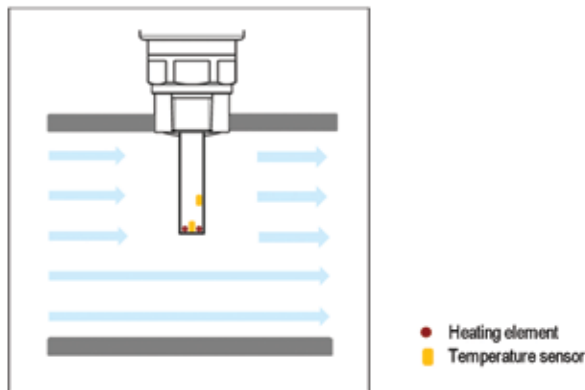


Figure 1: Schematic illustration of a measuring probe for a calorimetric flow switch.

addition to flow monitors with a float body, turbine or impeller, a growing number of users meanwhile resort to devices featuring the calorimetric or thermal measuring principle, for instance for cooling circuits, the cooling lubricant systems of machine tools, filter units or dry run protection in pumps.

Calorimetric flow switches follow the physical laws of heat transport in flows. They are based on one of two different methods, depending on the manufacturer, each leading to the same result regardless of the application.

Continuous heating (constant power method)

A flow switch which is based on the calorimetric measuring principle consists of a measuring probe with two temperature sensors integrated into it (see Figure 1). One of these sensors is heated continuously with the aid of a built-in heating element (wire-wound) with a constant heating power and measures the temperature at the sensor tip. The second sensor determines the temperature of the medium in the pipe. Consequently, a temperature difference occurs between the two sensors, which is registered by the electronics.

The higher the flow velocity of the medium in the pipeline, the smaller this temperature difference will be. The basis for this is a law of thermodynamics:

A body with a temperature higher than its surroundings supplies a medium flowing past that body with energy in the form of heat. The molecules in the medium flowing past the probe tip collect heat and transport it away. The more molecules flow past, the greater the cooling effect. The num-



Figure 2: Flow switch, type FSD-3, with built-in temperature measurement and optional diagnostic function.



Figure 3: Calorimetric flow switches – also referred to as flow monitors – are often used to monitor the presence of a flow in a piping system.

ber of molecules passing by increases continuously with increasing flow velocity.

Regulated heating (constant temperature difference method)

The measuring probe is basically identical in design. With this method, however, the heating power is regulated so that the temperature difference between the two sensors is kept constant throughout. Consequently, as the flow velocity increases, the heating power must be increased accordingly. It is thus a direct measure of the flow velocity in the medium.

Unlike other switch types, calorimetric flow monitors have no moving parts in the medium. They therefore also work reliably wherever there is a likelihood of contaminated media, for example in cooling circuits. What's more, they are virtually maintenance-free. The probe only requires periodic cleaning when used in very sticky media because adhesive residues could be detrimental



to its precision. Apart from this, calorimetric flow switches are extremely tolerant of changes in the media properties such as temperature, density, dielectric constant or conductivity. Hence, they are equally practical in both stable and non-stable conditions.

The ability to choose between digital and analogue output signals makes these devices even more flexible. If an analogue output is selected, for instance 4 ... 20 mA, information about the change in flow can be inferred from the continuous signal via the span. When monitoring a filter, say, blocking can be detected in good time before it becomes a problem.

Conclusion

The latest generation of flow switches are the most powerful and the most intelligent yet. Versions are available with built-in temperature measuring and diagnostic functions. Today's users, in other words, are also in a position to monitor the temperature of the medium using these devices, so that a second measuring point can be dispensed with. The diagnostic function outputs a warning if a sensor defect is detected. In case of damage, the switching output can be used to trigger a downstream safety function.

When it comes to flow control in pipelines, flow switches are an efficient and economical solution.



<<AUTHOR>>

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Oleg Greber is in Product Management, Electronic Products, Industrial Instrumentation, at WIKA.

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Compact stainless-steel sensor for flexible flow measurement

Selecting the right method and appropriate device for flow measurement generally involves a time-consuming and resource-intensive consideration of the advantages and disadvantages of the different systems and measuring methods. Particularly in the food and beverage industry, which relies on high process reliability and perfect hygiene standards, this means that there are often a large number of different measuring devices for the respective production areas. Therefore, the industry welcomes instruments that reliably monitor the flow of drinking chocolate, beer, olive oil, demineralised water, or milk, and which are just as precise in measuring the flow of cleaning agents in CIP and SIP plants or cooling water in cooling circuits. They reduce complexity and increase productivity. This variety of applications is possible thanks to sophisticated ultrasonic technology.

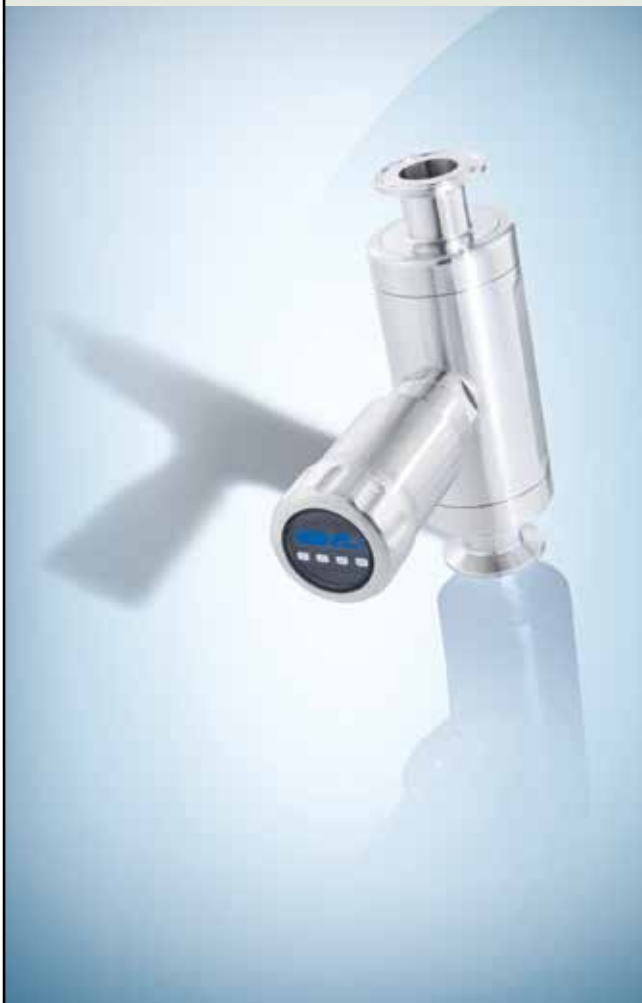
The IO-Link reduces cabling and also enables complete control and monitoring of the sensor in Industry 4.0 machine environments.

Time-of-flight

The DOSIC ultrasonic sensor operates according to the concept of time-of-flight difference: If the ultrasonic signal is sent against the flow direction, it requires a longer transit time than the signal sent in the direction of the flow. The transit-time difference between the two ultrasonic signals is directly proportional to the mean flow velocity. The flow volume per unit of time is the result of the mean flow velocity multiplied by the pipe cross-section. With regard to reliability and precision in transit-time difference measurements, the DOSIC sensor provides an alternative to Coriolis mass flowmeters, which usually entail high investment costs. The sensor can detect a wide range of challenging liquids and media for beverage and food production irrespective of their properties.

Durable and reliable in hygienic conditions

The rugged and compact model combined with a hygienic design ensures highly reliable measurement results. The absence of moving parts in the sensor eliminates potential contamination risks in the demanding hygienic environments of the food industry. In addition, the sensor has a straight, seal-free, and self-emptying measuring tube made of high-quality stainless steel (316L with Ra ≤ 0,8). The high-quality stainless-steel housing also provides the necessary ruggedness and resistance. It therefore goes without saying that the sensor has EHEDG certification and demonstrates FDA conformity. Since there is no contact between the sensor and the flowing media, and the flow volume is determined in a non-contact



The non-contact DOSIC flow sensor detects the flow volume of conductive and non-conductive liquids based on ultrasonic technology.



Brilliant factory tools

Will it be advanced technology or more sustainability that saves the world? Combine the two, and you stand a better chance.

GE's factory in Saint-Nazaire, France, is making turbines for a wind farm off the coast of Germany. The factory is testing 'brilliant factory' tools — like sensors, digital drawings and augmented-reality glasses — to bring intelligence and simplicity to its many tasks. And the wind farm powered by the turbines, which could one day be connected to the internet and analysed, will represent a smarter, more sustainable approach to powering our world. Their combined impact?

- The new, intelligent tools have already made the factory's work faster and easier, with a whopping 90 improvements. According to GE Global Research, digital tools like these will save businesses billions of dollars due to increased efficiency
- The wind farm will power nearly half a million German homes and contribute to the projected 14% reduction in cumulative greenhouse gas emissions that wind energy can provide

Enquiries: Visit www.ge.com

manner, aggressive cleaning agents in CIP and SIP operations are not a problem either. The sensor can easily withstand temperatures up to 143°C in SIP processes for up to one hour. The rugged design ensures a long service life and reduces the need for maintenance.

Compared to similar flow sensors that take up a lot of space when installed in compact plants, the DOSIC has a modest design and can be used in the most confined spaces. Two configurable digital inputs and outputs and up to two analogue outputs, as well as an IO-Link interface to a superordinate control unit, ensure that you get just the right start position.

The DOSIC is an impressively flexible measurement system that is available in two sizes (DN15 and DN25). In addition to the DOSIC flow sensor, the extensive portfolio contains other sensors that are ideal for hygienic application conditions. For example, the PHT pressure transmitter ensures constant liquid pressure in buffer tanks when bottling carbonated beverages. The PHT controls the pressure precisely at high throughput rates, even when pressure is applied to bottles and cans to prevent foaming. The PBS Hygienic pressure switch is also designed for hygienic pressure measurement and monitoring. It is used in bottling machines, particularly for the hydrostatic level measurement of liquids in tanks. The LFP Inox, which has been developed especially for the high demands of the beverage and food industry, measures the fill levels as well as the limit levels in buffer or machine tanks. Thanks to its high-end design and variant diversity, it provides the ideal prerequisites for a number of application possibilities. Thanks to the foam mode, the LFP can easily be used even in difficult applications such as bottling foaming liquids like milk.

Enquiries: Robert de Scände. SICK Automation Southern Africa. Tel: +27 (0) 11 472 3733 or email Robert.deScande@sickautomation.co.za



SMART SENSORS. SMART TECHNOLOGY.

More than 45 years' experience providing specialist sensing solutions across southern Africa has positioned Countapulse Controls as the leading sensor solution provider.

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Multi-sided digital manometer

KOBOLD, represented locally by **Instrotech**, has on offer model MAN-SD intelligent digital manometers that offer reliable pressure monitoring of plant and machinery and has application in the fields of mechanical engineering, environmental technology and hydraulics. These battery-powered devices, which are fitted with piezo-resistive sensors, resist overloads up to three times nominal loading.

There is a choice between 24 measuring ranges, which extend from -1 ... 0 up to 0 ... 1 600 bar. The manometer can be

installed in such a way that the easy-to-use four-digit LCD display can be very easily read, as both the process connection and the front cover are rotatable. Operation is simple and convenient using three function buttons on the film-covered keypad. The zero point can be set automatically using the zero function, and a freely-selectable password offers protection against incorrect or unintentional operation.

Models with analogue or relay output are available. In the model with a push button and relay, switching point and hysteresis



can easily be set using the keypad. The devices can also be provided with a peak value memory. This robust pressure measuring device fulfils Protection Class IP 65 and is therefore suitable for use in tough applications. All parts which have contact with media are of stainless steel or ceramic.

Enquiries: Tel. +27 (0) 10 595 1831 or email sales@instrotech.co.za

Fit for purpose sensing solutions

Replacing original sensing, measuring and monitoring devices represents the ideal opportunity to assess a specific application and the suitability of the equipment.

This is according to Gerry Bryant, managing director of **Countapulse Controls**, who says that often a better fit for purpose solution which incorporates new technology is available. Often the selection of the original sensing devices occurred with one particular machine, rather than the entire process, in mind. Bryant says that when replacing the original sensors, it is possible to achieve a more holistic overview of the process.

"By involving a specialist sensor supplier like Countapulse Controls in this process, it is often possible to provide a far more cost efficient and plant related solution, and this can end up providing significant cost savings for an operation," Bryant says.

As sensing and measuring technology continues to develop, all industries have to adapt. Bryant says that Countapulse Controls has evolved from being a supplier of technologically superior sensing and monitoring devices to a solutions provider offering advanced technology packages

that incorporate high level support. This is underpinned by assistance in both the selection of application appropriate and cost effective solutions, as well as the installation of total systems.

"When assessing a customer's application, it is best to look beyond a single problem area. A more structured approach is required to obtain a general overview of the specific requirements. And by considering the overall operation of the plant, we are able to provide a solution that encompasses any unforeseen needs within the process," Bryant says.

Bryant cautions that selecting sensors is not as simple as matching a model number to a requirement. There is the need to assess the operating environment and gain a comprehensive understanding of the elements that need to be monitored, and only then can a fit-for-purpose sensing solution be applied. Parameters that need to be taken into account include the range of the sensor, the speed of the automatic process, the background conditions and type of product, auxiliary equipment and the circuits within the process.

An example would be selecting a photo electric sensor that is suitable for various switching distances within a plant. The customer would have the option of standardising on one sensor type, as opposed to having different devices throughout the process, and this would reduce parts inventory and associated operating costs. A failure to understand the full capabilities of a specific device could result in the selection of a far costlier sensor, when a more cost effective option would suffice in a particular application.

"Technical acumen and experience play a large role in reducing the effects of human error, which could result from uninformed product choice and the absence of appropriate technical information," he says.

This is where a dedicated technology and solutions provider like Countapulse Controls plays a vital role. "Each application has unique, specific needs. In order to provide a balanced solutions driven approach, it is advisable to select a supplier with extensive industry knowledge and a diverse portfolio of customers."

Enquiries: Tel. +27 (0) 11 615 7556 or email bryant@countapulse.co.za



WLAN solution for machine building

The new WLAN 1100 wireless module from **Phoenix Contact** combines Access Point and antenna technology in just one device. In contrast to the classic concept, it is installed like an antenna directly onto machinery, mobile vehicles or control cabinets, rather than inside the control cabinet. Two integrated high performance antennae with MIMO technology ensure reception wherever it is needed. This concept offers the user not only a cost-effective but also extremely simple WLAN machine connection. There is no need for expensive WLAN planning or installation of antenna technology.

As the wireless module does not require space in the control cabinet it is simple to retrofit. It is attached using single-hole assembly and via a Combicon connector and RJ45 Ethernet connector, as usual. The wireless module is also suitable for tough industrial environments. It is shock proof according to IK08 and therefore even withstands stronger mechanical loads.

Enquiries: Email sbritz@phoenixcontact.co.za



Analogue signals at a glance

The compact connector unit is simply inserted in the connection cable of analogue sensors (4...20 mA). It displays the measured values locally. The user can set a switch point or limit at which the transistor output switches. A colour change (red /green) of the display indicates this unmistakably. Critical process states or operational problems are reliably signalled.

Converter for Industry 4.0

A special feature is the signal conversion: The threshold display converts analogue signals to digital.

IO-Link signals: Today they are required in almost any modern industrial environment and for Industry 4.0 applications.

Some applications include: Compressed air meter for recording energy consumption of suction grippers; monitoring of the system pressure in the coke oven machine; monitoring of hydraulic power units; invoicing of industrial water and many more.

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Cerabar PMP21, non-ex area, M12	R4281	R4110	R3982
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2017 CESA Aon Engineering Excellence Awards

At the recent 2017 CESA Aon Engineering Excellence Awards, Lynne Pretorius, President of CESA states, "Consulting Engineers are at the forefront of Infrastructure development and these awards bear witness to the pivotal role that Consulting Engineers, as trusted advisors and partners to our clients, play in the delivery of services to the people of South Africa and the African continent."

"Given the pivotal role that CESA members have in the South African society and economy, these awards are about thanking all the participants for the role you play in our country's growth. Most of all, the winning projects show us that South Africa still has so much to deliver and offer to its citizenry, and that the potential of the country that we love and call home will continue to require excellence that the Consulting Engineering industry has to offer.

"Clearly an enormous responsibility lies upon your shoulders as the consulting engineers in South Africa, but by the same token,

to deliver on these responsibilities, consulting engineers have to operate in a secure, risk-managed environment. It's our role at Aon South Africa to facilitate that environment, and to ensure that you have a professional and qualified team on your side, every step of the way," says Terence Williams, CEO of Aon South Africa.

Awards were handed out in the following categories: Young Engineer of the Year; Engineering Excellence for projects with a value of less than R50 M; projects between R50 M and R250 M and for projects with a value of over R250 M; Best International Project; Visionary Client of the Year; Mentor of the Year; Business Excellence; Mentoring Company of the Year; Publisher of the Year; Job Shadow Initiative; and Branch of the Year. (See *Social Engineers* page 51)

Enquiries: Dennis Ndaba. Tel. +27 (0) 11 463 2022 or email dennis@cesa.co.za

Winner – Vision 2030 Award

The CDC, in 2016 during the Gas Options session/conference, one of the outcomes highlighted the Coega SEZ as one of the locations identified to host the gas to power plant, with an allocation of 1 000 MW. This has initiated an Environmental Impact Assessment (EIA) study for the gas to power programme and strategically further explored the SEZ's full potential beyond the current allocation of 1 000 MW. The CDC has successfully attracted R4 billion worth of energy projects. These include the R3,5 billion Dedisa Peaking Power Plant, with

a capacity of 342 MW name other energy projects here R9 M lay down area for normal and abnormal cargo. The 12 hectares lay down area in Zone 1 of the Coega SEZ is located on the boundary between the Port of Ngqura and the Coega SEZ and has played an integral role in the regional connection of wind power. Complementing this project is a million rand 48 kW Solar Plant, which feeds power to the CDC head office.

Enquiries: Email Simlindle.manqina@coega.co.za



Congratulating the CDC on winning the Vision 2030 Awards on Infrastructure Development and its commitment to the realisation of the national development plan objectives: Cllr Athol Trollip, Executive Mayor of the Nelson Mandela Bay, Arnaud de Limburg, Dedisa CEO, Honourable Ms Mamokolo Kubayi Minister of Energy, (Front) Christopher Mashigo, CDC Executive Manager Business Development and MEC Sakhumzi Somyo, DEDEAT Eastern Cape.





EOH signs Schneider Electric software deal

EOH is the official Southern African distributor for world-class industrial software solutions provider **Schneider Electric** Software, strengthening its industrial technologies portfolio.

The Schneider Electric Software portfolio which includes; Aquis, Avantis, OASyS, Ampla, Citect SCADA, ClearSCADA, SimSci and Wonderware, improves productivity and profitability for production, manufacturing and infrastructure industries.

Schneider Electric Software has a long-standing relationship with EOH, through

Wonderware Southern Africa, a partner of the EOH group, having supplied and supported the Wonderware suite of products since 2003. As a result, EOH was the logical choice to take on the distribution of Schneider Electric software in Southern Africa because of its existing focus on, and technical expertise in, the mining, manufacturing and infrastructure sectors.

“Bringing Wonderware and the rest of the Schneider Electric Software business under one EOH roof in South Africa is great news for our customers,” said Deon Bar-

nard, MD of Wonderware Southern Africa. “We are proud to be a part of the depth and breadth of proven solutions, backed by some of the most knowledgeable people in the business.

“This is another milestone in the elimination of artificial boundaries between solutions and their functional application in the field, a great benefit to our customers who have to do it all.”

Enquiries:

Tel. +27 (0) 11 607 8100 or

visit www.eoh.co.za

Batteries play a leading role in power stations

The complexity and importance of power stations across South Africa is matched only by the reliability and steadfastness required of its interconnected parts. If not run with utmost efficiency, power stations cannot and will not function at capacity – leaving communities and industries across the country without power. The result of which, is devastating losses to the economy at large.

As the country’s oldest – but most innovative – battery manufacturer, **First National Battery** has been at the heart of power stations for decades. It takes a depth of technical knowledge, applied to the manufacturing of solid and reliable specialised batteries to be able to maintain a leading role in the functioning of power stations.

“The resulting losses from even a minor fault in the intricate power station infrastructure can have substantial consequences to the functioning of the system as a whole,” says Ntsumbeni Mavhungu, Director of Industrial Product Marketing.

“Any kind of power dip within the power station is compensated for and stabilised by robust First National Battery UPS (Uninterrupted Power Supply)

units. This protects the balance of power within the station.” First National Battery units perform the same function – protection of infrastructure for uninterrupted functioning – at South African nuclear power stations.

Enquiries: Visit www.battery.co.za



Africa’s Most Influential Women in Business and Government award

Eskom’s Group Executive for Customer Services, Ayanda Noah, has won the coveted Most Influential Women in Business and Government award.

The awards seek to celebrate the continent’s influential leaders and individuals who promote critical and collaborative thinking.

Noah is an electrical engineer by profession and has 25 years’ experience in Eskom, having joined the company in 1992 as an engineer-in-training. She worked her way up the organisation, and prior to her current position at Customer Services, Noah was the Group

Executive for Distribution - the first woman in Eskom to head that division.

Eskom’s Interim Group Chief Executive, Johnny Dladla, congratulated Noah, saying that: “Ayanda has been part of the executive team for 10 years and has a world of experience as a leader in Eskom.

“She has always been exemplary and also made it a point to bring people up with her as she climbs the corporate ladder. Eskom is very proud to have a leader of her calibre,” he said.

Noah said: “This award is humbling, especially as we celebrate women’s month and I would like to thank CEO Global for this recognition.”

Enquiries: Email mediadesk@eskom.co.za





KITE 2017 provides a comprehensive portal for industrial technology solutions

The KwaZulu-Natal Industrial Technology Exhibition (KITE), held between 26 and 28 July 2017 at the Durban Exhibition Centre, once again proved that it is undoubtedly the only place in KwaZulu-Natal to source and experience a comprehensive variety of industrial technology solutions under one roof.

A total overall attendance of 4 470 of the country's industry professionals (97% from KwaZulu-Natal) and KITE 2017 was lauded as the definitive interactive industrial technology equipment showcase.

Feedback from the visitors clearly indicated their satisfaction for the wide selection of technology available. Kosheek Surajpal – Hulamin, says: "We run a very large plant and because we are responsible for general maintenance, we need a variety of equipment. I am a regular visitor to KITE and find the show very informative. We found lots of new equipment and amassed a lot of valuable information."

Avishkar Madhan – Avi M Consulting, adds: "I have attended the last four KITE events and in all instances I found products

that suit the company's needs. This year I was looking for mechanical fluid control and flow technology such as pumps, valves and accessories. There is a very good coverage of a number of the sectors we operate in, such as mining, sugar and general industry. We found a number of new suppliers who we will be ordering from in the coming months. What makes this so valuable is that they all have a local stockholding and supply capacity and capability."

Similarly, exhibitors at the event were enthusiastic about the calibre of visitors in terms of procurement decision making capabilities. Jo van Aulock – Schneider, says: "We were previous exhibitors at KITE and returned after an absence of about six years and the show has exceeded our expectations in terms of visitor quality and general organisation. We used this opportunity to introduce our packaged industrial solutions – known as our Industrial Eco-structure – to the market and we have had a really good response. This is the perfect branding opportunity for us in KZN."

Graeme Cox – Omron, says: "Omron returned to KITE after an absence of a few years. We have realised the potential of the show and the great value in the target market it attracts. We had lost contact with a number of previous customers and have used our presence at KITE to reconnect with them on a very positive level. We were definitely able to interact with the right people and we have had a great response to our customised integrated network capabilities solutions. Our Johannesburg team were pleasantly surprised at how vibrant and large the KZN market is."

Enquiries:

Visit www.kznindustrial.co.za



Putting out fires

Centa Group - a group of fire protection specialists providing complete fire protection throughout South Africa and the Indian Ocean islands - has been a major contributor to uplifting the quality and safety standards of fire protection equipment for over 25 years.

"Centa is the only fire company in South Africa to locally manufacture a range of fire extinguishers and hose reels – all with the 'Proudly SA' stamp of approval. The company's portable fire equipment includes fire fighting powders, fire hoses, cabinets and signage," says Duncan Boyes, chairman of the

Centa Group. "We have a thorough understanding of the science of fire and are equipped with the knowledge of the legal requirements of fire protection equipment.

"Centa's commitment to providing dependable fire protection that saves lives and protects property, is confirmed by accreditation from various standards authorities, including SABS and ISO 9001: 2015 certification, SAQCC-Fire, as well as coveted 'Proudly SA' approval.

Enquiries: Kim Botha. Tel. +27 (0) 31 569 1175 or email kbotha@centa.co.za

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CESA Awards 2017

Consulting Engineers South Africa (CESA) supported by Aon South Africa hosted the Who's Who in the engineering industry at a gala dinner held at Vodaworld in Midrand to celebrate the 2017 CESA Aon Engineering Excellence Awards. These Awards recognise outstanding achievements in the engineering industry celebrating innovation, quality, outstanding workmanship and professionalism. See some of the winners below,

Enquiries: Dennis Ndaba. Tel. +27 (0) 11 463 2022 or email dennis@cesa.co.za



Group Awards.



The category for Engineering Excellence with a value greater than R250 M was won by Aurecon for the Mall of Africa for Atterbury Property.



The category for Engineering Excellence with a value between R50 M and R250 M was won by Neil Lyners and Associates for the L'ormarins Hydro Power Project.



The category for Engineering Excellence with a value less than R50 M was won by Fellow Consulting for Malapa Fossils for Wits University.



Tongaat Hulett is the Visionary Client of the Year.

- CEO** – Chief Executive Officer
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- CIO** – Chief Information Officer
- ERP** – Enterprise Resource Planning
- GPRS** – General Packet Radio Service
- ICASA** – Independent Communications Authority of South Africa
- IIoT** – Industrial Internet of Things
- LoRa** – Level of Repair Analysis
- LTE** – Long Term Evolution
- MTN** – Mobile Telephone Network
- NBIIoT** – Narrow Band Internet of Things



We invited Dave Wibberley, MD of Adroit Technologies, to Write @ the Back.

He did ... and he asks:

The Emerging Infrastructure Capability for IIoT... Who Will Win?

As with all new cutting edge technology, a lot of hype is being generated by Telecommunication, Technology, and Infrastructure and Consulting firms about IIoT (Industrial Internet of Things). It is a very critical battlefield and it is not surprising that companies are becoming intimidated and the uptake to IIoT is still very limited.

The problem, in my humble opinion, is that the large-scale benefits will only be realised through large-scale implementations. Consulting firms are expediting their IIoT solutions to the CEO/CFO level at companies with money but the budget is often sitting in the CIO's hands. Both top management groups are in the very unfamiliar territory when it comes down to the sensor and data acquisition level. Engineers, however, feel extremely comfortable with the complex and challenging real-time world.

The success of IIoT lies in the reliability, cost and scale at which we can feed the big data, analytics and ERP systems. So, it really needs the two worlds, management and engineering; that traditionally is a bit like mixing oil and water, to somehow find a way of integrating. In addition, there is still the challenge of low-cost, high reach, low powered networks and sensors that need to get to the level and reliability needed to really launch the uptake of IIoT. In South Africa, we have SquidNET rolling out the SigFox network offering very low-cost of use, low powered units, and high physical penetration, but it is extremely limited in sensor messaging. NBIIoT (runs on LTE) being driven by Huawei through MTN. Vodacom (which still offers GPRS) is apparently waiting for ICASA approval, but promises larger messaging capability which will most definitely impact the cost. LoRa has been discussed but I haven't heard much about this network recently. The problem is that every solution demands a very specific choice of network to meet the physical requirement, which gives the lowest cost at the greatest reliability.

Enquiries: Adroit Technologies, +27 (0) 11 658 8100 or email info@adroit.co.za or visit www.adroit.co.za



Dave Wibberley, MD of Adroit Technologies

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Africa LED Expo 2017

13 – 15 September 2017, Gallagher Convention Centre, Midrand. This is a focused exhibition for professionals to see the latest developments and innovations in the LED lighting industry. The Expo will focus on architectural lighting; decorative lighting; commercial lighting, entertainment/gaming lighting and industrial lighting.
 Enquiries: Visit: <http://africalexpo.com/lid>

Water Research Commission (WRC) Bi-Annual Symposium

'Adaptation to the new normal'
 18 – 20 September 2017, Birchwood Hotel & Conference Centre, Boksburg. The theme for this year's WRC Symposium was selected to address issues of behavioural change, governance, policy, resilience and technology.
 Enquiries: Tel. +27 (0) 12 761 9300 or email adriaant@wrc.org.za

Generators & Standby Power Conference

26 & 27 October 2017, Emperors Palace Convention Centre, Johannesburg
 The following topics will be covered: Health & safety procedures; Contractors and installation regulations; Importing of generators and standby power supplies; Risk and mitigation plans in generator and standby power use; Servicing, Inspection and maintenance; Industry innovations and challenges.
 Enquiries: Email grace@vukanicomms.co.za



brain block...

Question 3

(Courtesy Glyn Craig, Techlyn)

An audio amplifier in an office block drives the audio reticulation system signal at 70,7 V. Each loudspeaker is connected via a transformer.

1. Why are the loudspeakers simply not connected in parallel?
2. The 70,7 V seems a strange value. Can you offer an explanation?



Answers to Brain Block questions are on our newsletters and website.

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The implementation of Industry 4.0 is, among other things, about creating a digital silhouette of a plant or machine, thus allowing for flexible process optimisation. Essential information is provided by the many sensors that are already installed for process or machine control. Thanks to IO-Link, these sensors provide much more data than mere switching signals or analogue values.

When it comes to digital machine or plant upgrading use IO-Link. With low-cost and robust interfaces, the sensors can provide more information about the process, which can then be evaluated and optimised to the benefit of plant machine efficiency.

IO-Link, sensors and masters, contributing to Industry 4.0

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