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Far be it from me to comment on things environmental. Why would I? I am an engineer, after all. In all seriousness, we need to remain cognisant of the environment. This requirement applies on many levels and requires us to do things for the right reasons.

We know about the 'polluter pays' policy. No problem with that. However, be aware that some perverse things can happen when the punishment for non-compliance is a fine. You can choose to pay a fine… I suspect there are some similarly perverse incentives in carbon tax and trading credits.

The point is that this is not a game. We can be incentivised to do certain things, and punished for not doing them, but the fundamental issue is that we have a shared responsibility to our environment and that alone should dictate our behaviour.

Climate change and global warming are obviously hot topics but climate change is a normal event for our planet. It happens. Our responsibility is to understand how and why we may be influencing it and we are. One can argue at length about the relative effect of one volcano versus 10 million motor cars. The point is we can control one and not the other.

We are obligated as the dominant species on the planet to learn how best we can control what we do.

The reality is that our planet was 0,75°C hotter last year than it has been in the recent past. Of course it has been a heck of a lot hotter before; and a heck of a lot colder. That, in a nutshell, is climate change.

Over thousands of years, vegetation changes, species become extinct and new species evolve. We are watching this stuff happen – not in slow motion, but fast, and we need to respond fast. The immediate response is to try to figure out how we can continue the development of our species with minimal harm to our home planet.

Sure, we will leave this planet one day. Of course we will. The challenge is to be around (not individually, of course, but as a species) when the time comes…. That is some time off.

There is another measure that intrigues me. We are aware that, globally, lightning activity is increasing. A well-known specialist in this field, Professor Colin Price, has been quoted as saying that one of the best ways to take the temperature of the earth is to monitor global lightning. We see real evidence of the increase in lightning activity in South Africa; the increase is clearly outside the limits usually associated with the sun-spot cycle, which is known to influence lightning activity.

Driving through the Free State recently made it clear to me that we need to think very carefully about the crops we grow there – maize in particular; or on a controversial note, how we can genetically modify those crops to flourish in changing climatic conditions. All these things are possible – but what to do?

Industry faces challenges that include water and not only energy. How do we manage that? How do we change the mind-set from where we buy a commodity (call it water or energy), and treat it as a resource?

Can we do that? Will that change the way we do business?

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Ian Jandrell

Pr Eng,
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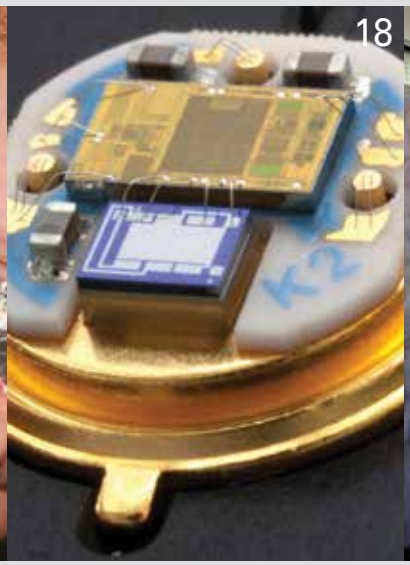

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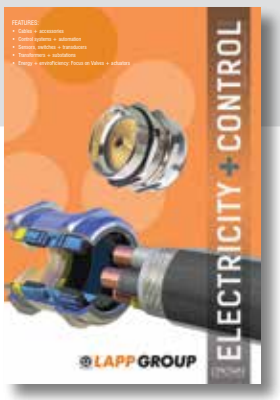

Cover

The **LAPP GROUP** offers not only cables, but cable glands and connectors that combine optimum electromagnetic compatibility and easy assembly. *Read more on page 11.*

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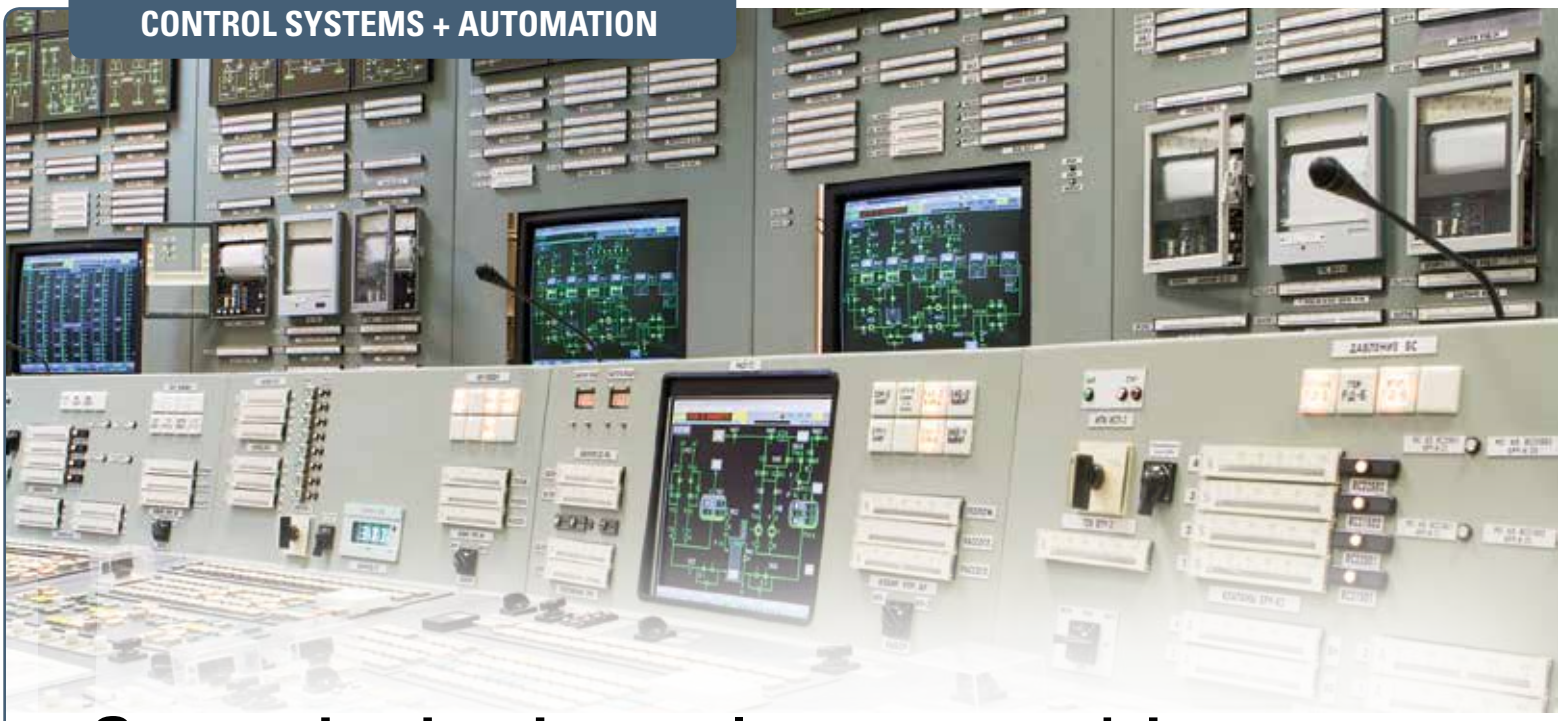

Commissioning a large machine **functional safety project**

Ian Hetherington, VANTAGE

Methods on how the client's User Requirement is Specified (URS) and the recording of the verification and validation procedure.

This article is taken from the aspect of the client or end user. They may be putting a single machine or a large complex of machines into service, the question remains the same. Did they get the safe system they required? It is not the role of the end user to design and specify out the complete detail of the safety system. It is certainly their role to verify and validate that the system performs to the required level. To this end the article suggests methods on how the client's user requirement is specified (URS) and the recording of the verification and validation procedure.

Systematic and installation errors

To begin with may I put this question to you? From a performance aspect, what is the difference between a regular control system and a Safety Related Control System (SRCS)? A regular control system has an independent and continuous validation of its performance. This is provided by the key performance indicators for the process under control, such as quality and efficiency. The very reason for the control system's existence is being challenged on an hour by hour, day by day basis. Can the same be said of an SRCS? Not really, no it cannot. An SRCS may only be challenged when a demand is placed on it. There is no independent and continuous validation of its quality of performance.

The quality of a regular control system is measured in the very fine confectionary it produces or the excellent motor cars it produces. The scale of quality of an SRCS is measured in two possible ways. Performance Level (PLr) or Safety Integration Level (SIL) If that PLr or SIL was inherently wrong on day one, it will not show up in the quality of that shiny new car or that tasty biscuit. Therefore for the team involved in the delivery of a safety system, it is imperative that a Functional Safety Management Plan is effective in reducing the possibility of systemic design errors and installation errors. There are two regulated or standard approaches this management plan:

- IEC 62061: Functional Safety Programmable Systems
- ISO 13849: Safety Related Parts of a Control System

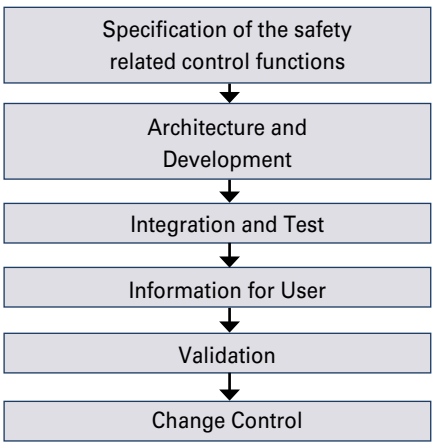

Figure 1: Basic Functional Safety Management Plan.

It is not the intention of this article to discuss the detail of functional safety management plans in either standard IEC 62061 or ISO 13849; neither to discuss the management of the design of safety systems. It is rather the intention to discuss the practicable application of a management plan under such topics as:

CRC – Cyclic Redundancy Check
EDM – External Device Monitoring
I/O – Input/Output
IEC – International Electrotechnical Commission
ISO – International Standards Organisation
MTTFd – Mean Time To dangerous Failure
PLC – Programmable Logic Controller
PLr – Performance Level
SIL – Safety Integration Level
SRCS – Safety-Related Control Systems
URS – User Requirement Specification

Abbreviations/Acronyms

- Avoiding excessive or cumbersome management plans
- Modular approach to functional design specification (URS)
- Recording the verification process
- Recording the validation process using the URS

Other subsidiary topics for discussion are:

- Detecting and final control Elements
  - The rise of programmable or more accurately 'parameterable' (if that's a word) elements presents its own set of challenges
  - Traditional detecting and final elements had a dedicated single function. It did exactly 'what it said on the tin'
  - These elements continue to develop with self-teach functions, floating muting, profile for safe minimum speed, etc.
  - One must take care that with all the available flexibility, that the required safety function is being executed
- Areas of most frequent sub-standard design

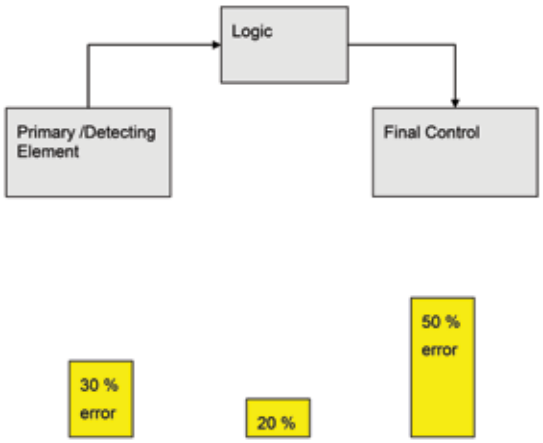

Figure 2: Areas of most frequent sub-standard design.

These figures are not based on recorded statistics, but from observation of many projects. The high error rate for final control elements, is mainly due to non-safe rated components in a safety loop without sufficient diagnostics, redundancy or insufficient Mean Time To dangerous Failure (MTTFd).

Modular User Requirement Specification

On a large or more complex project, where there are multiple suppliers of major sections of plant, in addition these suppliers may be from different countries with varying statuary regulation. This places greater emphasis the URS and the Safety Management Plan. Hypothetically, we are considering a project which covers many hundreds of square metres, several thousand I/O (regular control) and different complexes of machinery. It is a production process using a variety of complex machinery. We are discussing the delivery of the safety system for this. A modular approach to requirement specification of safety functions and then building these modules into safety loops, creates a clear and unambiguous statement. In broad terms, typical safety loops can be grouped into the following (the list is not definitive):

- E-Stop
  - Zoning
  - Class of stop function (break for free run)
- Access Control
  - Physical restraint with interlock or guard locking
- Presence sensing
- Muting or Bypass
  - Safe speed
  - Hold to run / Jog
- Process interlock
  - Hazard materials

Rather than specifying the detail function of each complete safety loop, of which there may be several hundred in a large complex project, one chooses the modules that make up the loop. Some of the benefits to this type of development are:

- Avoids repetition of stating the same function in each safety loop
- Transparent to the hardware or software platform being used
- Diagrammatic format tends towards a clear, and unambiguous definition
- A revision of a module does not require it to be exhaustively revised in every loop. Change it once at the module definition and it is referenced to wherever it is called

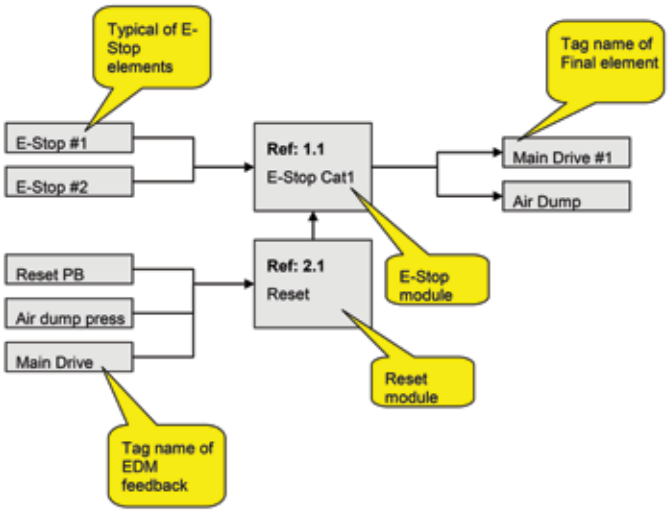

Figure 3: Example E-Stop loop.

In the example the module Ref 1.1 E-Stop and the module Ref: 2.1 Reset are specified for this particular safety loop. The Ref: 1.1 E-Stop may be re used again and again in other E-Stop loops. All that changes are the tag names of the input elements and output elements.

Definition of a module E-Stop Cat1 (Break Stop)

Refer to ISO 13850 E-Stop principles of design.

- E-Stop push buttons shall be dual channel (min Cat 3 architecture)
- There is no zoning of E-Stop functions. The E-Stop shall be global to the defined area
- E-Stop contacts shall be normally closed of the self-monitoring type, see hardware specification
- E-Stops shall adhere to the requirements of ISO-13850:2008
- The E-Stop category shall be Cat 1. i.e. break stop

It is recognised that the function of the E-Stop is to avert arising or reduce existing hazards to persons, damage to machinery or to work in progress. It is not a substitute or alternative to any protective measure such as a safety interlock to prevent access to mechanical movement.

Reset (Manual Monitored)

- All E-Stop functions shall be Monitored Manual Reset, requiring External Device Monitoring (EDM) with the exception of safe rated final elements with self-monitoring
- The reset shall be taken from the falling edge of the reset pulse
- The reset pulse shall be 'AND' with the EDM
- The reset command shall not be accessible from within the hazard area

Other examples might be presence sensing i.e. light curtains. The behaviour of that particular module will define how it will respond to inadvertent access – in other words a shut down to a safe condition. It will also define the behaviour under muting conditions, what sequence it will have and time out, etc.

Recording of the verification process

The objective of the verification by analysis is to establish if the SRCS shall function correctly and if it attains the required safety performance level or SIL. IEC 62061 in particular calls for details about strategy, role and identification of the people involved etc. There are different techniques to adopt. The 'top down' approach such as Fault Tree Analysis, or in the example below, the 'bottom up' approach. At a minimum the following is required to record the process. There are a number of core documents required. *Figure 4* is a flow diagram showing how the documents support the analysis to determine if the safety loop 1. Functioned correctly and 2. Did it achieve the required safety level?

take note

- It is important to distinguish between a control system and a 'safety-related' control system.
- Whereas the former operates all the time, the safety-related control system only has to respond when a demand is placed on it.
- Any design errors may only be detected too late – unless the user requirement is properly specified.

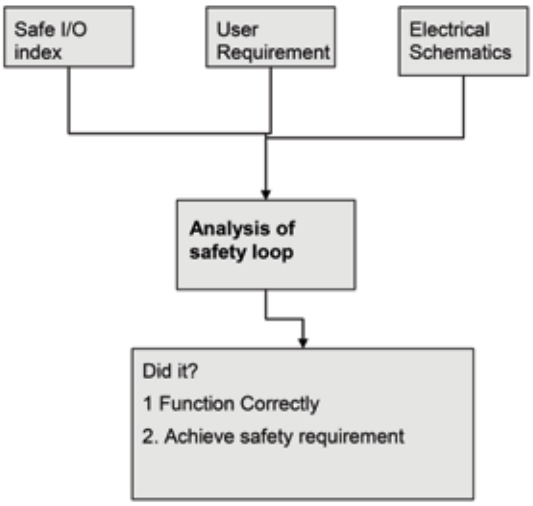

Figure 4: Flow diagram of analysis.

Example of analysis

- From the documentation the inputs and outputs for this E-Stop safety loop are defined
- From the URS the function of the E-Stop and Reset are defined
- Error: From analysis it is found that there is no safe message being passed to the final elements, and the Reset is Auto reset, it should be manual

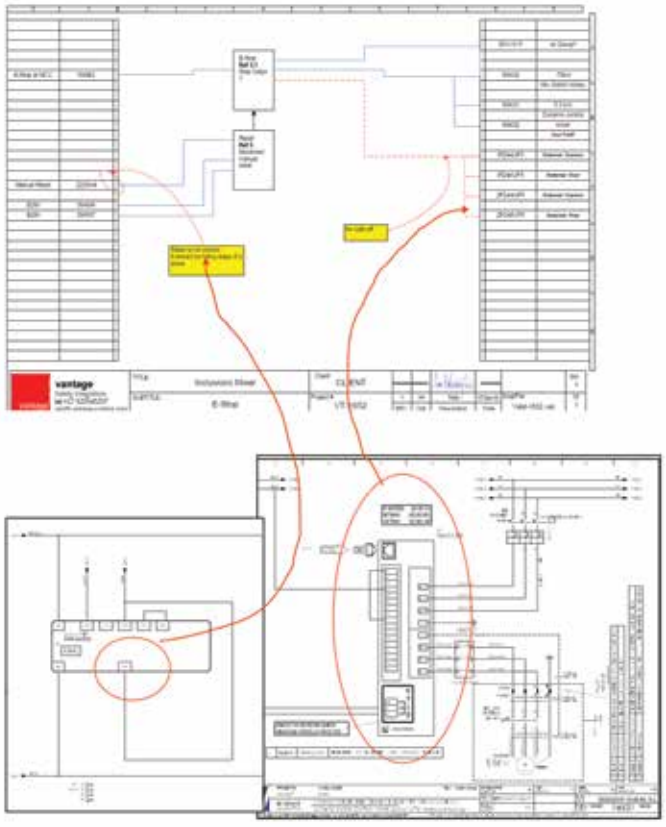

Figure 5: Example of analysis.

> *If the Performance Level (PLr) or Safety Integration Level (SIL) PLr was inherently wrong on day one, it will not show up in the quality of that shiny new car or that tasty biscuit.*

By using the graphical method, proof of the analysis is recorded and errors of design are identified. It should be noted that the work previously undertaken in the URS in defining modular functions is expanded further by defining the I/O for a particular loop. The logic of how the safety elements are configured is analysed in the electrical schematic and recorded in this format. In the case of safe software the Tag-Name and PLC address are recorded on diagram.

Recording of the validation process

Validation in this case, is taken to mean validation of the installed safety system. Testing of each installed detecting element trough the logic to each resultant final control element's behaviour. The validation test may only be satisfactorily undertaken after the analysis of the safety loops that make up the safety system. In other words, one has to understand the safety function to be able to test it. For example: A fault in how a final element is safely shut down may be masked by the regular control system stopping that element. Therefore the test must observe that the safety message is being passed to the final element. For large complex systems, simulation of the safe logic is useful in debugging, I do not see it as a substitute for a validation test.

A 'Shut Off Matrix' is simple and somewhat useful when the safety loop is basic. Where it is found lacking is in the reset function after safe shut off. It does not address the reset action or device coverage. Cause and Effect test sheets are also useful, but can become exhaustive and cumbersome.

Use if modular functions for validation

Previously in the URS, the behaviour of various modules making up a safety loop where defined Carrying those URS modules forward to the validation phase, they are used as a model or template against which the action of the loop under test is witnessed. The function block type test shown is a suggested method for recording validation tests. The modules defined in the user specification are carried forward to the validation test. Where a safety loop is more complex, with various parameters to enable different safe operating conditions. For example a hand held jog station or enabling pendant. There may be a number of test sheets for the one loop. The test sheet begins with all inputs and out puts marked in red. As the test progresses with positive results the input and outputs are marked in green. When the complete loop is tested satisfactorily it is signed by the responsible person. Observations and notes may be added in yellow.

Safe software reporting

Most safe software platforms provide a Cyclic Redundancy Check (CRC). This is shown as hexadecimal number. Once the final software configuration is complete and compiled it will generate this CRC number. This number is unique to the configuration at that time, any further changes will generate a different CRC number Therefore the recording of the validation test must include the CRC number.

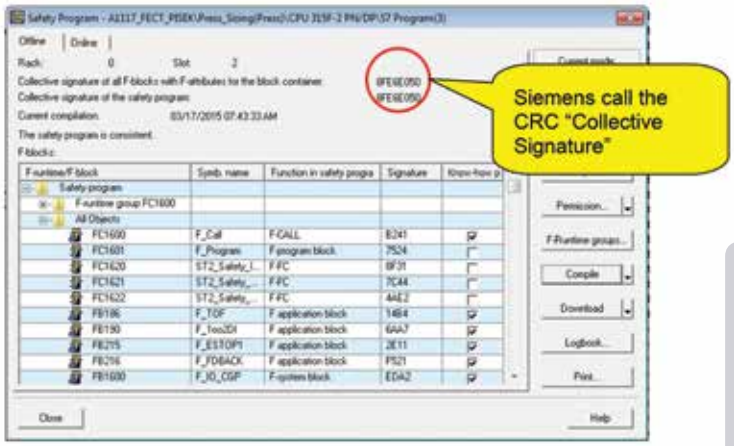

Figure 6: Example Siemens Step7-F. CRC (Siemens calls the CRC 'Collective Signature').

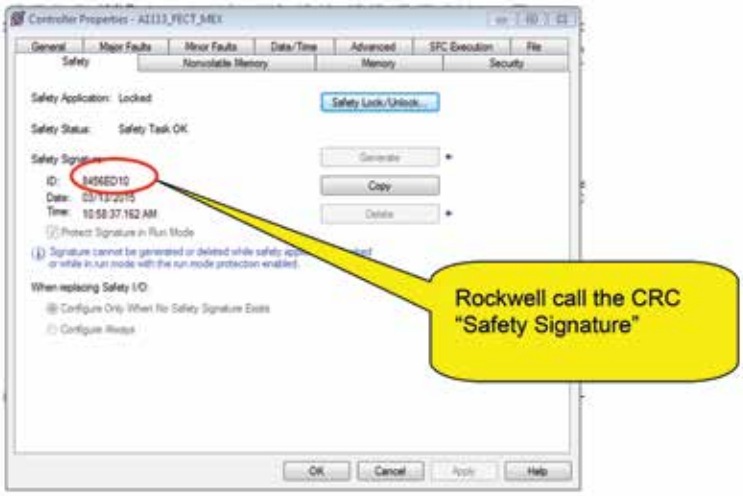

Figure 7: Example Rockwell GuardLogix.CRC (Rockwell calls the CRC 'Safety Signature').

Ian Hetherington is a certified machine safety engineer. He provides design, specification and CE certification of safety systems. Also independent analysis and validation of safety systems. Technical files are auditable and verifiable to ISO/IEC and SANS standards. Projects are undertaken in South Africa, Europe and United States.
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CONTROL SYSTEMS + AUTOMATION

ROUND UP

Using wireless products in hazardous areas

Solexy Wireless from **RET Automation Controls** has released the new RX series antenna coupler, making it easier to use wireless products in hazardous areas. This unique design is the only barrier design that is Explosion Proof with an internal Intrinsically Safe Barrier, and allows you to use a standard passive antenna or a cable run to a remote antenna.

No glands and no space inside the housing are required. This barrier is mounted into the enclosure wall, providing the flame proof protection. In one product:

- Explosion proof sealed fitting
- Intrinsically safe barrier
- RF pass through

The Solexy RX series explosion proof and intrinsically safe RF Barriers are an integrated protection device that facilitates passive antenna installation in hazardous areas making the signal intrinsically safe. The patented RX series barrier features a barrier circuit which protects the antenna connection and field cabling from faults or voltage and current high enough to cause a spark ignition. The RX circuit is encapsulated and housed in an explosion-proof stainless steel body and is designed to be used with a listed enclosure for hazardous areas. The RX offers new advantages over the legacy AX series. An engineered co-planar circuit design, and tuned to tighter frequency ranges reduces in insertion loss as much as 50% or more.

The longer housing keeps the antenna radiation pattern away from the housing to allow for a more dependable signal. The RX series also has new ratings for IECEx and ATEX. It is now approved as an Apparatus. This will cut down on costly Notified Body evaluations. The new RX series has a list of installation parameters and when followed you can use this without requiring additional evaluations.

Enquiries: Brandon Topham.
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Radar dual-zone sensor - superior detection

Banner Engineering has introduced a new Frequency Modulated Continuous Wave (FMCW) radar sensor for reliable detection of moving or stationary objects. Featuring a very narrow 11 by 13 degree beam pattern, the R-GAGE Q240 sensor is ideal for monitoring a specific area without detecting adjacent objects. With two independent adjustable sensing zones, the sensor provides far and near proximity warning signs with the capability to detect objects over 40 metres away.

"Our new R-GAGE Q240 sensor is extremely robust and provides reliable detection capabilities," said, Brad Ragozzino, Technical Marketing Engineer, Banner Engineering. "Regardless of weather conditions such as wind, falling rain or snow, fog, humidity, air temperatures or light, the Q240 easily detects moving or stationary objects. This makes it ideal for outdoor applications, such as port crane collision avoidance and overhead crane monitoring."

The R-GAGE Q240 provides easy set-up and configuration of range, sensitivity and output with simple DIP switches, avoiding the training and complicated PC interface required for many other products. The sensor also features rugged IP67 housing to withstand harsh environments and ensure reliable performance in temperatures ranging from -40 to 149 °F.

The sensor has no moving parts and a rugged design that resists high-shock and vibration conditions. Combined with its robust outdoor performance, the R-GAGE Q240 is a more reliable solution with lower costs for purchase and maintenance than traditional laser scanner solutions. For optimal outdoor performance, the optional snap-on all-weather shield protects against extreme weather conditions and helps shed liquid off the face of the sensor.

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Acquisition: Distributor in Turkey

Yokogawa's subsidiary, Yokogawa Europe B.V. has acquired 100% of the shares of its distributor in Turkey, Birleşik Endüstriyel Sistemler Ve Tesisler AŞ. (BEST), which is based in Izmir. The acquisition of shares was carried out on 25 November.

With this acquisition, Yokogawa strengthens its focus on Turkey as a market with substantial growth potential. It will allow Yokogawa to extend its position in promising segments such as the power industry. Through the acquisition, Yokogawa will also enhance its relationships with customers in Turkey.

"BEST has been Yokogawa's distributor since 1977 and has already built an excellent reputation in the oil and gas industries, where it will continue to provide great value to customers," comments Yokogawa Europe's president Herman van den Berg. "Yokogawa is committed to working with customers as partners to help them get maximum value from their plant operations, and this acquisition is a major step forward in our plans to grow our footprint in emerging markets, and specifically in target industries including the power and energy sectors".

Yokogawa celebrated its 100th anniversary in 2015, and is continuing to create new value with its clients for a brighter future. The company is now accelerating its efforts to bring about a transformation that will allow it to sustain growth for another 100 years.

Enquiries: Christie Cronje. Tel. 27(0)11 831 6300
Christie.cronje@za.yokogawa.com

Acquisition of CD-adapco by Siemens

Siemens and CD-adapco have entered into a stock purchase agreement for the acquisition of CD-adapco by Siemens. The purchase price is $970 M. CD-adapco is a global engineering simulation company with software solutions covering a wide range of engineering disciplines including Fluid Dynamics (CFD), Solid Mechanics (CSM), heat transfer, particle dynamics, reactant flow, electrochemistry, acoustics and rheology. Last fiscal year, CD-adapco had over 900 employees and revenue of close to $200 M with software-typical double digit margins. On average, CD-adapco increased its revenue at constant currencies by more than 12% annually over the past three fiscal years. Siemens expects this business to continue to experience strong growth in the future.

"As part of its Vision 2020, Siemens is acquiring CD-adapco and sharpening its focus on growth in digital business and expanding its portfolio in the area of industry software. Simulation software is key to enabling customers to bring better products to the market faster and at less cost. With CD-adapco, we're acquiring an established technology leader that will allow us to supplement our world-class industry software portfolio and deliver on our strategy to further expand our digital enterprise portfolio," said Klaus Helmrich, member of the Managing Board of Siemens. CD-adapco is a global engineering simulation company with a unique vision for Multidisciplinary Design eXploration (MDX). Engineering simulation provides the most reliable flow of information into the design process, which drives innovation and lowers product development costs. CD-adapco simulation tools, led by the flagship product STAR-CCM+, allow engineers to discover better designs, faster.

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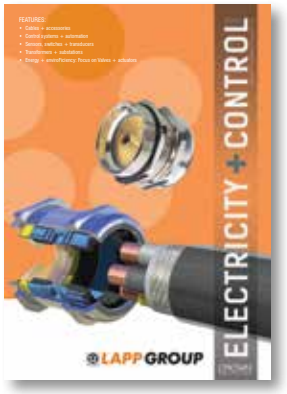
The LAPP GROUP
Interferers don't stand a chance

Connection technology for improved electromagnetic compatibility of overall systems



A well-screened cable connection does not let interfering signals bother it. Sensitive points that are often forgotten about include cable glands and connectors. A large contact area and low electrical resistance to ground are critical. The Lapp Group offers not only cables, but cable glands and connectors that combine optimum electromagnetic compatibility and easy assembly.

An overall system is electromagnetically compatible when its functions are not affected by other systems' electronic or electromagnetic fields. Poorly shielded connections, especially around cable glands or in the connector, are often gateways for such interferences. Although there are standards, legal requirements and even an EMC directive regulating many areas of cable and connection technology, these do not regulate cabling. According to the EMC legislation, connectors and cables are components with no direct function, but this does not mean that each manufacturer can define the EMC features of its components as they please. Instead, EMC-related requirements for some shielded cable types, such as the ÖLFLEX® 140CY are part of the European or national cable design standards.

What constitutes the ideal connection between cable and connector from an EMC perspective? The electrical resistance between the cable shield and ground potential must be as low as possible. For this, the contact area must be as large as possible and large metallic areas and integrated electrical connections with high conductivity improve screening. A prime example is the EPIC® ULTRA rectangular connector. The metal housing is nickel-plated with the seal on the inside, meaning that the two metallic housing parts have a large contact area. The SKINTOP® MS-M BRUSH cable gland goes perfectly with this, as a well-screened overall system needs the transition from the connector to the cable to provide a tight seal. While the screen is usually secured with a spring, on the BRUSH this function is performed by thousands of bristles arranged in a ring making assembly, dismantling and allocation quicker and easier. The cable is centered, attached, strain relieved and hermetically sealed in a single operation. Currents that are induced through interfering signals from outside are efficiently diverted by the highly conductive 360° brush screen. This is especially important when transmitting sensitive signals.

Insufficient shielding: When the Lapp experts open a control cabinet, they can see immediately whether there might be EMC problems. For example, if there are no ground straps on the doors, the screening suffers; if there is little space in the control cabinet, the recommended cable bending radii are often not achieved; if power cables with high currents are routed directly beside this, the strong electromagnetic pulses may disperse into the poorly shielded cable and result in interferences in the entire plant. The SKINTOP® MS-M BRUSH is a solution for critical applications such as this. Regardless of how you turn or bend the connectors and cables, the contact area between the cable's screening braid and the cable gland's brush insert is always good.

Patches for screening: At times, a technician accidentally cuts too deeply when stripping and damages the shielding, affecting the screening. This can happen when automatic stripping as the components used have certain production tolerances. If, as described, something should happen to go wrong, the damaged area can be repaired using a conductive self-adhesive screening tape. Inadequate EMC screening is a common cause for machinery failures and the EMC Institute has confirmed that the screening of EMC-optimised cable glands such as SKINTOP® MS-M BRUSH is considerably better than that of conventional solutions. As a result, the user has fewer EMC-related interferences to worry about. The assembly saves time and money.

Enquiries: Gavin Rautenbach, Head of Customer Service
Tel: 011 2013200
E-mail: Gavin.rautenbach@lappgroup.co.za or
info@lappgroup.co.za

Scan the QR code below to see product animation video of SKINTOP® BRUSH ADD-ON.

Lapp has produced a webinar on the topic of EMC and cable glands, and training videos will be appearing on YouTube soon. http://www.lappkabel.de/service/wissenscenter/emv.html

PVC Granulator

Laurence Braithwaite, Aberdare Cables

One of Aberdare Cables' (from this point referred to as 'the company') manufacturing operations is based at the Group Operations Centre, in Elandsfontein, Johannesburg. Two of the key strategic objectives for the company, are to manage and contain costs and to manufacture efficiently. As a result of this company strategy, the company sighted to pursue an endeavour that allowed it to manage the PVC Bleed by recycling at this site.

PVC is a significant component of manufacturing power cables and therefore scrap will always be a result of the production process. The process that the company followed was, that the purged extrudate, also known as 'bleed' was sold off to a buyer as per the company's tender process. This material was sold at the best price offered, and resulted in an average loss of R8,50 per kg to the company. Financial analysis indicated that during financial years 2014 and 2015 the loss of 'bleed' was in excess of R300 000 per month.

The root cause of this situation is a process requirement and in 2014 questions had to be asked and solutions explored. In line with the Company's Environmental Policy (The Company is ISO 14000 compliant), it made more sense to explore how we could reuse this material. Trials were undertaken to understand what the reusable PVC could be used for. This was done using a dosage of re-chip PVC to virgin PVC whilst meeting specifications. A successful option was found in the 'bedding' phase of production. The next phase was to identify a suitable, economical and long term solution to rechip, deliver and reuse the PVC to the bedding extruders.

Investigations were made into what the best fit solution would be and this resulted in the company investing in a Granumatic – Granulator arrangement and Piovan transfer system to a silo located centrally at the extruders. This machine is manufactured in Sweden by a company called Rapid Granulator. 2015 brought a year of approval and the installation and commissioning of the system was commenced in November 2015 by a local company, Eder Design.

The features of this machine are:

- Designed for plastics: The GranuMATIC has been designed exclusively for efficient recycling of polymer materials
- Energy saving: A GranuMATIC followed by a granulator is a solution that is very energy effective. Compared to a solution with a single large granulator for the job, the GranuMATIC in combination with an optimised granulator do the job much more effectively
- PolyCUT cutting technology: The unique Rapid PolyCUT technology, is a combination of knife cutting angle, cutting speed and sequential cutting. It provides a superior shredding solution for plastic materials. PolyCUT provides a sheer and smooth cut with low stress and therefore requires less motor power
- FlexiPUSH feeding system: The pneumatic FlexiPUSH-system is self-regulating-, efficiently absorbing vibrations and mechanical stress that occur in tough applications. The special hopper design allows material to be transported automatically into the rotor
- Robust gear box design: The GranuMATIC design contains no compromises. Its unique cutting technology together with a robust gearbox requires lower motor power for the job, minimising energy consumption
- Easy cleaning/access: The design puts handling in focus. Cleaning

> *Compared to a solution with a single large granulator for the job, the GranuMATIC in combination with an optimised granulator does the job much more effectively and with energy efficiency.*

Aberdare Cables, is an industry leading power cable manufacturer in Southern Africa. Aberdare specialises in manufacturing low and medium voltage electrical cables for application in power generation, transmission, distribution, rural electrification, rail, petrochemical, mining, ports, airports, wholesale, construction and domestic building environments.

the machine for new materials or colours is easy. Just remove a single plate, and you have instant access to the machine's interior

- Screenless operation: As the material is cut into uniform pieces, the GranuMATIC operates without a screen, although screens can be installed as an option when smaller chip sizes are desired
- Easy maintenance: The front opening makes it possible to access the heart of the machine fast and easily. All knives, rotating and fixed are easy accessible. The rotating knives are reversible and are of cassette type, simplifying maintenance.

It is estimated that annual gains/savings generated will be in the region of R 2 000 000 by recycling 75 % of the bleed generated.

Conclusion

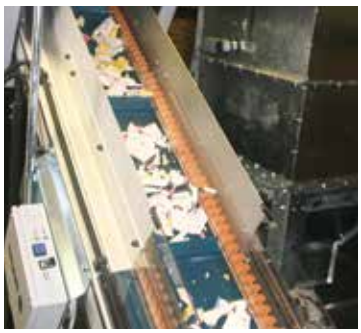
This granulator runs for 12 hours a day and is operated by one person and this covers material for both shifts of the factory. The energy consumption is efficient. Aberdare Cables offers cable design, product development, as well as installation support, commissioning and diagnostic testing through the company's Engineering Services business. In addition comprehensive value added services such as Key Account Management, Customer Relationship Management, product and application training, laboratory testing and a Technical Help desk is offered. With over 69 years' experience, Aberdare's focus remains on its people, customer relationships, cabling solutions, value added services, embracing innovation and technology and overall embodying high standards of quality.

Acknowledgement

Information marked with * is taken from the Intellectual Property of Rapid Sweden.

take note

- PVC is a significant component of manufacturing power cables.
- This company explored ways to reuse PVC scrap, rather than sell it.
- For this purpose a Swedish manufactured machine, designed exclusively for efficient recycling of polymer materials, was purchased.



Laurence Braithwaite has 25 years' service with Aberdare Cables and has had the pleasure and privilege of managing all three manufacturing sites of Aberdare Cables namely, Gauteng, Pietermaritzburg and Stanford Road. His current portfolio of managing Yield at Aberdare Cables ensures that the in-process allowances are managed for benefit to the customer and that scrap is significantly reduced during production. He holds the position of General Manager.
Enquiries: Email Jyoshtie Dhunes jdhunes@aberdare.co.za

Aberdare Cables earns ISO 50001 Certification

International manufacturer, **Aberdare Cables**, has scored well during a UK-backed Private Sector Energy Efficiency (PSEE) audit. This has led to the company's Port Elizabeth site becoming one of only a select few businesses countrywide to receive the highly-prized ISO 50000 certification for Energy Management Systems.

The certification was awarded based on the sites ability to provide conclusive evidence that it has an active Energy Management System that it utilises to reduce energy consumption toward its 10% target. The 48-million kilowatt hours that the business consumes yearly has a substantial financial and carbon-related impact and as such its three manufacturing operations (Port Elizabeth, Pietermaritzburg and Johannesburg) have worked continually since the mid 2000s on becoming more energy efficient. The Company will now role the certification out to their remaining manufacturing facilities.

Statistics from the National Business Initiative, which ran the PSEE programme, show that since its launch in 2014, about 940 medium-sized firms had been audited Nationally. Of this, 181 have completed or are busy implementing energy-saving directives outlined in the audit reports. Additionally, 37 large firms, spending more than R45 M on energy consumption annually, participated in PSEE programme.

Aberdare Cables plans to introduce green energy solutions, including concentrated solar and wind power for heat and electrical energy generation. These will however have to prove themselves as being truly sustainable before getting the green light.

Enquiries: Jyoshtie Dhunes.
Email jdhunes@aberdare.co.za

Toughest outdoor identification label

Brady has developed a top quality identification label that resists UV-light, weathering, fluids and abrasion for more than 10 years. The toughest outdoor identification label in the market to date keeps equipment, vehicles, components and facilities clearly identified for more than a decade.

Many outdoor identification solutions fade, shrink, crack or fall-off after a couple of years making them unreadable and therefore irrelevant. Brady's new, halogen free and ultra durable outdoor identification label remains attached and clearly legible for more than 10 years in tough outdoors conditions. The label is uniquely weather resistant and does not even need an overlaminate to protect its print. Clear and durable identification increases the efficient use of equipment, components, vehicles, tools and facilities, and it does not need frequent replacement.

Available in black print on a white surface, the toughest outdoor identification label is ideal to barcode and to identify solar panels, vehicles, equipment and facilities or exposed cables. Potential applications also include identification on signposts, on vending machines, rooftop air conditioning units, doors or outside stairwells.

In sectors with outdoor activities or products, like data/telecom, construction or electrical, the toughest outdoor label will increase efficiency through clear identification and communication on the spot. The toughest outdoor identification label can be printed at location using a quality thermal transfer benchtop or mobile printer from Brady. When coupled with labelling software, several barcode and serialisation options become available for on-site printing. Because the label is self-adhesive and does not require an overlaminate, it is easy to print and apply. Also called B-8591, the toughest outdoor weather resistant label is part of Brady's Workhorse Label Series.

Enquiries: Email emea_request@bradycorp.com

Never in the dark

Proof Engineering, specialist manufacturer and supplier of flameproof and explosion proof products, introduces a new range of energy saving, LED lighting solutions for hazardous tunneling and underground mining applications.

The country's protracted energy crises and resultant unreliable power supply not only affects equipment but can also put the safety of workers at risk. The new Azolite LED fluorescent lights have been specially designed with personnel safety in mind and offers two unique features that ensure long periods of continued lighting in the event of a power outage. The units have been fitted with an emergency back-up LED and a small charger which will continue to provide light for up to 12 hours to ensure the safe movement of underground personnel during power failures.

In addition, the light fitting has been manufactured from special material which glows for up to a remarkable eight hours after a power cut.

The Azolite range also includes a non-hazardous blue LED light which has the capability of shining through heavy dust, making it ideal for applications such as underground rescue bays.

Azolite was the first flameproof light available on the market that could be isolated safely while live in order to change fluorescent tubes. This rugged range of lights and lighting systems with flameproof, dust- and waterproof specifications meet all necessary local SANAS as well as ISO 9001 accreditation through BVQI.

Enquiries: Donovan Marks.
Tel. 27(0)11 271 0000
or email donovan@powermite.co.za

Maximised machine uptime

Powermite is a component, equipment and system specialist that leads the southern African market in the supply of a comprehensive range of high quality, locally manufactured electrical products suitable for an extensive array of mining and industrial machinery.

"Quality and reliability are prerequisite for extending the lifecycle of products operating in the notoriously stringent mining environment to optimise uptime and productivity," says Powermite Director, Donovan Marks. "Our range of electrical products manufactured locally by Proof Engineering and Ampco are ISO9001:2008 compliant. Both operations also respectively carry SABS approval to IEC60079 Part 1 and 2 and SANS 1489 – 2005, and to 60309 Parts 1 and 2. Marks adds that local manufacture ensures rapid product and spares availability, another vital element to maximising production levels.

Proof Engineering produces PLM366 and 415/515 plugs and sockets as well as an 11 kV 800 A tunnel coupler and adaptor for open cast applications. "We also have a 22 kV 400 A coupler for draglines and we recently extended our product offering even further with the launch of a new 35 kV 400 A coupler and adaptor for overhead line skids," adds Marks. An extensive series of plugs, sockets, couplers and adaptors, ranging from 120 A 1,1 kV to 400 A 12 kV, is also available from Proof for underground equipment.

Unique to the offering from Proof Engineering is the phase-to-phase segregation which eliminates the risk of phase-to phase-faults which, in addition to costly downtime, can cause serious injury to personnel. Another innovation from Proof Engineering is the unique ProAlloy coupler which is manufactured from non-theft material.

Ampco manufactures plugs and sockets suitable for certain underground operations as well as a product range that primarily focusses on industrial applications. Available from 16 A to 63 A, 200-230 V, 16 A to 125 A 380 V to 400 V and 16 A to 125 A 500 V to 525 V, these products are ideally suited for mobile generators, pumps, welding machines, factory installations, etc.

The Ampco range features a unique interlocking design which prevents the end user from removing the plug under load. Proof Engineering and Ampco are part of Powermite and all three operations are part of the Hudaco Group (a division of Hudaco).

Enquiries:

Tel. 27(0)11 271 0000 or email donovan@powermite.co.za

Medium Voltage Power cables you can trust

Aberdare Cables, a leading cable manufacturer since 1946, brings you medium voltage electric cable of the highest standard in quality, safety and reliability.

Paper insulated lead covered (PILC) cables and cross-linked polyethylene (XLPE) cables are used in many electrical distribution and reticulation applications including: • Municipal distribution • Mining (special construction with water blocking as well as flame retardency for shaft installations available) • Petrochemical industry • Wind farms

181A Barbara Road, Elandsfontein, Gauteng P.O. Box 1679, Edenvale, Gauteng 1610, South Africa
Tel +27 (0)11 396 8000 Fax +27 (0)11 396 8010 www.aberdare.co.za

A MEMBER OF SAFE HOUSE
Suppliers you can trust

altron power

ABERDARE CABLES

Driven by Powertech

No more inferior cable straps

Costly water-cooled power cables and coils used in furnace applications are vulnerable to corrosion and overheating if they are insufficiently clamped into place. Induction heating and foundry specialist ABP has eliminated these risks over the past two decades since using Band-It stainless steel strapping products on its power cable range.

Water-cooled power cables are used to transfer electricity and cooling water to the furnace, with considerable dynamic forces exerted on the cables by the flowing current. With high replacement costs, ABP Inductions general manager Byron McCall states that a high-quality clamp is essential to ensuring that the cables supplied to customers perform at optimal efficiency. "ABP cables are manufactured in Europe and locally. We supply and repair a fair amount per month for local operations. Each cable requires six clamps. As a result, we cannot afford to use an inferior clamp. Band-It's heat and corrosion-resistant, non-magnetic Stainless Steel Band and Buckle are ideal for packaging, securing and transporting the cables, which are protected from heat stress and water damage," he says.

Banding & ID Solutions Africa distributes and manufactures Band-It stainless steel strapping and buckles under license from USA-based Band-It-Idex, a world leader in quality engineered band clamping and fastening solutions. Business manager Rosa Remendos says: "The stainless steel clamping system is easy to install and remove, and creates a close-knit and tidy packaging. It is available in various sizes, making it suitable for cables of all diameters."

ABP recently built a coil for a sweet factory and used about 130 m of banding clamping to hold the coil in position.

Enquiries: Tel. 27(0)11 974 0425 or email rosa.remendos@banding.co.za

Faster automated cable identification

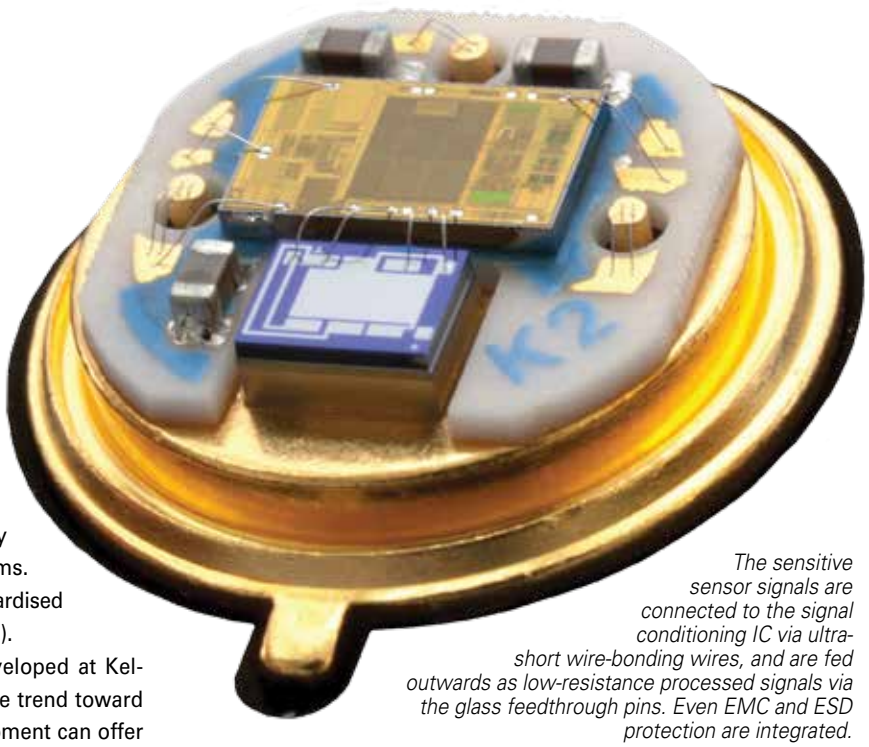
The Wrapto Wire ID Printer Applicator is a great tool to control manufacturing cost and enhance identification quality. In less than 5 seconds, the Wraptor prints and applies labels around wires and thus eliminates the need to print labels in advance and the time needed to apply them by hand. The Wraptor's technology enables 300 dpi prints for barcodes, logos and diagrams, and a tight label wrap around the wire, with minimal bubbling or wrinkling. Without any adjustments, the Wraptor can identify cables from 1,52 mm up to 15,24 mm in diameter and apply labels with varying widths up to 50,8 mm, and lengths between 19,05 mm and 76,20 mm. A versatile tool, the Wraptor can easily be transported to different workstations to identify a great variety of cables. Coupled with **Brady** LabelMark software for easy label design, barcoding and serialisation, the Wraptor becomes a highly practical process efficiency increaser, even more so when integrated with Schleuniger Cut and Strip Machines.

Enquiries: Brady. Email emea_request@bradycorp.com

OEM-transmitters: **All inclusive**

Daniel Hofer and Bernhard Vetterli, KELLER AG

The OEM transmitters discussed in this article are systems that can be described as 'embedded' in the best sense of the word – and in two different ways.



The sensitive sensor signals are connected to the signal conditioning IC via ultra-short wire-bonding wires, and are fed outwards as low-resistance processed signals via the glass feedthrough pins. Even EMC and ESD protection are integrated.

First, the sensor and the downstream electronics are embedded in the same housing and second, the transmitter capsules themselves are ideally suited for embedding in application-specific systems. Depending on requirements, the output signal is standardised and temperature-compensated (ratiometric or digital).

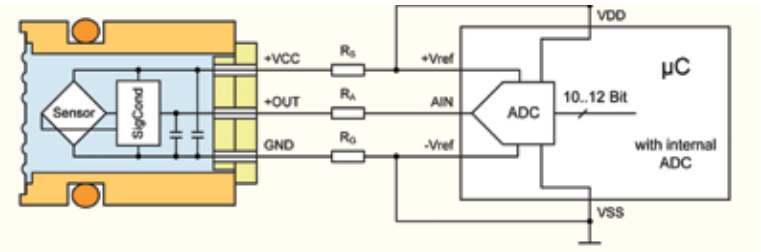
Thanks to the Chip-in-Oil (CiO) technology developed at Keller (referred to from this point as 'the company'), the trend toward sensor miniaturisation is now a reality. This development can offer impressive advantages: An extremely compact structural design, high resistance to electrical noise fields and high vibration resistance thanks to low mass and short conduction paths.

To put it clearly, CiO technology means that an Application-Specific Integrated Circuit (ASIC) is fitted directly next to the pressure sensor – in the same housing – to provide users with a whole range of beneficial functions. However, this does not make the pressure measurement capsule any larger. Its external dimensions remain the same. This transmitter concept is available in housings 4L ... 9L, starting from a diameter of 11 mm.

Sintered-in pressure-resistant glass lead-throughs feed the transmitter signals outwards. The internal wiring uses short, lightweight bonding wires – with the total exclusion of air in oil. First, this approach eliminates the need to connect filigree signal processing boards with multiwire cabling in the rest of the installation process for the pressure transducer. Second, there is no need to protect the downstream electronics against moisture and condensation.

Together with the high-grade steel housing, the glass lead-throughs act as feedthrough capacitors, forming a Faraday cage. This makes the CiO technology extremely resilient to electrical fields. Even field strengths of 250 V/m at frequencies of up to 4 GHz are unable to influence the measurement signal. The digital interface must be protected by the equipment manufacturer itself.

The ASIC is designed as a microcontroller with the corresponding peripherals, so the sensor signals can be registered with high resolution and dynamism. In addition to the process pressure as such, the temperature of the pressure sensor is measured and is used for mathematical temperature compensation when the signal is processed. OEM transmitters supply two output signals: A ratiometric analogue voltage output and a digital inter-integrated circuit interface (I2C).



Schematic structure of a C-line OEM transmitter, directly connected to a microcontroller with integrated analogue/digital converter. If care is taken to keep the line resistances low, no calibration is needed because the ADC and 'SigCond' are referenced to one another.

A/D – Analogue/Digital
AD/DA – Analogue Digital/ Digital Analogue
ADC – Analogue-to-Digital Converter
ASIC – Application-Specific Integrated Circuit
CiO – Chip in Oil
EMC – Electro Magnetic Compatibility
ESD – Electrostatic Discharge
I/O – Input/Output
OEM – Original Equipment Manufacturer

Abbreviations/Acronyms

Ratiometric output signal

The secret of the ratiometric format of the output signal is that it actually has no format at all, because it depends on the voltage supplied. This is an inestimable advantage for applications in integrated systems. If the analogue-to-digital converter downstream of the transmitter is operated with the same supply voltage, the digital measured value will always be correct.

This is because the height of the digitisation steps depends on the voltage supply, but the number of steps does not – and their number is the critical factor. Using ratiometric signals substantially reduces the outlay on passing signals from the pressure transmitter to the A/D converter in the downstream electronics, and calibration steps are unnecessary; in the specific case of connection to a microcontroller with an integrated A/D converter, this outlay equals zero.

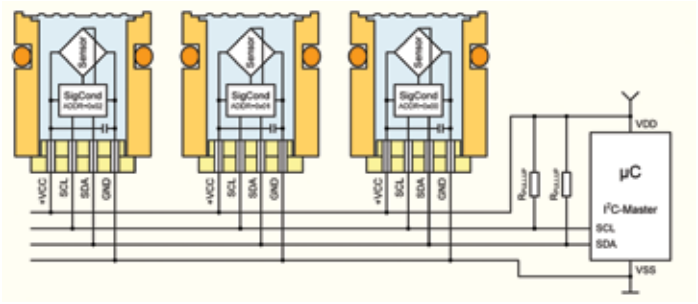
Nevertheless, an interval is specified for the output signal, i.e. 0,5 ... 4,5 V for a supply voltage of 5,0 V. With a stable and precise supply voltage, this interval can also be used directly as the 'standard signal'. The sampling rate of 2 kHz offers amazingly good dynamic scope for a product based on the AD/DA principle. Moreover, the embedded electronics in CiO technology provide constant protection against overvoltage and polarity reversal on all lines up to ±33 Vdc.

Chip-in-Oil technology means that an Application-Specific Integrated Circuit is fitted directly next to the pressure sensor in the same housing to provide users with a range of beneficial functions.

Embedded interface I2C

OEM transmitters that are the same size as pressure measurement capsules are never connected directly to field bus systems. Instead, the respective coupling modules have corresponding input interfaces, e.g. for the inter-integrated circuit or I2C interface. For years, this has been the serial standard to cope with short distances in embedded systems. The I2C master needs two lines for the serial data and the pulse (clock) for synchronous sampling. Consequently, no timing requirements are specified for the master – which, in fact, determines the timing.

Each OEM transmitter has its own address, which is addressed by the I2C master. In the existing configuration, one master could manage 128 different addresses. The pressure and temperature values are registered by means of a request from the master, and are then available at the transmitters (slaves) after less than 4 ms, so that they can be clocked out according to a specified protocol. The values are temperature-compensated and temperature-standardised, and they only need to be scaled from the 15-bit integer to a pressure and temperature with units.



Schematic structure of a mini-network of D-line OEM transmitters with the I2C interface. Two free digital tri-state I/O lines are the only requirement for the microcontroller, which freely determines the timing in its capacity as master.

Mobile application

Unlike the CiO version with a ratiometric output, CiO versions with a I2C output can also operate with a voltage supply of only 1,8...3,6 Vdc, so they are excellently prepared for mobile battery-powered applications. In this case, however, features also include the short conversion time of less than 4 ms (during which a mere 1,5 mA is drawn) and the excellently optimised Sleep mode. Unless they are polled, the transmitters remain in this mode, which is typically specified as 0,1 µA. If the master allows suitably fast communication, 250 samples per second can therefore be attained.

OEM transmitters for everyone

Typical key data vary according to the format of the output signal – ratiometric or digital. With an analogue output, the transmitter can be used at temperatures of between - 40°C and +150°C, whereas the I2C output is subject to an upper limit of 110°C. The pressure range for the analogue version extends from 1 bar to 1 000 bar; for the digital version, the range is from 1 bar to 200 bar. For a greater dynamic scope with increased power consumption up to a

- Chip-in-Oil (CiO) technology sees an ASIC fitted right into the oil-filled pressure sensor.
- CiO technology ensures immunity to electromagnetic interference.
- Integrating the ASIC into the cell makes linearisation, parameterisation and temperature compensation that much better.

take note

maximum of 8 mA, the analogue version should be chosen. For low voltage and low power applications, the digital version (which also supplies the temperature information) is recommended.

Conclusion

The company's C-series OEM transmitters herald a new chapter in the history of high-integration pressure measurement technology. The CiO concept moves signal processing directly into the protective oil-filled pressure measurement capsule housing, made of stainless steel. Linearisation, temperature compensation and parameterisation are handled here. For integration into higher-level systems or battery-powered devices, versions are available with a ratiometric voltage output or with a serial-digital I2C interface. Various structural designs can be supplied depending on the specific application.

Daniel Hofer and Bernhard Vetterli, both have diplomas in Electrical Engineering, and are product developers at KELLER AG, Switzerland – manufacturer of measuring technology such as isolated pressure transducers and transmitters.
Enquiries: Email Enquiries: Instrotech. Tel. 010 595 1831 or email sales@instrotech.co.za
d.hofer@keller-druck.com
b.vetterli@keller-druck.com

Easy, reliable rotational speed evaluation systems

ifm electronic's new rotational speed evaluation systems DD0203 and DD0296 supply the basic functions of rotational speed monitoring and standstill detection by means of external pulse pick-up. All settings are intuitive via four potentiometers:The rotational speed is set using a logarithmic scale, multiplier x1 / x 100 and output function, start-up delay and hysteresis. Featuring one semiconductor output and one relay output functions of which can be set in case of under speed or over speed. Four LEDs indicate the switching and operating states. The integrated wide-range power supply which can be supplied with direct or alternating voltage guarantees high flexibility. The monitors supply 24 Vdc output power to the connected sensors. They are small in design with plug-in screw terminals to simplify installation.

Enquiries: +27(0)12 450 0400 or email info.za@ifm.com

Dual channel sensor – enhanced performance

The Q4X laser distance sensor from **RET Automation Controls** is now available with dual discrete outputs and IO-Link configuration. Dual discrete outputs enable the Q4X to solve challenging high/low monitoring fill level or dancer arms applications, while IO-Link allows for remote configuration, sensor backup and easier preventative maintenance. The new Q4X dual channel sensor offers enhanced performance features, including window size and offset control for easier setup of difficult applications, totaliser to reduce PLC programming for high speed counting and pulse frequency modulation (PFM) output as an alternative to an analogue output. Additionally, the IO-Link point-to-point serial communication protocol allows complete remote accessibility to device and event data and more precise, digital data transmission. "We are continually striving to enhance the Q4X sensor to ensure our customers are equipped with a powerful solution for their most difficult distance-based sensing applications," said Brad Ragozzino,Technical Marketing Engineer, Banner Engineering. "The added capabilities of dual discrete outputs and IO-Link enable our customers to solve even more applications with just one single sensor, making it the ultimate problem solver." With the capability to detect height changes as small as 0,5 mm and sense up to 300 mm, the Q4X can solve distance-based applications regardless of target surface reflectivity, including black foam on black plastic, black rubber in front of metal, multicolour packaging and targets of all colours. It is also optimal for clear object detection and error-proofing applications.

Enquiries: RET Automation Controls. Brandon Topham. Email brandon.topham@retautomation.com

Safety light curtains optimised for vibration

Leuze MLC 500-V Series safety light curtains have been optimised specifically for applications subject to strong vibrations, such as for safe-guarding presses, punching machines and similar large equipment.

These reliable safety light curtains have unusually slim dimensions of only 29 mm by 35 mm, but clever engineering has ensured slightly set back front screens, reinforced side walls and metal end caps, all of which result in a sturdy construction.

In addition, the new vibration-resistant Leuze MLC 500-V models were designed to provide extra protection for the high quality electronics.

The safety light curtains are mounted on specially developed BT-2SB10-S swivel mount brackets that are largely able to compensate for excess vibration.

This is an important feature with long light curtains, typically longer than 900 mm. Shorter light curtains can be simply and conveniently mounted on machinery such as presses using adjustable vibration-damped BT-2R1-S swivel brackets.

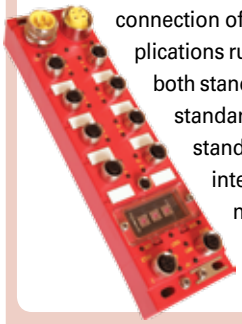
Form fitting mounting is possible due to removable swivel mount cylinders and this means that there is no dead space into which unpermitted access would be possible. With the extended functionality of these V-models, the user has access to functions that can be adjusted without a PC.

These include three scan modes and fixed and floating blanking. This simplifies and speeds up the in-feed of the work pieces and contributes to more efficient production, since there is no interruption to the manufacturing process.

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

Connecting industrial safety controllers

Molex, LLC has introduced Brad HarshIO Ethernet modules to provide a reliable solution for connecting industrial safety controllers to sensors and actuators in harsh duty environments. Machine mountable in an IP67 rated housing, Brad HarshIO modules are ideally suited for industrial applications where liquids, dust or vibration may be present, and have been tested to withstand shock, high-vibration and high temperatures.The Brad HarshIO modules are designed for safety applications, up SIL3 (Safety Integrity Level 3), Cat4/PIe, where communication over EtherNet/IP is needed to exchange safety and standard control data and diagnostics information over a single Ethernet network.



The compact modules offer 12 safe inputs and four safe outputs, supporting connection of single and dual channel safety devices - ideal for automotive applications running robots in cells.The digital inputs and outputs can connect to both standard and safety rated sensors and utilises test pulses for connected standard outputs to perform diagnostics on panel lamps, buzzers and standard actuators. An overmoulded on-board memory key, available internally or M8, stores the configuration allowing module replacement in a minute without any special tools or re-commissioning.

Enquiries: Yoshiko Helena Eping. Email yoshiko.eping@molex.com

World-class long range sensing capability

Banner Engineering has introduced its DF-G3 discrete long-range fibre amplifier with dual digital displays for use with plastic and glass fibre optic assemblies. Featuring increased sensing power, the DF-G3 can sense more than three metres with opposed mode fibres or more than one metre with diffuse mode fibres. The extra power provides increased detection reliability for dark targets at long range and enhanced detection sensitivity when using specialty fibre assemblies for large area and small part detection applications.

The DF-G3 is available with a single discrete output or two dual discrete outputs. The dual discrete outputs can be independently taught to trigger at different intensity values, which is ideal for correct part-in-place or error-proofing, bottle down, and edge guiding applications.

"We developed the DF-G3 fibre amplifier to meet our customers' need to precisely detect smaller targets at longer ranges" said Dennis Smith, Senior Marketing Manager, Banner Engineering. "With increased sensing power, the DF-G3 will solve difficult detection challenges in printing, packaging, and electronic assembly markets around the world."

Users can also set up the sensor remotely via a multi-function input wire which can be configured to control the LED, gate the amplifier's output, remote teach the amplifier, or set up a robust cross-talk avoidance ring with up to seven amplifiers to solve dense sensing point applications. The DF-G3 offers a simple interface to ensure easy set-up and programming via displays and switches. The easy-to-read dual digital displays show both signal level and threshold simultaneously.

Enquiries: Brandon Topham. RET Automation Controls. Email brandon.topham@retautomation.com

Gewiss 90 DIN Range

GEWISS's protection system comprises products which have synergy and perfect integration among each other, such as the innovative 90 ReStart range (automatic reclosing devices), the 90 MCB and 90 RCD ranges (modular circuit breaker for circuit and residual current protection) and the 47 CVX range (metal distribution boards). The advantages of GEWISS systems are several, practical compatibility of homogenous products, simple and quick planning, installation and maintenance of the system, as well as modern and stylish designs. 90 ReStart devices restore power supply quickly from automatic circuit breaker trips, but only after checking the system status. In addition, the Autotest function periodically tests the functioning of the residual current circuit breaker protection without disconnecting the system from the power supply. The range includes two pole and four pole versions. The 90 miniature circuit breaker (MCB) range is made up of three types:

- MTC - Compact miniature circuit breakers, from 2 to 32 A in B and C curve and breaking capacity up to 10 kA
- MT - Traditional miniature circuit breakers, from 1 to 63 A in B, C and D curve and breaking capacity up to 25 kA
- MTHP - High performance miniature circuit breakers, from 20 to 125 A in C and D curve and breaking capacity up to 25 kA

The 90 RCD range includes the MDC monobloc compact residual current circuit breaker with overcurrent protection, the BD and BDHP add-on modular residual current devices for MT and MTHP miniature circuit breakers and the SD residual current circuit breaker.

The 90 AM range consists of auxiliaries for circuit breakers and many modular accessories for protection, command, programming, measurement and signalling in electric systems. The LST surge protection range guarantees excellent protection of loads and power distribution systems. The 47 CVX range of Distribution Boards are available in both modular and monobloc systems from 160 A to 3 200 A.

Enquiries: ACDC Dynamics. Nelen Govender. Tel. 27 010 202 3300 or email neleng@acdc.co.za

More protection for temperature sensors

Aggressive media, high pressures and flow velocity make the use of thermowells necessary. Thermowells protect temperature sensors from such influences and make it possible to replace sensors during the running process. **ifm electronic's** thermowells are sized for all common process connections with installations depths 30 mm to 330 mm. The thermowells simplify sensor calibration without process interruption. They are suitable for all temperature probes with a diameter of 6 mm. With a robust design the sensors are protected in harsh applications.

Enquiries: Tel. +27(0)12 450 0400 or email info.za@ifm.com

Fit-for-purpose optical sensing solutions

The ability to accurately measure over both short and long distances is critical in sensing applications. Leuze has leveraged technology to enable customers to achieve this no matter the parameters. Two types of Leuze Optical Distance Sensors are available – one using laser or LED light and the other using ultrasonic technology.

Compact sensor Leuze ODSL 8, is in a compact metal housing and supplies reflection-independent distance information.

The Leuze PDSL 9 sensor enables accurate measurement even under difficult conditions including glossy objects. Its integrated display shows the measurement values and facilitates easy adjustment of the sensor. This sensor offers greater flexibility as it can be used in combination with digital interfaces.

Suitable for large measuring distances, from 60 mm to 25 000 mm, the Leuze ODS 96B optical distance sensor is extremely robust. Adjustment and configuration is simple done using its integral key pad. The sensor can operate in fast, standard or precision mode.

Achieving maximum precision at long distances can be done using the Leuze ODSL 30 sensor which has a measurement range up to 30 metres, and in applications with bright objects as far as 65 metres away. With a sensing resolution of 1 mm, the unit is capable of highly accurate measurements over the complete range.

Ultrasonic technology is most advantageous where there is limited light and using Leuze Ultrasonic Distance Sensors it is possible to reliably detect even partially or completely transparent objects. Measurements can also be done in dusty, hazy or humid environments.

The Leuze 418 Series sensor is best for short range applications and its small cylindrical metal housing makes it suitable for use in adverse conditions. It is possible to synchronise up to 10 sensors on one cable. More compact in design, the Leuze 430 Series sensors is ideal for detecting levels in liquids and bulk material. High accuracy is possible through temperature compensation. Leuze Optical Distance Sensors are available from **Countapulse Controls**, the official distributor for these German-engineered sensors.

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

Practical approach to designing **cost efficient** transformers

David S. Roesser, Cargill

A Total Cost of Ownership (TCO) perspective between mineral oil and Envirotemp FR3 fluid filled transformers.

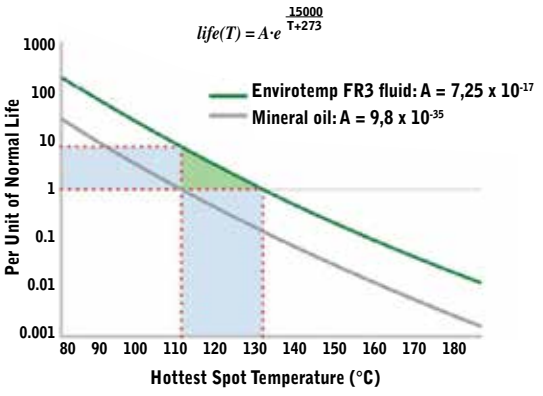
As electric utilities seek ways to add value to their shareholder base and increase efficiencies internally, taking a total cost of ownership perspective versus an initial cost only could create potential to gain more cost and resource savings across the organisation. One such opportunity is looking at existing transformer fleets – everything from how they are initially designed to extending asset life... as well as resources needed to operate and maintain the existing fleet.

For electric utilities potentially dissatisfied with the current mineral oil-filled transformers, better transformer solutions are available. High temperature transformer insulation systems, comprising solid cellulose and liquid FR3 fluid insulations, offer increased loading capability, extended insulation life, improved fire safety and reduced maintenance cycles.

Optimising transformer design, increasing fire safety, extending asset life and reducing maintenance costs are key considerations in a total cost of ownership perspective.

High temperature standards create design opportunities for cost efficiencies

Transformer designs are constrained by the thermal class of the solid insulation system. The thermal class of Kraft paper impregnated with mineral oil is 105, while the thermal class of thermally upgraded Kraft paper impregnated with mineral oil is 120. International standards guiding the design of mineral oil-filled transformers throughout industry have subsequently been written to accommodate a 95°C or 110°C hot spot, with 55°C or 65°C Average Winding Rise (AWR), for cellulose and TUK, respectively, to achieve transformer unit life expectancy (defined as 20,55 years by the IEEE loading guide IEEE C57.91).



High temperature capability of FR3 fluid compared with mineral oil.

> *With the additional fire safety and environmental benefits of FR3 fluid, electric utilities could achieve broader organisational savings beyond the initial cost of the transformer.*

Since thermal class of insulation systems is directly linked to design constraints and operating conditions, the recent advancements in high temperature insulation systems, along with the publishing of IEEE standard C57.154 (and the equivalent IEC standard 60076-14) are helping global transformer designers and users alike understand how to design new transformers and implement solutions that are more cost efficient with higher performance capabilities. Kraft and TUK

take note

- The choice of dielectric fluid is important in a transformer.
- The dielectric fluid provides both electrical insulation and cooling.
- New insulating fluids may permit transformers to operate at high loadings more safely.

Abbreviations/Acronyms

AWR	– Average Winding Rise
EPA	– Environmental Protection Agency
FM	– Factory Mutual
OEM	– Original Equipment Manufacturer
SPCC	– Spill, Prevention, Control, Countermeasure
TCO	– Total Cost of Ownership
UL	– Underwriters Laboratory

paper when impregnated with FR3 fluid are now thermal class 120 and 140 respectively.

This new capability enables the design of transformers requiring 'less cooling'. These designs use less fluid and construction materials while delivering the same or increased load capacity and it works for both power and distribution transformers.

Example: Gaining design cost efficiencies with high temperature insulation system

Designing a transformer is a balancing act between optimising the design constraints such as short circuit strength, total losses, temperature rise, and noise level with the ability to minimise the overall transformer cost.

A study, conducted by Cargill, Incorporated, which compared a 100 MVA, 230 kV - 69 kV transformer designed with mineral oil against the same transformer designed with high temperature insulation found the following:

- Moving incrementally from 110°C hottest spot to 120°C hottest spot resulted in near cost parity when comparing the Envirotemp FR3 fluid filled transformer to the traditional mineral oil-filled transformer, while providing increased overloading capability, extended asset life
- When comparing an FR3 fluid filled transformer optimised for 130°C hottest spot temperature compared to the mineral oil transformer designed for 110°C hottest spot temperature, the mineral oil transformer was more costly to produce than an FR3 fluid filled transformer, while still maintaining similar losses and life expectancy
- The mineral oil transformer weighed 8,5% more than the FR3 fluid transformer
- The mineral oil transformer contained 9% more liquid than the FR3 fluid transformer
- The mineral oil transformer contained 13,5% more copper by weight than the FR3 fluid transformer

Beyond the initial transformer design, OEMs and customers should consider all construction costs associated with a new substation. With more efficient designs taking advantage of the high temperature capability, there could be a quicker construction cycle and less costly freight to site.

Improved fire safety reduces organisational risk

Because of its 360°C fire point (compared to the 160°C fire point of mineral oil), the risk of a transformer fire is significantly reduced, making it a safer solution.

Since its introduction, there has not been a reported fire in an FR3 fluid-filled transformer If a fire were to occur, FR3 fluid is self-extinguishing reducing the risk of pool fires and limiting damage to the transformer and surrounding property FR3 fluid is rated as a K-Class fluid by UL and FM Global potentially enabling utilities to eliminate fire walls and place transformers closer to buildings which are critical in space constrained environments.

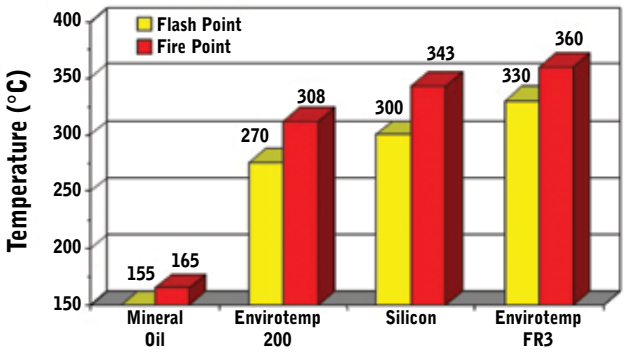


Figure 1: Comparison of fire and flash point of dielectric fluids.

With the less-flammable fluid rating, the need for expensive deluge systems may be significantly reduced.

Protecting insulation system extends asset life and reduces replacement cycles

Commonly regarded as the 'weak link' in the expected life of the transformer, the aging of the insulating paper (predominantly made of cellulose – Kraft paper – and, in some cases, incorporating additional chemical treatment to become thermally upgraded) is directly impacted by its interaction with the insulating liquid and the operating temperature of the transformer.

Cargill ageing studies of cellulose and FR3 fluid provided interesting observations compared to the same studies in mineral oil. Cellulose was observed to last from five to eight times longer when impregnated with FR3 fluid than when impregnated with petroleum based mineral oil.

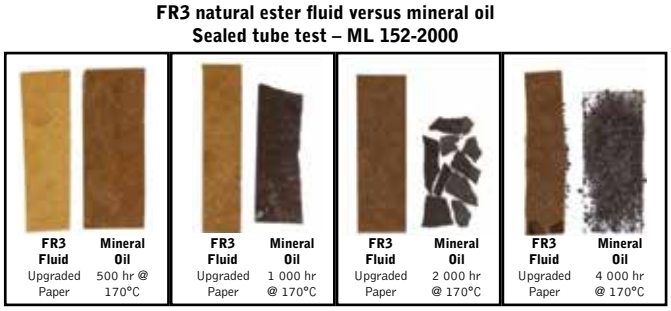


Figure 2: Thermally upgraded papers aged in FR fluid and mineral oil for varying times at 170°C.

Cargill research cellulose aged more slowly with FR3 fluid whereas cellulose in mineral oil ages rapidly, particularly at higher temperatures.

Ageing of the insulation paper is the number one factor that determines the life of a transformer. By using FR3-fluid filled transformers, the ageing of the insulation system is slowed thus potentially reducing replacement cycles.

Reduce maintenance costs, simplify spill remediation

Condition based maintenance is becoming the norm for the transformer industry. Reprocessing, dehydrating, and reclaiming mineral oil are normally occurring events during the life of a transformer. FR3 fluid is self-drying (due to chemical process of hydrolysis) so therefore the expense and time of dehydrating the fluid could be less. And, since (as noted earlier) expensive fire mitigation deluge systems may be significantly reduced, the costs of maintaining those reduced systems would be reduced as well.

Finally, FR3 fluid has inherent environmental benefits that can also impact spill containment and spill remediation costs. FR3 fluid is made from renewable vegetable oil and is non-toxic and non-hazardous in soil and water. Furthermore, it is ultimately biodegradable (equivalent to greater than 99% biodegradable) meaning it will biodegrade in less than 28 days.

There are two important characteristics of FR3 fluid as it relates to spill containment. First, because of the physical properties of FR3 fluid (more viscous), it does not reach ground water as quickly as mineral oil, if at all and will not leave a sheen on the water. Second, because of its environmental characteristics, simplified containment may be possible.

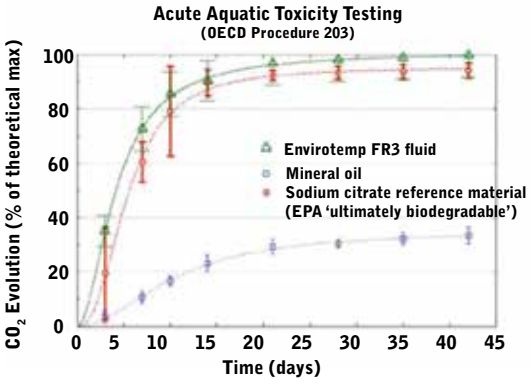


Figure 3: Aerobic aquatic biodegradation EPA Test OPTS 835.3100.

Remediation, the process used to repair the environment to pre-event condition, often requires excavating and disposing of contaminated soil, replacing it with 'clean soil' and then replanting indigenous plants. Mineral oil spills often require full remediation as it is not biodegradable and is toxic to the environment. In the case of FR3 fluid spills, an equally effective remediation plan may permit the use of bioremediation in lieu of the more common (and expensive) mineral oil process.

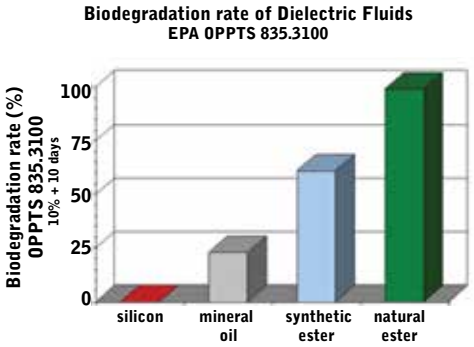


Figure 4: Acute Aquatic Toxicity Testing comparing FR3 fluid and mineral oil, OECD Procedure 203.

Consistent with EPA recommendations, Cargill recommends using bioremediation to remediate ground spills of FR3 fluid. To accelerate the process, Cargill advocates adding biomass consuming microorganisms to the site by spreading active yeast over a spill site and adding water to activate the yeast. The yeast will consume the FR3 fluid, thereby effectively removing it from the environment, achieving the same result as the traditional mineral oil remediation process, but at substantially less cost.

(Refer to local state spill remediation regulations as well as the US EPA's Spill Prevention, Control, and Countermeasure (SPCC) regulations for specific requirements for ground spill situation).

Conclusion

Utilities are seeking ways to improve grid reliability, optimise transformer performance to handle loads appropriately and realise real cost savings. Cargill's cost comparison study highlights specific cost reductions that could be achieved with FR3 fluid and high temperature insulation system. This technology provides substantial opportunity to all electrical equipment customers to use these enhanced capabilities to their advantage.

With the additional fire safety and environmental benefits of FR3 fluid, electric utilities could achieve broader organisational savings beyond the initial cost of the transformer.

Transformer design parameters are dependent on individual specifications, utility practices, conditions in which a transformer will be used and applicable laws, regulations and codes. The study described herein outlines potential cost savings identified by Cargill that users of FR3 fluid could realise. However, results will vary and Cargill makes no representations or warranties whether express or implied, with respect to use of the information included herein or any cost savings users may or may not realise.

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Note

The views expressed in this document are based on Cargill's extensive testing of FR3 fluid and third party validation as of the publication date. There is no guarantee that test results and/or third party standards will not change.

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In Conversation With

Peter Middleton

Warwick Jackson

Following the successful deployment of seven modular 'buildings' for the electrical infrastructure at the Kolomela mine, Efficient Engineering has pioneered the offsite construction, assembly, testing and commissioning of complete modular plants similar to these, which include the containment structures and all functional equipment. Crown Publications editor, Peter Middleton, talks to Warwick Jackson, now the managing director of Efficient Power and the inspiration behind this new approach.

How did you come up with the 'modular buildings' idea?

The idea underpinning large integrated modular plants arose while Warwick Jackson was the lead electrical engineer for Anglo American – Kumba Iron Ore – SSP on the development of its operations in the Northern Cape. He had been told that it was not feasible to build large substations offsite, because they could not fit into standard ISO shipping containers, making delivery impossible.

"After the meeting, I happened to be driving behind a Komatsu 960 haul truck. At 11,6 m wide, I realised that products five times wider than conventional ISO containers were being routinely delivered to sites all over Africa," Jackson says.

On discussing his observation with his switchgear colleagues, Jackson was advised to talk to Efficient Engineering. "Johan Basson, who ran RBF at that time, now JB Switchgear, recommended Efficient, which, he said, was not afraid of size," he recalls.

"That is where my relationship with Efficient began. I met Tony Cimato, the then owner, who showed us how the company made large buildings, control rooms and huge shell structures to house equipment: for shiploaders, e-houses, and reclaimers, for example," he adds.

For Kolomela, Efficient Engineering was willing to build the shells for the substations, Motor Control Centres (MCCs) and Control and Instrumentation (C&I) rooms as single integrated modules, and fully equip them offsite. "So my staff and I were given an office here at Efficient, where we collaborated to build exactly what we needed for Kolomela. It was a fantastic way of working," Jackson says.

What was needed for Kolomela?

The result was the development of seven 'buildings' that met the project requirements for the entire electrical infrastructure needed at Kolomela: For the primary, secondary and tertiary crushers, the run-of-mine conveyor; the product screen, the load out station and the dewatering pump station.

"It was an amazing success. The modular plants arrived on site 100% commissioned. Our slogan was from *motor to mouse*. Only once everything was signed off at Efficient Engineering, did we arrange delivery to site. Once there, we connected the power cables and everything worked," he says.

Were you able to remain within your budget?

On the Kolomela project, Anglo had a R500 M budget for the electrical and C&I infrastructure. For the seven substations, the building budget was R11 M. "By taking the offsite modular approach, the shell structures cost close to R15 M, but by the time we had completed the installation, we had under-spent our R500 M electrical budget by R83 M," Jackson says. So by agreeing to spend R4 M extra on the offsite modular construction approach, R79 M was saved.

The main reason? "The provisional and general budget virtually disappeared, because all the work was done offsite. Very few contactors had to be paid for travel, accommodation or material shipping costs to the site. In addition, the contingency budget went unspent, because there were no unexpected additional costs due to onsite issues.

"And the knock on savings were outrageous. We closed a site with running costs of R150 M per month five months early. As a result, 1,4-million tons of ore were put through the mine before it was due to open – and the capital expenditure for the development of Kolomela, which was about R8,4 billion, was paid off in 24 months," Jackson reveals.

From electrical to mechanical plant?

Pit dewatering at Kolomela is achieved via 16 boreholes that lower the surrounding water table. "The water is fed into an eight-million litre water tank and it is then pumped 18 km as potable water to Beeshoek, into the Vaal Gamagara municipal intake at up to 1 500 m^3/h.

"While the mine had moved towards offsite modular designs with respect to its substations and MCCs, the pump house itself experienced civil delays. We had a fully functional MCC control room and all of the medium-voltage infrastructure onsite and operational, but the pump station building hadn't been completed. So, while massively successful on the electrical side, we were still being hampered by delays on the civil and mechanical side," Jackson says, adding, "the budget for the pump station building was originally in the order of R1,8 M, but it ended up costing well north of R4 M – and it was more than eight months late."

"Onsite construction of plant at remote mines is such an onerous thing. A project can be hampered by continuous delays, due to late deliveries of inputs, the wrong people being sent to site and a host of safety and security restrictions that make rapid progress impossible," he explains.

Have there been similar projects?

Following the success of Kolomela on the electrical side, therefore, when another pump station project emerged, Jackson, with Kevin Hundley who was with Aurecon at that time, began to explore a similar approach. The mining pit at Sishen, which is one of the largest open cast pits in the world, is becoming deeper, so an ad-

ditional dewatering pump station is required. Similar to the Kolomela pump station, an additional 1 800 m³/h station with a modest 40 m head was proposed. At Sishen, water from the pit is pumped into a reservoir and then gravity fed into the Vaal Gamagara system.

"To accommodate pumps, however, we knew that we needed big concrete blocks to cater for the 35 t of trust and the vibration issues. But we remained convinced that pump stations could also be built using the offsite modular approach," says Jackson. "And if it were possible to house and equip a pump station building offsite, we would change the execution strategy completely, from an on-site nightmare to a plug-and-pay dream," he adds.

"Along with people such as Stephan Kleynhans from Aurecon and his specialised team, we identified the issues, went back to first principles, did the calculations and designed a structure. We determined that, if we mounted the pump station module on a 3,0 t concrete plinth and included vibration dampers for decoupling, then an entire pump station could be delivered as a module in a large custom built container," Jackson explains.

As an additional benefit, the 'building' becomes structurally sound and dynamically optimised, purpose-designed to best suit the equipment it houses. The only site-based construction requirements are the concrete plinth and, for a pump station, some key thrust points designed to transfer loads through the appropriate beams.

Describe some of the features of the pump station?

This solution was completed late last year and delivered to site during the last week of November. Jackson describes some of its features.

"Built into the housing structure is an overhead crane, enable installation and servicing of the heavy pumps and piping systems. So the steel frame of the building had to accommodate the lifting loads. Shuttering formwork and a steel reinforcement cage were incorporated below each pump, so that once the pump station was delivered to site and placed on its plinth, the shuttering could be lowered to the floor to enable the void below the pump to be mass filled with concrete. This creates the base support needed to transfer the thrust. So the steel building incorporates its own concrete former. Rag bolts are included to allow for adjustments and should the mine wish to move the pump station to a new location, the entire module can be disconnected from its suction and discharge flanges, lifted off the plinth and moved to a new one'.

… and the hydraulic lifting system?

To further facilitate delivery and installation, Efficient has developed a highly innovative hydraulic lifting system. "Because of the costs and logistical issues associated with cranage on remote mining sites, we have developed an amazing hydraulic jacking system to make loading, unloading and installation simple and delay-free. Typically, to accommodate safety and reach issues, an oversized crane would be needed to load and unload a module of this size."

According to Jackson, the hire of a 700 t crane can cost up to R1,4 M plus R11 000 per hour thereafter. "With our system, we typically budget around R150 000 to deploy and lift a module into place," he estimates.

Initially based on a telescopic jacking system with hydraulic rams, an Efficient shop floor foreman came up with the idea of a vertical lift system based on a forklift mechanism. "So we went to a forklift specialist, who designed a system based on six synchronised forklifts running off a central hydraulic power pack. The 'jacks' are bolted onto the module, and each can lift 20 t, giving a total safe lifting capability of 120 t," Jackson explains. Once attached, the lifting system raises the module to allow a trailer to be reversed underneath. Then it is lowered onto the trailer for delivery to site. The lifting jacks are removed and packed for immediate use when the truck arrives on site. "There, the entire pump station module is lifted off the trailer, the truck can be driven away from underneath it and the module lowered directly onto its plinth," Jackson reveals.

The complete pump station, which was fully tested and commissioned on the factory floor of Efficient Engineering's Tunney premises, was delivered to the Sishen site and then deployed and anchored to the plinth in only three days. "The concrete bases underneath the pumps will be poured early next year and, after a few days of curing, this pump station will be fully operational," he adds.

The off-site modular approach… ideal for remote areas?

As well as for electrical substations and mechanical pump stations, the offsite modular approach to the construction of plant, according to Jackson, is ideal for any large, complex equipment systems that operate in remote or difficult environments. In particular, he cites mini hydro plants; telecommunication centres; dust scrubbers for pollution control; lubrication systems for a crusher plants, with oil purification and cooling/heating systems to protect the assets; and geotechnical laboratories, with robots and automation equipment that is difficult to commission in a remote environment.

Significant savings accrue by changing the project execution strategy: "A brick-built building requires that everyone, including the equipment installers, have to drive to site and install the equipment. They will all bill the project for the additional travelling, accommodation and inconvenience. These costs can easily amount to 30% of total project costs.

"Efficient Power manufactures properly designed plant buildings that use advanced materials such as our South African-Developed 3CR12 stainless steel. They are equipped with the best equipment, from companies such as KSB and ABB. Yet the cost deviation by taking an offsite approach is dramatic!" Jackson concludes.

New generation Ex isolated barriers and Ex analogue signal isolators

Turck, supplied locally by **RET Automation Controls**, has released the IMX12 device series, a new generation of Ex isolated barriers and Ex analogue signal isolators. With its compact and slim 12,5 mm housing, the device series offers maximum signal density. This now enables 2-channel temperature measuring amplifiers in 4-wire PT100 circuits to be implemented via up to four 2-pole terminals – each on the Ex and non-Ex side. Besides the signal density, the IMX12 devices stand out on account of their speed, accuracy and flexibility.

The IMX12-DI isolating switching amplifier offers maximum values in terms of speed. Even input frequencies, which were previously the reserve of special frequency transducers, can be transferred reliably. With up to 15 000 Hz, measured values can be optimally resolved and allow precise measuring without the negative effect of a signal conversion.

The developers have given special consideration to the increased requirements with regard to precision: The new electronic design enables the effects of factors such as temperature or voltage fluctuations to be reduced on the IMX12-AI Ex analogue signal isolator. The effect of the interface device on the overall performance of a complete measuring circuit is thus considerably less than usual.

The devices of the IMX12 series can be used seamlessly in a range from 10 to 30 Vdc. This opens up new possibilities, for example, with a battery or PV current supply.

Enquiries: Brandon Topham. Email brandon.topham@retautomation.com

Early warning signs

BMG offers the full portfolio of SPM condition monitoring equipment, from basic hand held instruments, to high level on-line systems. Included in this range is the entry level VibChecker portable instrument, designed for reliable on-site vibration measurement and assessment.

"The VibChecker requires minimal operator training and supports BMG's BearingChecker which is used to accurately assess the condition of rolling element bearings during operation in equipment like motors, fans, pumps and gearboxes," says Carlo Beukes, General Manager: Drives Belts & Ironware divisions, BMG – Bearing Man Group. "The VibChecker gives early warning signs of developing machine problems in order to prevent premature replacement of machine parts. Vibration monitoring is the most widely used preventative maintenance technique for the accurate assessment of the condition of machinery elements – like pump rotors, fan impellors, gearbox gears and housing mountings.

Enquiries: Carlo Beukes. Tel. 27(0)31 576 6300 or email carlob@bmgworld.net

Largest investment in SA history for non-metallic enclosures

Building products in South Africa for South Africa may have been a sound strategy in the 70s and 80s but the changes that occurred in the local and global marketplace over the years following 1994 required a change of thinking. Many of the global giants with offices in South Africa still follow this methodology as the international products tend to be developed in 'centres of excellence'. The result of such an approach is that a fraction of the proceeds of innovation stay in the country.

Established in 1978 Allbro has grown consistently to the point where it is now one of the world's largest manufacturers of non-metallic enclosures. Although the local market does drive certain developments, these are always integrated with a keen eye on international requirements for such products. One of the most outstanding examples of just how successful this approach has been can be seen with the completion of **Allbro**'s 'Allbrox' range of enclosures. The price point of SMC enclosures internationally is significantly higher than Powder coated steel and in most cases even higher than stainless steel. The reason for this is twofold:

- SMC enclosures offer significant technical benefits related to durability, environmental impact, and safety
- Producing SMC Enclosures is challenging, and the investment cost to create the complex tooling required is significant

It is therefore an absolute world first to find a company manufacturing a range of SMC enclosures at a cost that is generally lower than even 'cheap' 'Far East' steel products.

The extended advantage to South African Panel builders and OEMS is that they have an aesthetically and technically superior housing for the innovative systems that they design and manufacture. While it is clear that the housing does not sell the solution we know that design and presentation carries more weight than it logically should in the decision making process.

More importantly the perceived quality and genuine reliability of systems are directly affected by how sound the IP level on the enclosure is, and for how many years it is able to retain its integrity.

South African companies have made breakthroughs in security, access control, communication, automation, distribution, monitoring, metering, and solar combiners. Sadly they are faced with a tough choice between a well-priced steel box and an expensive imported SMC enclosure solution. The Allbrox range of enclosures completed in November of 2015 includes the following sizes:

Part Number	Description	W (mm)	H (mm)	D (mm)
ALL-003	Allbrox 3 with SMC Device Plate	250	350	200
ALL-004	Allbrox 4 with SMC Device Plate	300	400	200
ALL-005	Allbrox 5 with SMC Device Plate	350	500	200
ALL-006	Allbrox 6 with SMC Device Plate	400	600	200
ALL-7.1	Allbrox 7.1 with SMC Device Plate	828	709	287
ALL-7.1/PORT	Allbrox 7.1 Portrait	709	828	287
ALL-008	Portrait with multi-cam	800	1000	320
ALL-008/L-ICAM	Landscape with individual cam	1000	800	320

Enquiries: by Quintin Lamprecht.
Tel. 011 894 8341 or email marketing@allbro.com

Assisted funding for prototypes

The introduction of a new product usually requires a prototype to be provided for approval. Allbro is assisting the funding of this process by offering a 50% reduction in the Nett price of any of the new Allbrox range of enclosures used for prototype purposes. The process to qualify for this subsidy is simple. To find out more just Email marketing@allbro.com with the subject 'Prototype'.

Gas gensets for IMG midstream power plants in Pennsylvania

At the end of 2015, the power generation provider IMG Development LLC and **Rolls-Royce** signed a long-term strategic agreement for the supply of Rolls-Royce medium-speed gensets for a minimum of five plants extending into 2020. The first part of the agreement involves the delivery of six B35:40 gas generating sets designed for two new power plants in Pennsylvania, USA, that will be operated by affiliates of IMG Midstream LLC. The two companies also signed a long-term service agreement for the systems being supplied to the two plants. The power plants will feed up to 40 MW of electric power into the local grid. Bergen Engines is part of Rolls-Royce Power Systems. Three gensets, each of which will produce 7 010 kW of electric power, are to be installed in each power plant. The gensets are based on the medium-speed 16-cylinder B35:40 gas engine from Bergen Engines. Ron J. Kiecana, Senior Managing Director and Board Member at IMG said: "Rolls Royce has the right end-to-end power generation solution to help us rapidly deploy our distributed generation model in infrastructure constrained areas with the type of flexible power needed to address a dynamic energy market where traditional energy supply and consumption patterns are changing. We are excited about this partnership and growing our distributed power generation model with Rolls Royce in the U.S. market."

Enquiries: Email Silke.Rockenstein@rrpowersystems.com

At the end of 2015, Ron J. Kiecana (right), Senior Managing Director and Board Member at power generation provider IMG Development LLC and Matthias Vogel, Head of Power Generation Business at Rolls-Royce Power Systems.

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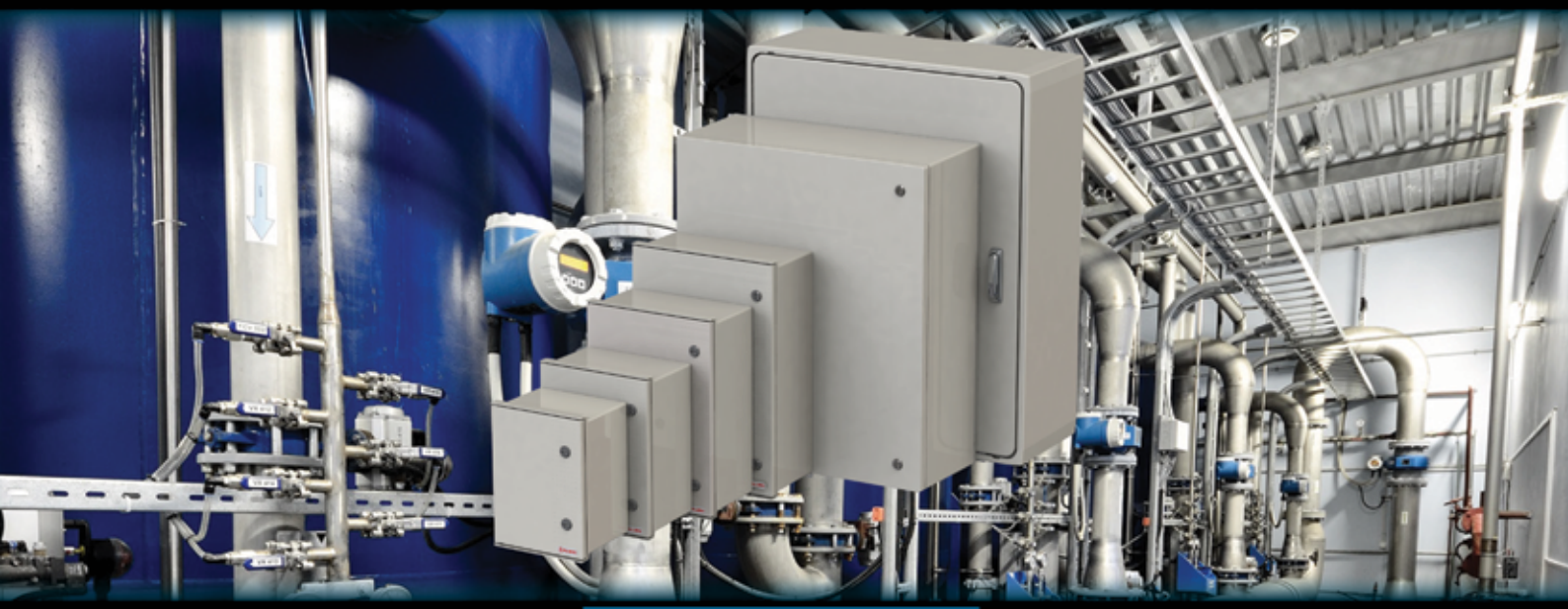

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Part Number	Description	W (mm)	H (mm)	D (mm)	Price per unit (Excl VAT)
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ALL-004	Allbrox 4 with SMC Device plate	300	400	200	R 489.85
ALL-005	Allbrox 5 with SMC Device plate	350	500	200	R 623.50
ALL-006	Allbrox 6 with SMC Device plate	400	600	200	R 757.86
ALL-7.1	Allbrox 7.1 with SMC Device plate	828	709	287	R 1 706.06
ALL-7.1/PORT	Allbrox 7.1 Portrait	709	828	287	R 1 706.06
ALL-008	Allbrox 8 Portrait with multi-cam	800	1000	320	R 2 503.80
ALL-008/L-ICAM	Allbrox 8 Landscape with individual cam	1000	800	320	R 2 503.80

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ALL-005/IN/DOOR	Allbrox 5 Inner Door	R 49.00
ALL-006/IN/DOOR	Allbrox 6 Inner Door	R 56.00

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ALLBRO

E-House… modular and mobile… tailored to Sasol's needs

ABB, power and automation technology group, has delivered a complete modular packaged substation to Sasol Secunda plant in Mpumalanga, almost eliminating unplanned power outages during annual shutdown periods. The mobile substation is made up of 14 panels of UniGear ZS1 medium voltage (MV) switchgear, future-proof protection and control technology. This innovation, aptly named E-House, is specifically tailored to Sasol's needs such as slope plant flooring and constant movement around the plant.

The E-House was designed by ABB and Sasol engineers with a scope which required a universal switchboard in a mobile substation, suitable to be operated at 3,3, 6,6 and 11 kV without significant changes to the switchgear configurations. This optimised solution was created to energise and protect motor feeders, transformer feeders and line feeders without changing of protection equipment.

During the design phase, the team recognised that Sasol Secunda switchgear replacement can only take place during shutdown periods when process equipment is not in full operation. As the switchgear in the plant is reaching its end-of life span, it was critical to find an alternative replacement strategy to increase the number of switchboards that can be replaced without relying on the shutdown period. Due to limited time and resources during the annual shut of eight – 10 days, the number of switchboard replacements were limited with increased risks to plant and personnel. The challenge was to conduct switchgear replacements outside the shutdown period, without creating plant disruptions or unplanned outages. The substation is connected and currently utilised to do the first replacement project at Sasol Secunda site.

Product Group Manager Secondary Switchgear and Modular Systems, Hermanus Jooste says: "This project was exciting because of the many delicate considerations that had to be built and are outside our scope such as air suspended trailer to enable effortless plant mobility for the substation. The outcome is a brilliant solution for Sasol which further demonstrated out ability to go the extra mile for our customers".

ABB and Sasol – together – developed the scope requirement by using ABB ZS1 Digital switchgear as the main switchboard platform, and the mobile substation had to be fitted permanently on a purpose built trailer that could be moved around the Sasol plant as required. The broad scope included:

- Unigear ZS1 digital switchgear with sensor technology (14 panels)
- Remote control panel for remote operation (RCP panel)
- Remote engineering station for configuration and event recording
- Ac distribution board (option of 220 V or 380 V ac as input supply)
- Dc distribution board (110 Vdc)
- Interposing Relay Panel (panel used for transformer Diff protection schemes)
- Battery tripping unit (25 AH duel battery charger unit with batteries fitted in separate battery room)
- Alarm annunciator panel (alarming any unhealthy or dangerous condition)
- Air conditioning of E-House
- Fire detection system
- Substation pressurisation system
- ARC venting duct system on top of Unigear ZS1 venting to outside of the E-House
- Safari roof construction to enable airflow and additional cooling of roof structure

The purpose built trailer has to be roadworthy and licensed to be driven on public roads with full air suspension to limit vibration from road surface to equipment. Other requirement included self-levelling hydraulic system to ensure level walkways even if the plant area is sloped, and walkways and fold-up staircases to enable fast and safe access. Communication and information sharing between various components and systems are digitalised to a maximum by using 61850 protocol. The installed Unigear ZS1 Digital switchgear, rated at 17,5 KV, 2 500 A, 40 KA, gives flexibility to operate the switchgear at any point in the Sasol plant where switchgear replacement, refurbishment or maintenance may be required. This project was not only to assist Sasol in new ways of maintenance and switchgear replacement, but lead to new innovation by which the programming of the ABB REM 615 relay, in conjunction with the RIO units, achieved simple switch over from motor to feeder protection (selector switch) without changing the protection relay, giving a further 'universal switchgear' functionality. Only protection settings needed to be changed via the engineering station.

The project started in 2014 as a partnership between Efficient Engineering and Aurecon. The E house was delivered to Sasol Secunda after a four and half hour road trip from ABB's factory in Johannesburg, a 210 km journey.

Enquiries: Shivani Chetram. Tel. 27(0)10 202 5090 or email shivani.chetram@za.abb.com

New range innovative switchgear

Schneider Electric, a global specialist in energy management and automation, builds on innovation and experience for its 40,5 kV gas-insulated switchgear (GIS) offer. The cutting-edge GHA is now available to the Southern Africa market and beyond.

This new range of convenient and innovative switchgear incorporates a user-friendly operator interface, sealed-for-life medium voltage compartments and intelligent gas monitoring – helping to decrease facility switchgear total cost of ownership, streamline operations, reduce maintenance, and enhance safety and reliability.

Today's facilities and plants, constrained by limited space requirements, are looking for smaller equipment that neither compromises on safety nor performance. "Schneider Electric's GIS delivers a compact design combined with easy-to-install features that provide drastic space savings, as compared to traditional primary metal enclosed air-insulated- and gas insulated switchgear," highlights Brighton Mwarehwa, technical manager for southern Africa at Schneider Electric.

Reliable and safe switchgear is fundamental for optimising equipment performance and plant operations, and Schneider Electric's GIS solution features internal arc-resistant designs that have been tested and passed as per IEC and IEEE standards requirements, which help mitigate effects of faults and provide high level of worker safety.

The GHA is tested for internal arc faults, up to 40 kA for one second. "The progressive technology by Schneider Electric now delivers even more power at the reduced dimensions. Options for single or double busbars are offered and up to a busbar rating of 4 000 A is available for the single busbar option," adds Mwarehwa.

Enquiries: Email isabel.mwale@schneider-electric.com

Extended product guarantees

Long gone are the days of being considered a run-of-the-mill OEM. This is the strong message being given to all industries by **Zest WEG Group Africa**. With WEG Brazil as its parent company, this group has its roots firmly in Africa and its commitment to the continent is without question, especially following the large investments made in 2015 in local manufacturing facilities that will be able to service countries across Africa.

Such is the confidence and level of commitment of Zest WEG Group Africa to its customer base that Louis Meiring, group Chief Executive Officer, announced guarantees have been extended across all WEG products.

"Zest WEG Group Africa is known for leading industry in its thinking and the decision to extend the product guarantees is, we believe, another very important first," Meiring says. "While the extended guarantee will cover customers for unexpected electrical and/or mechanical failures giving them absolute peace of mind, it is not going to cost them more."

Meiring says that this was a prime consideration for Zest WEG Group Africa as the organisation is well aware of the additional financial pressures that many of its customers are operating under in the current financial climate. "By extending our product guarantees we are increasing the peace of mind that customers have with WEG products and opening the door for potential customers to examine what we know is an unbelievable value proposition."

Extended guarantees will vary from product to product, but all customers are still assured of the same high level of in-field support for which Zest WEG Group Africa is known.

Enquiries: Kirsten Larkan. Tel. 27(0)11 723 6000 or email kirstenl@zestweg.com

Full range of WEG transformers with guarantees extended to three years, with the option to extend the guarantee with the WTA Service plan to five years.

Seminar on lightning protection

In response to massive industry interest, **DEHN AFRICA** the local subsidiary of Germany-based DEHN + SÖHNE, recently ran a two-day seminar that offered attendees a fully comprehensive approach to lightning protection. The course was endorsed by the South African Institute of Electrical Engineers (SAIEE), which approved two CPD credits. Delivered by Alexis Barwise, managing director of DEHN AFRICA, the seminar covered:

- The characteristics of lightning, how it is formed and the types of flashes that exist; along with the types of risks and damage associated with a lightning strike
- How to assess the risks associated to a structure/building/plant and to apply mitigation methods in order to protect personnel, the structure and its equipment
- Designing a compliant and effective lightning protection system (LPS) including all the elements of an LPS (air-termination systems, down-conductors, earth-termination system, separation distance and equipotential bonding)
- Selecting compliant lightning and surge protection devices through understanding the full requirements of these devices and other applicable standards; along with the certification of an LPS using the SANS installation safety report

Enquiries: +27(0)11 704 1487 or email alexis.barwise@dehn-africa.com

Alexis Barwise managing director of DEHN AFRICA.

Splitting a compressed air ring

Energy efficiency opportunities

Rudi Joubert, Johann van Rensburg, Ruaan Pelzer, North West University;
Consultants to HVAC International and TEMM International

The purpose of this study was to implement an energy efficient strategy on a compressed air ring of a South African gold mine.

Sustainable energy supply in South Africa requires ongoing new and innovative methods to ensure that production activities are maintained and that energy is conserved. South African gold mines are among the largest electricity consumers in the country [1]. The focus of the study was to reduce the electrical energy consumption of air compressors supplying compressed air to large compressed air rings at these mines.

A typical mining compressed air system consists of air compressors, a pipe network and air consumers. These air consumers, or end users, include rock drills, loading boxes, pneumatic valve actuators and refuge chambers. *Figure 1* shows the typical layout of a compressed air ring.

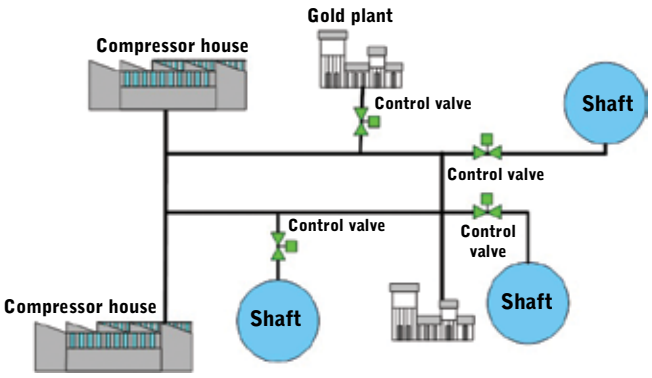

Figure 1: Typical layout of a compressed air ring.

The air consumption, pressure requirement and time of use of the consumers also differ. *Figure 2* shows the typical pressure and air flow consumption of a shaft. There are clearly defined periods of high and low consumption throughout the day. This is a result of the various combinations of pneumatic equipment in use. For example, rock drills are mostly used in the drilling shift, requiring high pressure and high air flow.

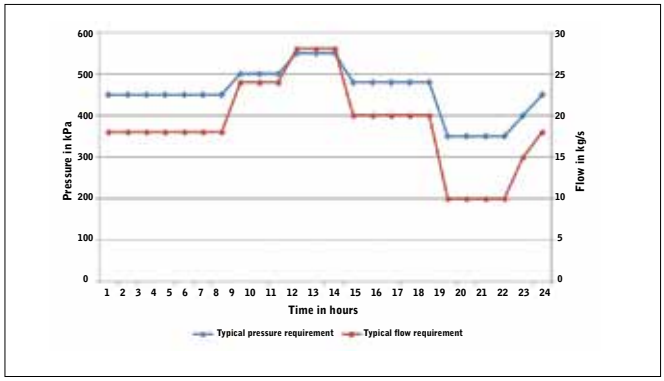

Figure 2: Typical shaft consumption.

Figure 3 shows the typical compressed air system pressure and air flow supply of the gold plant before implementation of this energy saving project.

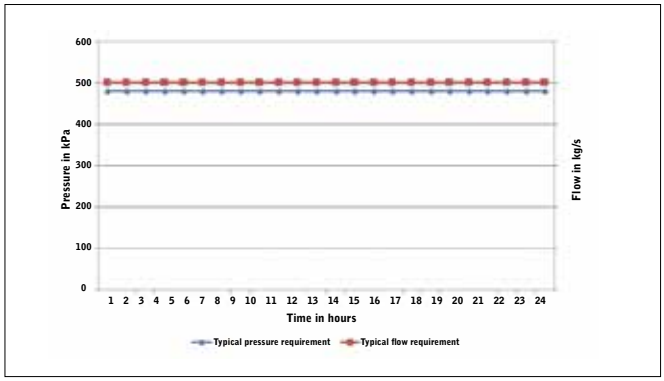

Figure 3: Typical plant consumption.

The plant requires a constant high pressure for the pnumatic instrumentation thoughout the day. Constant air flow is also required

at certain sections throughout the day since agitation operations continue without interruption. The different pressure and flow requirements for the various consumers presents an opportunity to implement a control strategy that will allow compressed air to be supplied more efficiently.

Pressure losses resulting from line friction

Air flowing over a long distance will be subject to relatively large pressure losses as a result of line friction. To calculate this pressure loss a few fundamental principles need to be taken into account. Owing to the relatively large air flow speed, pipe wall roughness and long pipe lengths, only turbulent flow conditions are assumed to be present. The airflow in a pipe experiences resistance as a result of viscous sheer forces. The wall roughness plays an important role in determining the friction factor, f. Experimental methods are mostly used to determine f for a specific situation. The friction factor is a function of the Reynolds number (N_R) and relative pipe roughness factor ($\frac{\varepsilon}{D}$) [2]. *Figure 4* illustrates what is meant by the relative roughness of a pipe.

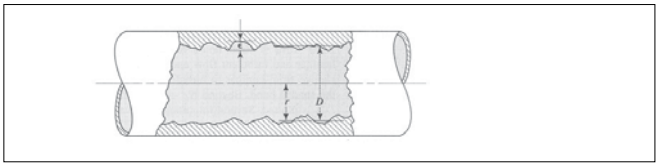

Figure 4: Relative roughness of a pipe [2].

When calculating the roughness of pipes that have been in use for some time, the absolute roughness of new pipes can only be used as estimates since the effects of rust and corrosion in the pipes will result in larger relative roughness values of the pipes.

Using assumed relative roughness and Reynolds number values, the friction factor f can be read off the Moody diagram shown in *Figure 5*.

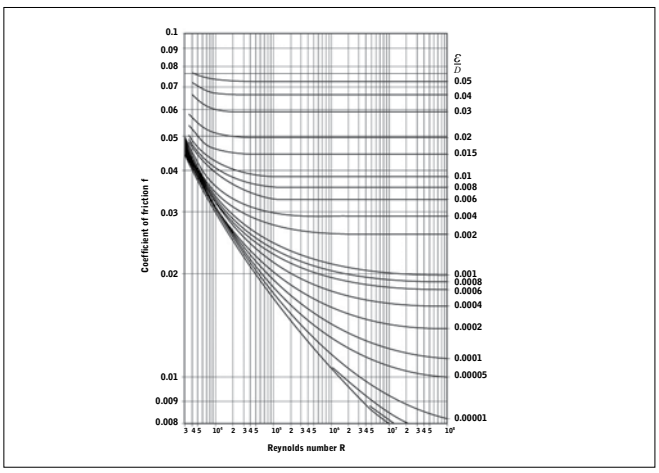

Figure 5: Moody diagram.

Air density is calculated using the standard equation of state for a perfect gas [3]:

$$\rho = \frac{p}{RT}$$

Where the variables are:

o	Density	- ρ	*[kg/m³]*
o	Temperature	- T	*[K]*
o	Absolute pressure	- p	*[N/m²]*
o	Gas constant	- R	*[N · m/kg · K]*

For air, the gas constant is 287 N · m/kg · K at 298 · K, and 101 kPa [3]. The pressure loss, $\Delta p = (p_1 - p_2)$ over a length of pipe can be calculated using the following equation [4]:

$$\Delta p = 4 f \frac{l}{d} \frac{pv^2}{2}$$

Where the variables are defined as:

o	Loss of pressure	- Δp	*[Pa]*
o	Density	- ρ	*[kg/m³]*
o	Internal pipe diameter	- d	*[m]*
o	Pipe length	- l	*[m]*
o	Average velocity	- v	*[m/s]*
o	Friction factor	- f	*[dimensionless]*

From this formula it is clear that the Δp over a length of pipe will increase if:

- The pipe length increases
- The rate of air flowing through the pipe increases
- The air density increases

Air flow losses through air leaks

The compressed air lost through air leaks in a compressed air system is a function of the pressure of the air in the pipe as well as the size of the leak. Most of the formulas used to calculate the compressed air lost through air leaks are derived empirically. The following formula can be used to calculate the volumetric flow rate of free air through a hole with a given size [5]:

$$V_f = \frac{NL \times (T_i + 273) \times P_1/P_i \times C_1 \times C_2 \times C_d \times \pi D^2/4}{C_3 \times \sqrt{T_1 + 273}}$$

Where the variables are defined as:

o	Volumetric flow rate	- V_f	*[m³/h]*
o	Number of air leaks	- NL	*[dimensionless]*
o	Atmospheric air temperature	- T_i	*[°C]*
o	Line air temperature	- T_l	*[°C]*
o	Line pressure	- P_l	*[kPa]*

- Atmospheric pressure - P_i *[kPa]*
- Isentropic sonic volumetric flow constant - C_1 *[7,3587m/s K^{0,5}]*
- Conversion constant - C_2 *[3600s/h]*
- Isentropic coefficient of discharge for square edged orifice - C_d *[0,8]*
- Leak diameter - D *[mm]*
- Conversion constant - C_3 *[10^{6}mm^2/m^2]*

It is clear from this formula that the air flow through the hole in the pipe will decrease when the system line pressure, P_1 is decreased.

Pressure control methods

Automatic pressure control valves are used to control the air flowing through a pipe. The valve opening can be adjusted so that pressure loss over the valve will result in the required reduced system pressure downstream of the valve.

Pressure transmitters installed in the air ring are used, not only to provide pressure metering at the specific location where it is installed, but also as a feedback process variable. This feedback process variable is used in the PID control loop to adjust the valve opening so that the pressure loss across the valve will provide the correct, reduced downstream system pressure.

Case study

The surface air ring of the mine that was used in this case study consisted of a pipe network that was approximately 40 km long.

Figure 6 is a simplified schematic layout of the mine's surface compressed air network.

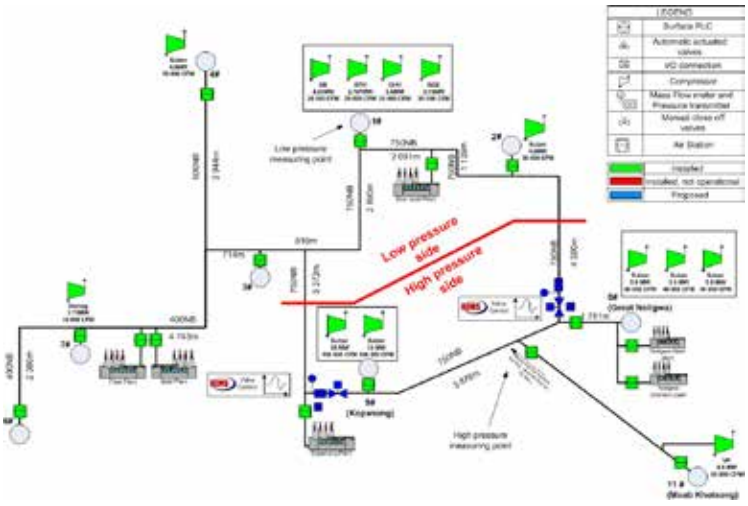

Figure 6: Surface layout of case study.

The bottom three shafts shown in *Figure 6* are the mine's main production shafts. These shafts require a supply pressure of 590 kPa during peak production hours which start at 0700 and continue to 14:00.

For the remainder of the day a pressure of 520 kPa will be sufficient to sustain the system air pressure requirements of the end users in this shaft. Most of the mine's compressors are also installed at these shafts. This allowed the compressed air supply pressure set point to be regulated at the pressure required for the high pressure side of the compressed air ring. For the implementation of the ring split strategy, two control valves were required. The location of the valves in the compressed air ring is indicated on *Figure 6*.

Figure 7 shows a typical pressure usage profile for a normal production day of these shafts. This was also the pressure profile of the entire compressed air ring that was used before the ring split strategy was implemented.

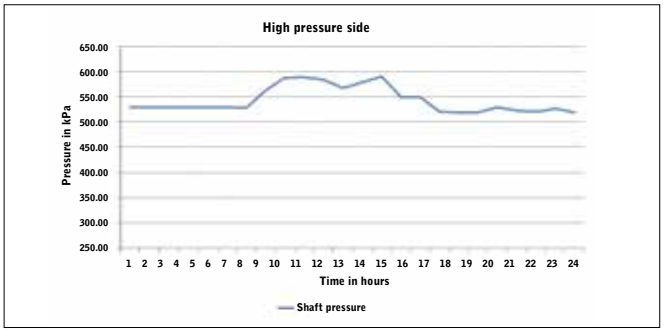

Figure 7: Shaft pressure.

The two valves are controlled from the central control room and isolate the high pressure side of the compressed air ring from the low pressure side. A low pressure set point of 440 kPa is maintained in the low pressure side.

It can be seen in *Figure 6*, that compressors are located on either side of the compressed air ring. The compressors located on the low pressure side are presently used as a backup in case additional air is required on the low pressure side of the ring. Because of the location of these compressors and the fact that they were used before the ring was split, no accurate flow data was available to compare the difference in flow rates before and after implementation.

> *Sustainable energy supply requires ongoing innovative methods to ensure that production activities are maintained and energy is conserved.*

The effect of the reduced pressure and air flow was obtained by comparing the total amount of compressed air used over a period of one month with the corresponding values when the power baseline was originally measured. After implementation, the total amount of compressed air used was an average of 191 728 tons per month.

This was 5 725 tons less than the average 197 453 tons of air per month consumed before the ring was split. This saving is a combination of the air saved as a result of a reduced line pressure leading to smaller line friction losses as well as the reduced amount of air lost through air leaks. *Figure 8* shows the pressure profile of the low pressure side after the control valves were installed and commissioned.

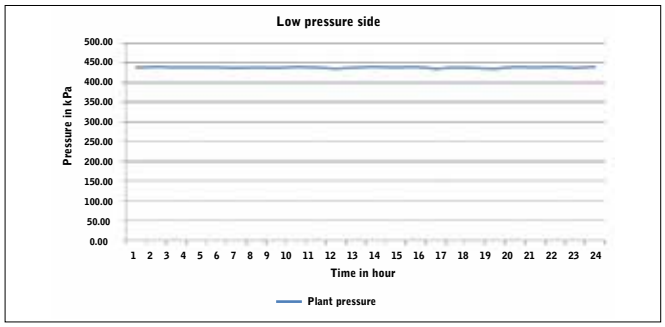

Figure 8: Low pressure at the plants.

The reduced energy consumption, which can be calculated from the area under the actual power profile of *Figure 9*, is clearly evident. This saving was achieved through a reduction in pressure on the low pressure side of 80 kPa. *Figure 9* shows the actual average power consumption, after project implementation, over a period of one month, against the original power baseline before the project was implemented. The average daily energy efficiency saving achieved was 43,2 MWh.

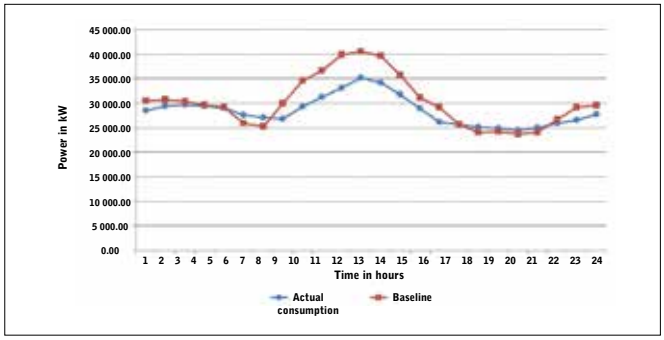

Figure 9: Actual power profile vs. baseline.

Conclusion

Evaluation of the compressed air system at a gold mine showed that it is possible to reduce the pressure and air flow in certain sections of the mine. This was accomplished by installing automatic pressure reducing control valves in the compressed air delivery line. When these valves are signalled to reduce the downstream pressure, they cause the upstream pressure to increase. The increased upstream pressure will cause the compressors to reduce their output to stay within the output pressure set point range. The reduced output means less power is required and this will result in significant electrical energy savings. This saving can clearly be seen in the results of the case study.

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[2] Mott RL. Applied fluid mechanics, 6th ed. Upper Saddle River. Pearson Education Inc. 2006.

[3] Zucker RD. Gas Dynamics, 2nd ed. Hoboken. John Wiley & Sons. 2002.

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take note

- Energy, like water, should be seen as a resource to be nurtured.
- Every opportunity to improve energy efficiency must be taken.
- Compressed air systems use large amounts of energy and are prime targets for improved efficiency.

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Email: rpelzer@rems2.com

CIP Technologies save 20% energy

Natlee Chetty, Endress+Hauser

Recent innovations in technology enable plant operators to calculate the optimal mix of water, chemicals, temperature and flow required to achieve safety standards while saving at least 20% in energy cost – reducing the downtime for cleaning by at least 20%.

A typical Clean-In-Place (CIP) process requires large amounts of water, chemicals and energy. It is estimated that, on average, a food and beverage plant will spend 20% of each day on cleaning equipment, which represents significant downtime for a plant. Energy usage varies depending on the process. For example, a milk plant is likely to use 13% of its energy on CIP, whereas a powdered milk, cheese and whey process is likely to use 9% of its energy on CIP. In a fruit jam manufacturing facility in England, cleaning hoses in the fruit room were identified as one of the highest end users of water in the facility (17% of total site water consumption). Many manufacturers are unsure of how their CIP systems are performing. Therefore additional steps are often introduced as a safeguard to ensure adherence to sanitation standards. This practice results in higher consumption of water, chemicals, and energy than is necessary in order to avoid the contamination issues. A number of companies have addressed CIP improvements with small modifications such as altering the chemical concentration, or by adjusting the time taken for each stage of the CIP process. However, very few food and beverage manufacturers have put tools in place that render the CIP process efficient.

Risks of inefficient and ineffective CIP systems

Food safety and litigation

With many hundreds of metres of pipework, and a multitude of valves, pumps and instrumentation that make up a typical CIP system. The risk of equipment failure is high and can happen at any stage of the process with a potential impact on food safety. It is quite difficult to verify that all aspects of the cleaning process have been taken into account. Consider the instance of an operator who runs a cleaning process and does not even realise that a particular component (such as a pump) did not work because no alarm was generated.

The result of improper cleaning is costly to a plant in violation of food and beverage industry safety regulations. The all-too-frequent incidences of food safety disasters around the globe are often caused by simple mistakes or faulty processes in a food or beverage factory which lead to sickness, injury, and even death for those who consume contaminated products. In addition to the human tragedy, these contamination incidents lead to the expense of product recalls, loss of confidence in a company's brand, and ultimately loss of revenue. Food safety authorities conduct plant audits to ensure that the critical control points identified as HACCP (hazard analysis and critical control points) are monitored and reviewed for regulatory compliance and continuous improvement. In the event of a contamination incident, full traceability (enabled by software) and 'proof of clean' will reduce the legislative and legal impact.

Production downtime

Lowering operational expenditure and reducing waste to lower the cost of production without impacting product quality are universal goals of food and beverage enterprises. However, when a CIP process is in operation, production is stopped. This impacts profitability. As a result, two tendencies manifest themselves which are both negative to the business:

- When a problem occurs, there is a natural reaction to avoid seeking the root cause of the problem. Such an intervention could involve even more time-consuming maintenance work
- With the risk of contamination at the forefront of most operators' minds, the tendency of the CIP operator is to overcompensate with increased cleaning time

Endress+Hauser CIP technologies alleviate problems with

- More advanced CIP automation enables dramatic reductions in troubleshooting time in the event of a problem, cutting what once took hours to perform into minutes of diagnostics
- An optimised CIP process can reduce cleaning times by up to 20%. If CIP currently takes around five hours of each day, a 20% reduction in cleaning time will deliver approximately an extra hour of production time

High consumption of energy and water

Efficiency improvement does not only focus on reducing cycle time, as well as energy, water, and chemical consumption. The primary purpose of the CIP system is to remove fouling from the equipment. When production equipment is not completely clean, expensive raw materials have to be thrown out. Effective cleaning results in fewer instances of contamination and therefore improved production efficiency.

The cleaning function, however, is energy intensive. Almost half of a milk-processing facility's energy is used to clean the processing lines and equipment. Calculating the precise temperature needed to clean equipment is critical to reducing the energy consumption.

- The risk of equipment failure in typical Clean-In-Place (CIP) systems is high.
- Failure of this equipment has an impact on food safety.
- Effective cleaning results in fewer instances of contamination and improved production efficiency.

take note

> *A milk plant is likely to use 13% of its energy on CIP, whereas a powdered milk, cheese and whey process is likely to use 9% of its energy on CIP.*

For every 1°C reduction in CIP temperature there will be a 1/60th reduction in the energy needed to heat the fluid. The amount of water or chemicals used can also be reduced by introducing recovery tanks so that the liquid can be re-used instead of sent down the drain.

Loss of innovation and flexibility

Food and beverage manufacturers must innovate in order to remain competitive. Recipes need to be improved and new product lines developed. Therefore, CIP systems need to be flexible in order to adapt to different types of fouling on the equipment as product lines evolve. Operators need to be able to alter cleaning recipes to suit particular types of fouling, whether product (sugar, fat, protein, or minerals) or microbial (vegetative microorganisms, or spore forming microorganisms) and ensure that the CIP system is operating in an efficient manner. Chocolate, for example, will require a different cleaning recipe for butter than it will for flour. Modern CIP systems, equipped with automation software enable a simple drill down into any aspect of the process. This traceability of the system offers a number of benefits:

- Operators can check each CIP operation to verify whether it has worked correctly
- Diagnostics are simple to perform and deliver detailed information on each element of the cleaning cycle
- Faults and issues can quickly be highlighted and rectified
- Plant managers can generate detailed operational reports
- Food security reporting to regulators is easy to assemble and more comprehensive

Conclusion

Recent innovations in technology enable plant operators to calculate the optimal mix of water, chemicals, temperature and flow required to achieve safety standards while saving at least 20% in energy cost and by reducing the downtime for cleaning by at least 20%.

Installing instrumentation in the process lines provides real-time control and follow-up, as well as making the process completely traceable, and this allows fast access to the process data, such as concentration, temperature, speed and phase shift. This way it achieves the maximum washing effect, measures the phase separation, determines when a cycle starts or finishes, and also quantifies water and chemical consumption, which are increasingly more common challenges.

In addition, all the steps in the process can be easily traced and automatically documented, which simplifies any auditing requirements that need to be performed by regulatory inspectors. With Endress+Hauser's detailed portfolio, which has instrumentation designed for the food and beverage industry – any manufacturing plant will be able to automate and overcome the challenges facing this process.

Natlee Chetty is currently employed as an Industry Manager for the Food & Beverage Industry at Endress+Hauser South Africa. She started her career at the South African Breweries (SAB) and has been in the Instrumentation & Automation Industry for the past 14 years. Natlee has completed her Instrumentation Trade test, has a Diploma in Electronic Engineering (Process Instrumentation and Control) as well as a Bachelors degree in Commerce. Enquiries: Natlee Chetty. Endress+Hauser. Tel: 27 (0)11 262 8000 or email Natlee.Chetty@za.endress.com

NEW radar level transmitter for bypass chambers and magnetic level indicators

With OPTIWAVE 1010, **KROHNE** introduces a new radar level transmitter for bypass chambers and magnetic level indicators. The 2-wire FMCW radar level transmitter is designed as a cost-effective solution for the continuous level measurement of liquids in bypass applications in various industries, e.g. chemical, power, water and wastewater, or automotive.

OPTIWAVE 1010 can be combined with the KROHNE BM 26 Advanced bypass chambers and magnetic level indicators (MLI), thereby adding a 4...20 mA HART output to the mechanical devices. The combinations can be conveniently ordered as a whole, e.g. as BM 26W1010 (OPTIWAVE 1010 welded to BM 26 Advanced). Alternatively, it can be welded on any bypass chamber with internal diameter 38...56 mm / 1,5...2,2". Thus it is also an ideal solution for other MLI manufacturers to add a level radar measurement option to their product range. OPTIWAVE 1010 is competitively priced to replace reed chains, magnetostrictive and simple TDR transmitters that are typically used with bypass chambers or MLIs. In addition to a measuring accuracy of ± 5 mm / 0,2", the FMCW principle offers a much better overall accuracy in bypass applications: While reed chain and magnetostrictive principles are measuring the float position which depends on the product density, the FMCW radar directly measures the liquid surface. Application range for OPTIWAVE 1010 includes almost any liquids with process temperatures ≤ +150°C / +302°F up to 40 barg / 580 psig and measuring ranges up to 8 m / 26,2 ft.

Enquiries: John Alexander. Tel. 27 (0) 11 314 1391 or email salesza@krohne.com

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Further delays with Inga III Hydroelectric Project in DRC

New analysis from Frost & Sullivan

The demand for electrification in Africa is unquestionable and seemingly insurmountable given the current state of energy affairs. The first phase of the Inga III dam project, Basse Haute (BC), is planned to commence in 2017 and has the capacity to generate 4 800 MW of green energy. The hydroelectric potential of the Inga site is estimated at 40% of the continent's total capacity. Should the project gain traction, a multitude of opportunities will present themselves in operations, maintenance and indirect markets like consulting and skills development. The Hydroelectric Inga III Project of the DRC (Frost & Sullivan), finds that the government of the DRC will collaborate with several African states, either as off-takers of power or as host countries for transmission lines. With South Africa's cabinet having approved the ratification of the treaty, this will allow South Africa to consume 2 500 MW of the power from Inga III, while other off-takers will include the capital city of Kinshasa and the mining region.

Environmental concerns

"Inga has already been delayed as the selection of a consortium to build the dam is in an unplanned second round of bidding," said Frost & Sullivan Energy & Power Systems Research Analyst Tilden Hellyer. "While the cost of Inga III and the associated transmission lines have been budgeted at US$14 billion, the amount has been underestimated several times in the past and it is unclear what the true cost might be." Environmental concerns surround the Bundi Valley. The area will flood when the Congo River is channelled, submerging arable land. However, several experts in geology, geotechnology, and sedimentology have been appointed to conduct studies aimed at minimising the environmental impact of the project.

Transparent collaboration

Under the political and economic conditions, it will take transparent collaboration to improve the chances of Inga coming into fruition. Gradually, several development and financial institutions are beginning to contribute finances and expertise to the project. The government of the DRC is aiming to make business in the country more attractive and increase foreign direct investment through various incentive packages. The government recognises that Public-Private Partnerships (PPP) are the best way to mobilise private participation. PPP contracts with the government of the DRC are currently open for the dam wall, intake and canal.

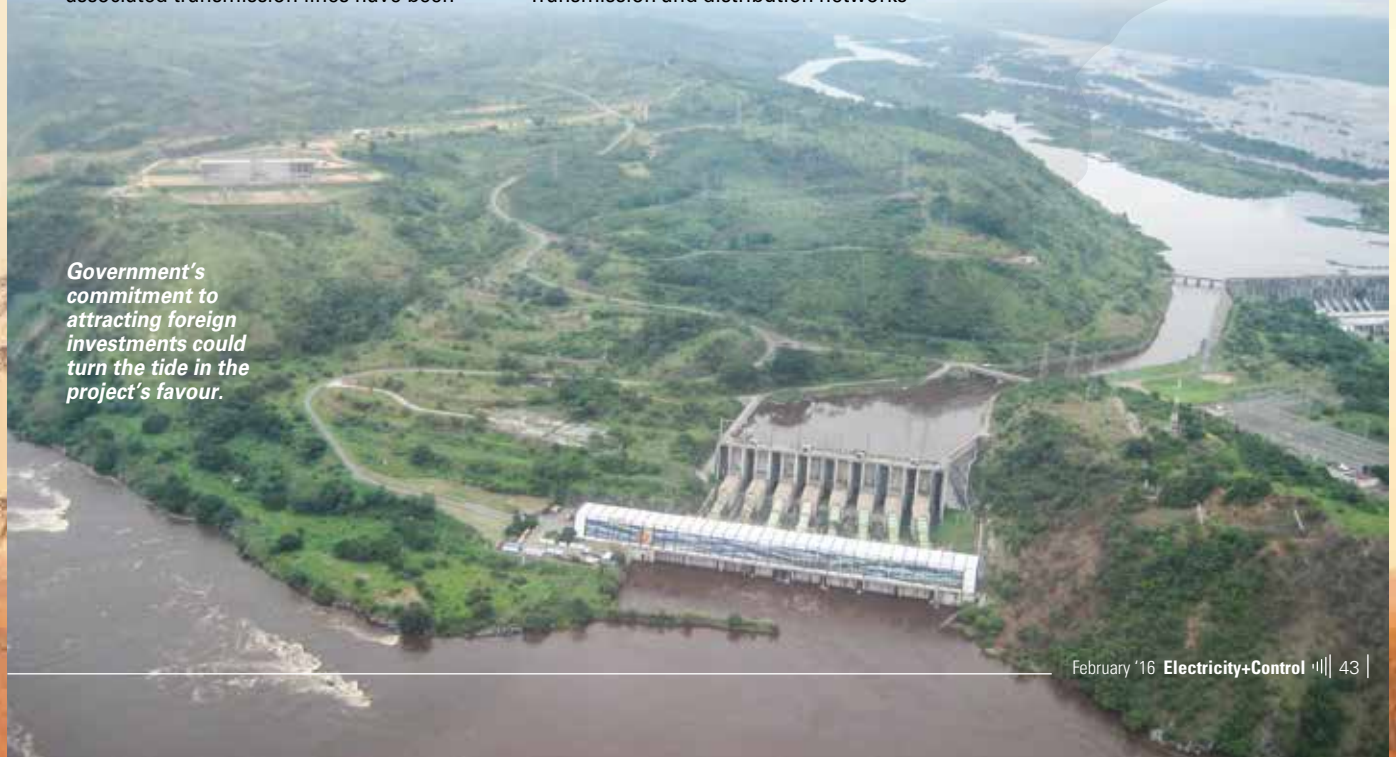
"If the project gathers momentum, it will take six years to complete common infrastructure, both direct and indirect markets stand to gain," observed Hellyer. "Transmission and distribution networks under the leadership of South Africa will require technical expertise in DRC, Zambia, Zimbabwe, Botswana and South Africa. By connecting the South African Power Pool through transmission makes it easier to collaborate, strengthen relationships and build revenues. A private consortium under a concession contract with the DRC will take shape to repair old and construct new transmission lines within the DRC. A similar concession contract will emerge for the power station at the Inga site."

Africa's energy highway

The success of the Inga III Basse Haute will open up further opportunities to explore DRC's hydroelectric power capacity and its potential to truly become Africa's energy highway. The Hydroelectric Inga III Project of the DRC is a Market Insight that provides analysis into the opportunities that a new hydroelectric dam in the DRC will provide over the next decade. The study delves deep into the current state of the DRC power industry, offering drivers and restraints of the project, key participants in the project as well as legislative environment and investment opportunities.

For complimentary access to more information on this research, please visit http://ow.ly/Xly1P

Enquiries:
Email Samantha.James@Frost.com



Government's commitment to attracting foreign investments could turn the tide in the project's favour.

Streamlining operational efficiencies in 2016

Greg Perry

The operations division is at the heart of SEW-EURODRIVE, and the division's newly-appointed General Manager Greg Perry is eager to consolidate on current successes to improve service delivery. The scope of the **SEW-EURODRIVE** operations division encompasses numerous functions, including; production, logistics, services and engineering. Despite the fact that the company is well-recognised as a market leader in innovation and quality, Perry admits that more needs to be done to maintain current clients and win over new ones in tough economic conditions. "Our products are good, and we have every confidence in them, in terms of design and functionality. Due to a gradual slowdown in new investments, a general industry trend is that operations are reducing overhead costs by diverting budgets towards maintenance to extend the total life cycle of equipment. As a result, customer service is more important than ever, and we are adopting a continuous improvement approach in that regard," he states.

Bearing this in mind, Perry believes that SEW-EURODRIVE will maintain its competitive edge in industries such as mining, automotive, food and beverage, and water treatment. "Our business model is sound and we have a strong team of people behind our products, however, it is important to work 'smarter' in challenging times, and we are doing this by taking a proactive approach towards streamlining efficiencies across the board."

Enquiries: Email Indaba@sew.co.za

New era for VEGA in South Africa

VEGA Controls SA has been appointed by VEGA Grieshaber KG as the sole authorised distributor for the South African market, from 1 January 2016. VEGA Grieshaber KG is the manufacturer and supplier of the complete range of VEGA level, pressure and nucleonic instrumentation. The new company will take over the day-to-day business activities of VEGA Instruments SA, under the leadership of African Region – Group Director, John Groom and Natalie Barnes as Director.

Natalie Barnes joined VEGA in 2006 and has worked in the sales and service departments of the company in a number of capacities. Her last position was Head of Internal Sales, Projects and Service. Natalie will continue to add value to the new company, and expects to see future growth in both the company's people and its business. She said, "My vision for VEGA is to remain a leading brand within the industry, exceeding our customers' expectations". John Groom announced that VEGA Controls SA has entered into an Employee Shares Opportunity Programme Trust that will collectively own a 26% share of VEGA Controls SA. This will mean that the staff collectively contributes to the success of the company within South Africa.

Enquiries: Chantal Groom. Tel. 011 795 3249 or email chantal.groom@vega.com

Natalie Barnes, Director VEGA Controls SA.

South African National Energy Development Institute (SANEDI)

Energy efficiency tax rebate increased to 95c/kWh

"Please note that in terms of the recently promulgated Taxation Laws Amendment Act, Act No. 25 of 2015, published in Government Gazette No. 39588, the Section 12L energy efficiency tax incentive has been amended and improved to increase the amount of the (measured and verified) deduction from 45 to 95 cents per kilowatt hour or kilowatt hour equivalent of energy saved. Furthermore, the increased rate is deemed to have come into operation on 1 March 2015 and applies in respect of years of assessment commencing on or after that date." *Extracted from the SANEDI press release of 18 January 2016.*

Contact the Energy Training Foundation (EnTF), sole licensed training provider for the AEE's Certified Measurement & Verification Professional (CMVP) qualification programme in the Southern African region, for a customised training session for your company's staff M&V training requirements. We can help you understand M&V from the basic level up to obtaining the qualification.

Enquiries: Barry Bredenkamp, Tel. 083 655 6891 or email: barryb@sanedi.org.za

PROCENTEC joins Italian PROFIBUS and PROFINET

PROCENTEC srl, knowledge partner in the field of PROFIBUS and PROFINET technology, joins the local Association Profibus e Profinet Italia. The Italian office of PROCENTEC has become a new member of the association 'PROFIBUS e PROFINET Italia', the local branch of the largest automation community in the world, responsible for PROFIBUS and PROFINET, the two most important enabling technologies in automation today. PROCENTEC srl follows the path of the Dutch headquarter, becoming an active partner of the global network of vendors, developers, System Integrators and end users. PROCENTEC will join different initiatives to promote and support PROFIBUS and PROFINET in Italy and will provide solutions, products, training courses and services.

Evelyn Mario, Managing Director of PROCENTEC Srl: "Becoming a member of 'Profibus e Profinet Italia' was part of the strategic plan of PROCENTEC and part of its international development. With this decision, we highlight our strong commitment in providing digital data communication solutions in the field of automation and in promoting best practices in the implementation of PROFIBUS and PROFINET technologies." PROCENTEC srl will join multiple networking activities of the Italian Association, starting from the PROFIBUS&PROFINET Day in April in Alba (a conference to present the latest technological developments in Industrial Communication) and the well-known exhibition SPS Ipc Drive in Parma (24 - 26 May 2016).

Enquiries: Email sleeuwenkamp@procentec.com

Kusile automation project achieves key early milestones

ABB's biggest automation order at Kusile thermal power plant in South Africa celebrates in these days its first important success. Owned by the South African electrical utility, Eskom, Kusile Power Station will comprise six units of 800 MW each, will be the world's fourth-largest coal-fired power station, and will help boost South Africa'scapacity to support the country's economy. It is located about 120 kilometers from the city of Johannesburg in the north-east region of South Africa. ABB is on schedule to complete automation for Generating Unit 1 of the power station: with successful Factory Acceptance Tests (FATs) of the balance-of-plant and the unit performed late last year.

"With record timing as a key deliverable of such an intrinsically complex project, there is excellent cooperation between the Eskom and ABB teams with very strict monitoring on each element of the project to ensure that deadlines are adhered to", commented Kevin Kosisko, ABB's Power Generation business Managing Director. "We are extremely pleased that our technology will be the keystone to bring reliable power supply to consumers and a step ahead in the development of South Africa's power infrastructure".

As part of the order, ABB is supplying the control system, software and instrumentation solution for all six of the station's 800 MW generating units, which will supply power to the entire country when the plant is completely operational by the last quarter of 2022. The solution also includes unit and balance-of-plant automation, field instrumentation, cabling, boiler protection and plant simulator, engineering, installation, commissioning, optimization and training.

Enquiries: Tel. 27(0)10 202 5090 or email shivani.chetram@za.abb.com

Bizz Buzz

Johnson Controls and Tyco merge

Johnson Controls and **Tyco** have entered into a definitive merger agreement under which Johnson Controls, a global multi-industrial company, will combine with Tyco, a global fire and security provider, to create the leader in building products and technology, integrated solutions and energy storage. Under the terms of the agreement, which has been unanimously approved by both companies' Boards of Directors, Johnson Controls shareholders will own approximately 56% of the equity of the combined company and receive aggregate cash consideration of approximately $3,9 billion. Current Tyco shareholders will own approximately 44% of the equity of the combined company.

Enquiries: Visit www.johnsoncontrols.com

8th Annual Africa Energy Indaba

The theme for the 2016 Africa Energy Indaba is 'Energy – the key driver for Africa's economic growth' and every aspect of the 2016 programme has been designed to support the growth and development of Africa's various energy sectors. For almost a decade, the annual **Africa Energy Indaba** has served as the connection point for investments into Africa's energy sectors catering to opportunities from small renewable energy projects to billion dollar utility tenders. Through SANEA, the World Energy Council and NEPAD, there is access to energy thought leaders from more than 90 countries through the Energy Issues Monitor and other studies. The 8th annual Africa Energy Indaba will be held on the 16 - 17 February 2016 in Sandton, Johannesburg, South Africa.

Enquiries: Tel. 27(0)11 463 8432 or email portia@energyindaba.co.za

Gast's Kusile project approaches completion

The Kusile Power Station has been under pressure to be in commercial operation by 2018 in order to start contributing much-needed power to the South African economy. However, the construction of any power station comes with environmental implications, which can only be neutralised through geosynthetics. To this end, construction and engineering group **GAST** was awarded the contract to manage the geosynthetic requirements of the Kusile Power Station. The contract was awarded via WBHO, based on GAST's incredible record of 11 500 successfully completed projects and its accreditation from the United Nations and the World Bank, both achieved through its trademark quality and performance across the board.

Enquiries: Email karen@prworx.co.za

PneuDrive Challenge… taking a break

The engineering design competition started as an initiative to find engineering talent in South African universities. In 2008, SEW EURODRIVE's Ute Schoeman and Rene Rose (both currently 'mediapositive') introduced the challenge concept. Over many years the competition (co-sponsored initially by SEW EURODRIVE and Festo; in 2015 by SEW EURODRIVE and SMC Pneumatics SA) has offered a unique learning experience… combining academic competency with the need to identify, design and propose innovative engineering solutions for real-world business problems. At the PneuDrive Challenge Prizegiving, held at the head office of SMC Pneumatics (South Africa) in Midrand on 21 January 2016, Adrian Buddingh, the company's General Manager, said that current sponsors of the initiative, SEW EURODRIVE and SMC, have decided to take a break from PneuDrive, to pause and reflect on the best way forward. They intend refuelling their resources, funding and planning to reassess the industry's needs. In so doing, they plan devising a more comprehensive and valuable programme, not only for universities, but for the industry as a whole.

Enquiries: Lindy Ndaba. Email lndaba@sew.co.za or Riaan van Eck. Email jbester@smcpneumatics.co.za

First place:
Stellenbosch University –
Josua Blom,
Madeli du Toit,
Johannes Leuvennink,
Jean Swart,
Reghardt Pretorious.

Second place:
University of the Witwatersrand –
Craig Daniels,
Richard Grieves,
Micha Dedekind.

Third place:
University of the Witwatersrand –
Portia Sibambo,
Tiisetso Ramolobe,
Vuledzani Madala.

Annual Vega Golf Day

Always a popular event on the calendar, the Annual Vega Golf Day was held at the Roodepoort Country Club on 21 January 2016. John Groom welcomed the guests and introduced some of the key people from Vega Controls SA (Pty) Ltd, the company now authorised as the sole distributor for VEGA Grieshaber in the South African market. Frikkie Streicher (External Sales Department) introduced and demonstrated, Bluetooth PLIS-COM, the new display and calibration module for VEGA sensors that will be available from March 2016. Adjustments can now be made without removing the VEGA sensor housing cover either at the sensor using the new magnet pen or from a safe distance of 25m using a smartphone or tablet. Günter Kech (Managing Director, VEGA Grieshaber) gave a hint of a 'game changing' instrument soon to be launched by VEGA. Look out for the next issue of Electricity+Control for more information.

Enquiries: Chantal Groom. Email info.za@vega.com/za

Frikkie Steicher shows how adjustments can be made via the new VEGATools app using a smartphone.

John Groom (Director, VEGA Controls SA); Natalie Barnes (Director, VEGA Controls SA); Mrs. Kech; Günter Kech (Managing Director, VEGA Grieshaber Germany.

Extended product guarantees

Long gone are the days of being considered a run-of-the-mill OEM. This is the strong message being given to all industries by Zest WEG Group Africa. With WEG Brazil as its parent company, this group has its roots firmly in Africa and its commitment to the continent is without question, especially following the large investments made in 2015 in local manufacturing facilities that will be able to service countries across Africa. Such is the confidence and level of commitment of Zest WEG Group Africa to its customer base that Louis Meiring, group CEO, announced that guarantees have been extended across all WEG products. (See article on page 35).

Enquiries: Kirsten Larkan. Tel. 27(0)11 723 6000 or email kirstenl@zestweg.com

Zest WEG Group Africa: Louis Meiring (Group Chief Executive Officer), Gary Daines (Managing Director, Zest WEG Electric) and Juliano Vargas (Group Logistics and Operations Director).

Zest WEG Group Africa: David Claassen (Executive - Integrated Solutions), Riaan Nel (Sales Manager - Drives & Automation), Francois Labuschagne (Sales Manager, External Sales), Fanie Steyn (Projects and Products Manager) and David Spohr (Head of Business Development).

CLIPBOARD APPOINTMENTS

SMC Pneumatics SA

Yattish Jugaroop, Senior Sales Engineer

Alan Homewood, Product Support Sales Engineer

Shiven Singh, Senior Sales Engineer

Selina Naidoo, Sales Engineer (Johannesburg)

Magnet Projects & Solutions

Dean Lotter, Divisional Head

Myendhren Govender, Business Development Manager

Karen Timms, Sales Representative (Port Elizabeth)

Manny Vieira, Regional Manager

Aurecon

Ferdi Nel, Managing Director

Mabatho Kekana, Head Office Receptionist

INDEX TO ADVERTISERS

DIARY MUSTS

2016 Africa Energy Indaba
16 – 17 February 2016, Sandton Convention Centre, Johannesburg
2016 Africa Energy Indaba is the sister event to the Infrastructure Africa conference. Regional integration will come under the spotlight. The annual African Energy Ministers Roundtable to be hosted at the Indaba will lead with this key issue and will include the financing of Africa's critical energy infrastructure supported by skills development in Africa. This includes the Women in Energy Forum (16 February).
Enquiries: Visit www.siyenza.za.com

Hygienic design of Food Processing Plants
16 – 17 February 2016 (Cape Town)
23 – 24 February 2016 (Johannesburg)
Enquiries: Email andrew.murray@mweb.co.za

Power & Electricity World Africa
15 – 16 March 2016, Sandton Convention Centre
This conference is in its 19th year. It welcomes over 6 000 attendees and hosts a mecca of solution providers spanning three halls and thousands of square metres. This is the place where buyers find solutions to their challenges.
Enquiries: Email tamsyn.briscoe@terrapinn.com

African Utility Week & Clean Power Africa
17 – 19 May 2016
Cape Town International Convention Centre
Running for 16 years, this event is the largest power and water utilities exhibition and conference on the African continent.
Enquiries: Email info@spintelligent.com

POWER-GEN Africa 2016 & DistribuTECH Africa
19 – 21 July 2016
Sandton Convention Centre
POWER-GEN Africa and its sister event, DistribuTECH Africa, will once again provide comprehensive coverage of the power needs, resources and issues facing the electricity generation industries across sub-Saharan Africa.
Enquiries: Email registration@pennwell.com

Electra Mining Africa
2 – 16 September 2016
Expo Centre, Johannesburg
Enquiries :Email leatitiavs@specialised.com

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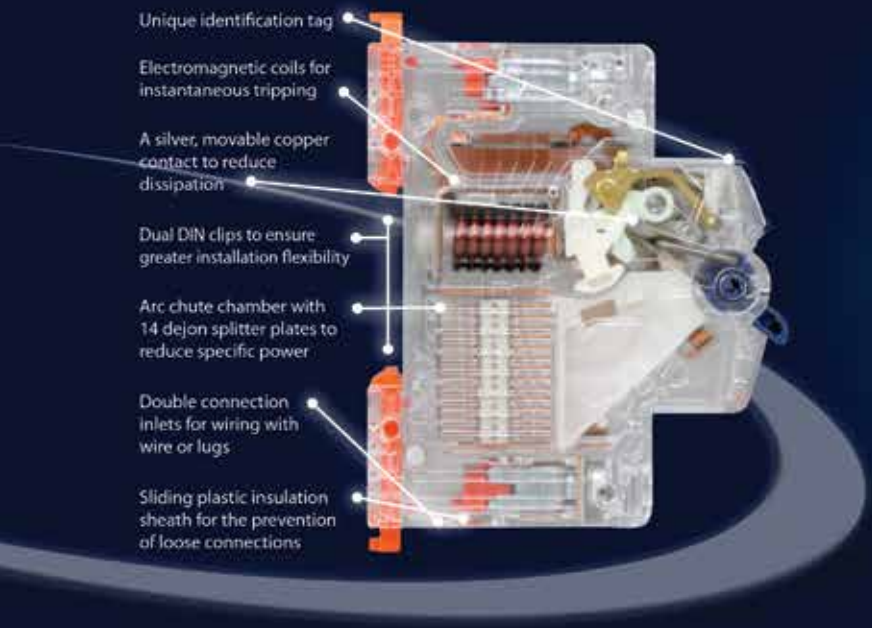

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