02/2017
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I find that many folk see their vision of the future clouded by so much dust in the air. True, the rains have come... but the dust has not settled. And as we watch a peculiar new world begin to emerge, one has to wonder if the dust will ever settle.

However, through this dust, a rather interesting image of Africa is beginning to emerge. As much of the world becomes more insular, there is an indication that Africa is starting to speak to itself.

More than that, I suspect that there will be a number of developed nations, watching the world move politically towards the right, which will begin to develop strategies of working with, and to the benefit of, Africa.

This continent is huge; it is resource-rich – and it is happening.

As fast as we seem to be seeing 'great' nations become more insular, so African nations are beginning to emerge. What will characterise that emergence?

The most significant thing that will characterise Africa for the next 50 to 100 years will be the energy landscape and rapid urbanisation. These bring with them opportunities – opportunities to do things from the start, to do them better than they have ever been done elsewhere.

It also brings real challenges.

Let's be clear ... fossil fuels are part of the mix, massive transmission networks are part of the mix – and so they should be ... all part of the old world charm that lights up developing nations.

Equally, consider that you could drop the whole of France and the whole of Germany into the gap between the major planned transmission networks on this continent, and a different picture begins to emerge – one that speaks to alternative energy sources, and all that is good about them. With that comes a need to rethink the model of energy consumption that has characterised the world for so long.

How exciting!

The biggest human migration in history is happening now, in Africa, as rapid urbanisation continues. It is estimated that urbanisation will increase up to fivefold (and even more) across huge swathes of the continent by 2050.

Imagine the challenge – and opportunity – that this poses? Undoubtedly with that will have to come economic growth – which led to the urbanisation in the first place!

Change is a good thing. But imagine how big this wave will be?

Are we up for it? And will we catch it?

Ian

Ian Jandrell

Pr Eng, BSc (Eng) GDE PhD,
FSAIEE SMIEEE

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Advertising Managers:
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Circulation: Karen Smith

Publisher: Karen Grant

Deputy Publisher: Wilhelm du Plessis

Editorial Technical Director: Ian Jandrell

Quarter 3 (July - September 2016)

Total print circulation: 4 694

abc

Published monthly by: Crown Publications cc

CnrTheunis and Sovereign Sts, Bedford Gardens

PO Box 140, Bedfordview 2008

Tel. +27 (0) 11 622 4770

Fax: +27 (0) 11 615 6108

e-mail: ec@crown.co.za

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Website: **www.crown.co.za**

Printed by: Tandym Print

Electricity+Control is supported by:

CESA

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SAAEs

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ifm's new IO-Link masters are perfect, even for difficult environments. Materials and production methods are identical to the ifm jumper cables of the EVC product series. *Read more on page 23.*

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Evolution of MV Power Cables and Accessories up to 36 kV: *Part 1*

Patrick O'Halloran, City Power Johannesburg

A discussion on the evolution of MV power cables over the last century, and pros and cons of all the different types of insulation materials used for MV power cables.

In South Africa most utilities still install three-core Paper Insulated Lead covered (PILC) cables and are considering three-core Cross-Linked Polyethylene (XLPE) insulated cables. No utilities install three-core Ethylene Propylene Rubber (EPR) insulated cables, although these are extensively used in the mining industries.

This is not the case internationally, where utilities predominantly only install either single, or three-core MV XLPE or EPR cables, and have programmes for replacing their existing PILC cable networks.

All new High Voltage (HV) cable projects in South Africa are single-core XLPE insulated. The old existing fluid-filled HV power insulated cables are being replaced because of the intensive maintenance requirements of these oil pressurised systems. Product evolution has affected all aspects of our lives. Who still uses a typewriter or a pager? These days we have email and smart phones. Technology is changing our lives faster than we could ever have thought possible.

Background

Ever since electricity was first transmitted over MV power cables more than a century ago, their insulation materials and designs have evolved. MV power cable networks make up the biggest asset, which most utilities have to operate and maintain. These MV power cable networks are buried and out of site, unless they become unreliable and faults are experienced. In many cases these networks are run to failure, with very little maintenance or expected life diagnostic testing being conducted.

Utilities need to ensure reliability of supply, hence MV cables designs have also evolved. MV power cable insulation ages as a result of the electrical stress and operating conditions to which it is exposed. Cable experts will remind end users how critical it is not to overload their MV power cables, since increased temperatures are the quickest ageing mechanisms for reducing the remaining life of MV power cables. When MV power cable faults occur, they contribute to large area interruptions of supply, and the fault may take considerable time to be located. This can be very costly to repair. Depending on the MV network design, some faulty cable sections could be quickly isolated, and power restored to the healthy parts of the MV network.

MV power cable design changes have also been driven by changes in switchgear design, higher voltages, and the loads which are required to be transmitted to provide the increased power demands which utilities need to supply. The remaining life of an existing MV power cable network is difficult to predict. However by performing regular condition assessment tests on the existing cables, the degrading results will give utilities a good indication as to when the cable insulation system is reaching the end of its life, and repeated failures can be expected.

Online and off line diagnostic testing can be applied to try to predict the remaining life of our existing installed MV power cable networks.

The impact of theft on MV power cables is now starting to affect the performance of MV networks, and the repeated faults are causing stress on upstream power transformers and associated MV equipment, which is also reducing their remaining life.

Another big concern is the lack of jointer skills needed for repairing all the cable faults utilities experience. Experienced jointers are being lost by utilities, either as a result of retirement, or to other industries. As a result, utilities are forced to make use of contractors to be able to perform the critical joints and terminations. The standard to which jointers should be trained, and who is competent to provide the required training, remains a thorny issue.

Introduction

The first power distribution system was developed by Thomas Edison in the early 1880s in New York City. This used a cable constructed from copper rods, wrapped in jute and placed in rigid pipes filled with a bituminous compound (see *Figure 1*).

Figure 1: First power cable – developed by Thomas Edison in the early 1880s.

Although vulcanised rubber had been patented by Charles Goodyear in 1844, it was not applied to cable insulation until the 1880s, when it was used for lighting circuits. Rubber-insulated power cable was first used for 11 000 Volt circuits in 1897 when it was installed in the Niagara Falls power project. Mass-impregnated paper-insulated, lead-covered, medium voltage cables only became commercially practical by 1895. During World War II, several varieties of synthetic rubber and polyethylene insulation started being used in MV

power cables. By the late 1960s XLPE insulation was introduced for MV power cable insulation, and this technology significantly changed MV power cable systems. However, like any new technology, this had many teething problems. Manufacturers spent a great deal of time and money in resolving the problems which were experienced in the industry with the first generation XLPE insulated cables.

The MV power cables currently available in South Africa are all manufactured and tested to stringent standards published by the South African Bureau of Standards (SABS). These standards are reviewed periodically, and the following SABS South African National Standards (SANS) are compulsory for MV Power Cables in South Africa according to VC 8077 [1] (Compulsory specification for the safety of medium voltage electric cables)

- SANS 97 [2]: Electric cables – impregnated paper-insulated metal-sheathed cables for rated voltages 3,3/3,3 kV to 19/33 kV (excluding pressure assisted cables)
- SANS 1339 [3]: Electric cables – XLPE insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV

In addition to the above standards, the Electricity Suppliers Liaison Committee (ESLC) has published the NRS 013 [4] specification for MV cables. This specification makes recommended rationalised options for PILC and XLPE MV power cables used by utilities.

MV power cable construction

The construction of the compulsory MV power cables needs to be clearly understood to be able to grasp the major technical differences between the two technologies. Both technologies are available in single or three-core, and as unarmoured or armoured. The conductors are either stranded Copper or Aluminium, depending on the end user's preference or power needs. The Copper conductor has been preferred over Aluminium for many good reasons, but not cost. The extruded outer sheaths vary depending on the final applications. Polyvinyl Chloride (PVC) is typically flame retardant but can also be low-halogen for mining applications.

Cables intended for underground use, or direct burial in the ground, will have heavy plastic or metal, most often lead sheaths, or may require special direct-buried construction. When cables must run where they could be exposed to mechanical impact damage, they may be protected with flexible steel tape or wire armour. A water resistant polyethylene outer sheath covers new XLPE cables. PILC MV power cables are insulated with mass impregnated paper insulation, and XLPE MV power cables are insulated with XLPE insulation. These two insulation materials are very different in many ways. PILC MV power cables have been around for more than 100 years, and subsequently make up the prominent installation base in South Africa, as well as internationally. These cables have had many design changes over the last 100 years. Many of these cable improvements were to make the cables' performance more reliable at higher voltages. When PILC MV power cables were first utilised they were only used on 6,6 kV or 11 kV voltages.

> *City Power has changed its MV power cable specifications to longitudinally water blocked XLPE insulated cables.*

EHV	– Extra High Voltage
EPR	– Ethylene Propylene Rubber
ESLC	– Electricity Suppliers Liaison Committee
HV	– High Voltage
MIND	– Mass Impregnated Non-Draining
MV	– Medium Voltage
PD	– Partial Discharge
PIB	– Polyisobutylene
PILC	– Paper Insulated Lead Covered
PVC	– Polyvinyl Chloride
SABS	– South African Bureau of Standards
SANS	– South African National Standards
TR	– Tree Retardant
VLF	– Very Low Frequency
XLPE	– Cross-Linked Polyethylene

Abbreviations/Acronyms

Figure 2:
Typical three-core PILC MV power cable.

Paper insulation on its own does not provide a good enough insulation for power cables for the following reasons;

- Absorbs atmospheric moisture
- Susceptible to cracking with ageing
- When continuously subjected to local ionisation (partial discharge) during load cycling can result in irreparable damage during cable handling

The paper insulation is currently impregnated with a non-draining compound. They are now referred to as Mass Impregnated Non-Draining (MIND) cables. In the past the oil-based compounds used were susceptible to draining (e.g. rosin oil). When the compound drained as a result of gravity and temperature, the paper insulation would dry out, and many failures at terminations were experienced.

There are two types of 'non-draining' compounds used by various manufacturers:

- Compound processed from a mineral based amorphous crystalline wax
- Recently, a synthetic compound better known as Polyisobutylene (PIB) compound

However, three-core cables have sector-shaped conductor and initially had a 'Belted' construction design, and one of the first improvements was to introduce an 'individually screened' construction. This design equalises electrical stress on the cable insulation. Martin Hochstadter patented this technique in 1916. The Screen is sometimes called a 'Hochstadter Screen'. The individual conductor screens of a cable are connected to earth potential at the ends of the cable, and at locations along the length if voltage rise during faults would be dangerous. When a cable is screened, it can be touched safely without the risk of a potential build up occurring.

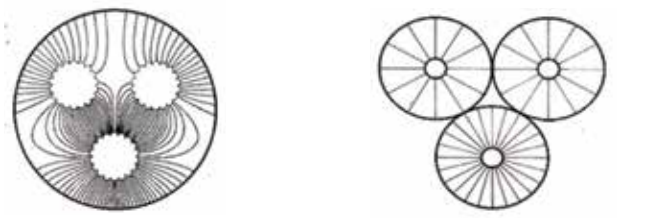
Unscreened Belted design is a three-core cable, in which additional insulation (the belt insulation) is applied over the laid-up core as-

sembly. If air is introduced in a belted designed cable, the potential for Partial Discharge (PD) to be initiated is increased. This is typically what happens at dry type terminations. If the air is removed, such as in a compound-filled cable box or in joints, no PD should occur, and therefore no crutch failure.

Screened cables are cables which, ensure that the radial electric field surrounding the conductor in each core is individually screened and contained in the core insulation, (by a non-magnetic conducting tape that is in electrical contact with the metal sheath). In the case of three core cables, in direct contact with the screens of the other two cores. The risk of a crutch failure is reduced with this type of screened cable design. Special steps must be taken to ensure that the electrical stress at the ends of the core screens are graded to prevent PD. Typically, stress relieving mastic or stress control tubes are used.

Belt papers are removed when jointing and terminating. This reduces the phase voltage to earth to 5,5 kV at all accessories. Screened designed cables are therefore more reliable when being jointed or terminated and only earth faults, rather than symmetrical faults, can be expected (i.e. lower fault currents).

In *Figure 3* (1) the electric field lines in belted unscreened and individually screened three core cables can be seen.



(1) Unscreened (Belted) **(2) Screened**

Fiigure 3: Unscreened (belted) cable and Screened cable PILC MV power cable.

Unscreened cable (belted design) insulation comprises core paper insulation and belt paper insulation

- Only 'collectively' screened
- Reduced core insulation when compared to screened cables
- Only up to 11 kV

Many of these cable improvements were developed to make the PILC cable performance more reliable at higher voltages. When PILC MV power cables were first used, they were on 6,6 kV or 11 kV voltages only. For voltages above 11 kV only screened designed cables are available.

All single-core PILC cables have round conductors and an individually screened design. PILC MV power cables are highly susceptible to moisture ingress. Once moisture has penetrated through the lead sheath, the paper insulation is rapidly affected, leading to insulation failure. This moisture quickly travels down the cores, and eventually affects a larger section of the PILC MV power cable. It is therefore critical to prevent moisture from entering the cable at all costs. It is also then very important to perform a moisture crackle test on the paper insulation prior to any joint of termination being installed. If moisture is detected, the cable with moisture ingress should be replaced to prevent further failures. It is also therefore critical that the PILC MV power cables are sealed at all times with the appropriate sealing caps. The sloppy use of a plastic bag or a plastic half litre cold drink bottle is not acceptable and will lead to moisture ingress.

XLPE insulated MV power cables have not been around for as long as PILC MV power cables. When XLPE insulated power cables were first manufactured in the late 1960s, they experienced many premature failures in the field. These failures were due to incorrect manufacturing processes, leading to the presence of impurities and contaminants within the XLPE insulation. These failures gave XLPE insulated MV power cables a poor reputation in the industry. In South Africa most utilities rapidly changed back to PILC MV power cables.

Figure 4: Typical single and three-core XLPE insulated MV power cables.

Subsequently the XLPE insulation cleanliness, designs and manufacturing production process technologies have evolved considerably. The manufacturers began to understand what was important when it came to making XLPE cables more reliable, with extended life expectancy. The three critical layers in XLPE insulated MV power cables are now applied at the same time and referred to as triple extruded. These three critical layers are;

- The conductor screen which is at U_o phase voltage
- The XLPE insulation
- The core screen which is at 0V (needs to be kept at earth potential)

The conductor and the core screen are both made of semi-conductive materials and the XLPE insulation is the pure insulating material. XLPE insulated cables always have a screened design and are round to ensure the equal stress distribution in the XLPE insulation.

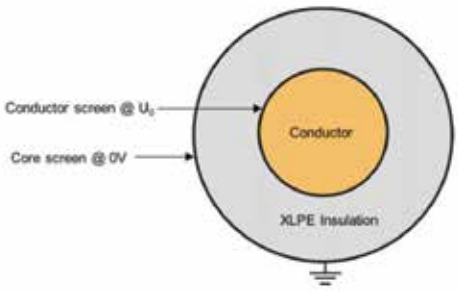


Figure 5: The three critical layers in a XLPE insulated MV power cables which are applied as a triple extrusion.

Further improvements have been made with regards to the XLPE insulation materials and for MV power cables Tree Retardant (TR) XLPE compounds. (TR-XLPE) is now utilised to successfully pass the

wet ageing type test and required breakdown strength criteria, which are specified in SANS 1339 [3]. The quality of XLPE insulated cables is so high that it is becoming the preferred insulation at 500 kV, since XLPE insulation has lower dielectric losses and higher operating temperatures. This means higher ampacities and lower environmental impact. Un-aged XLPE insulation for MV power cable has a typical breakdown strength of 50 kV/mm.

City Power has changed its MV power cable specifications to longitudinally water blocked XLPE insulated cables as a standard. The concept is like a baby's nappy, where water swell-able compounds and tapes are included in the areas where water could flow in the cable once it has entered in the cable for whichever reason (damage sheath, lugs, existing cables, storage, etc.)

The water penetration type test, as per SANS 1339 [3], shall be conducted to prove the design. This design will extend the life of the cable since when water enters, it is stopped at that point. This then also prevents the old problem of XLPE cables becoming water pipes. Areas in a three-core XLPE cable, which have to be water blocked, are:

- Conductors
- Core(s) and metallic screening
- Laid up cores for three-core designs
- Armouring

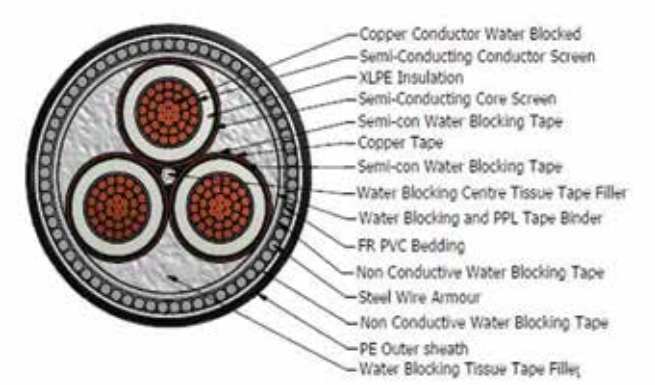


Figure 6: CBi Electric African Cables longitudinal water blocked XLPE MV power cable design.

The international trend is to use single core cables rather than three core cables. This is because it is simple and easy to longitudinally block a single core cable, since it does not have the large fillers between the cores. The risk of moisture entering all three phases is also reduced when three single core cables are utilised, as compared to a three-core design.

The first 400 kV Extra High Voltage (EHV) XLPE insulated cable was installed in South Africa early in 2014. The cables and the accessories were imported for this project. Our local market leading HV cable company has invested in a new EHV XLPE production line to be able to manufacture cable up to 275 kV. This is really exciting for future projects and we will no longer have to import 275 kV EHV cable. We are also able to purchase HV cables with conductor sizes up to 2 500 mm^2.

The risk of dc pressure testing is also better understood these days, and it is no longer recommended to use dc pressure test equipment on XLPE insulated MV power cables. Dc pressure testing has been proven

take note

- The first power distribution system was developed by Thomas Edison in the early 1880s.
- MV power cable design changes have been driven by changes in switchgear design, higher voltages, and the loads required.
- The impact of theft of MV power cables is starting to affect the performance of MV networks.

only to test the resistive properties of the cable, and at the end of the day is not really effective. Dc pressure testing has been around for many years, like PILC cables, but is slowly being replaced by ac, DAC and VLF source test equipment. Ac source test equipment tests the permittivity properties of the cable systems.

Part 2 of Evolution of MV Power Cables and Accessories up to 36 kV will be published in Electricity+Control, March 2017.

Patrick O'Halloran has a Bachelor's degree in Heavy Current Electrical Engineering from the Witwatersrand Technikon (1996). Patrick previously worked for Schneider Electric as the MV product manager and Tyco Electronics as the regional sales manager for Africa. He is presently employed by City Power as the Chief Engineer, Plant Condition Monitoring, responsible for advising City Power on best ways to detect Partial Discharge and prevent future failures. Patrick is a senior member of the South African Institute for Electrical Engineers (SAIEE) and is currently a member of the SAIEE council and has been the chairman on the SAIEE Power Section and Young members committees. Patrick is currently the chairman of the South African NRS Association Committee where he represents City Power. He represents City Power, AMEU and the SAIEE on numerous IEC, NRS, SABS and CIGRE technical committees. Patrick was awarded the SABS/ESKOM NRS award for his exceptional contributions to standardisation through participation in NRS work.
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Sean Laval, Comsol Networks

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Unfortunately, measurement (especially remote measurement) has always been a costly endeavour, and therefore has mostly been limited to the realm of higher value applications. In addition to this, the high power consumption of long-range wireless measurement devices has restricted their use mainly to scenarios where a constant power supply is available, or where the device can be easily recharged periodically. Often however, there is a comprehensive requirement to measure and control points in a system that do not have access to a readily available power supply and/or are positioned such that recharging or replacing batteries proves prohibitively time consuming and expensive.

For applications such as these, system developers have traditionally been faced with an uncomfortable trade-off between communication range, battery life and system complexity. As you read this, a new wave of wireless network technologies is already solving this age-old conundrum, combining the coverage benefits of a cellular-type network with the low power consumption typically reserved for short-range, low-bandwidth wireless communication. In addition to this, the network technology has been engineered from the ground up to offer low hardware and connectivity costs, robust security, flexible scalability and extremely low barrier-to-entry.

LPWA networks are upon us, and if you have not heard about them yet, you will soon (very soon if you continue reading this article).

What is a LPWA network?

The performance of any communication medium is measured by many criteria, depending on the features that are most critical to each specific application. In the case of the vast majority of sensing, metering and control applications, blistering data transmission speeds are fairly low down the list of priorities. At its core, low power wide area networks achieve their superior performance by trading high data rates for increased receiver sensitivity, which equates to greater communication range. This relationship was well documented by Ralph Hartley and Claude Shannon in the 1940s, which later became the known as the famous Shannon-Hartley [1] theorem. The theorem implies that, all things being equal, the lower the capacity of the communication channel (bits/sec), the lower the required Signal-to-Noise Ratio (SNR) needed to successfully decode a data packet. This translates directly into increased communication range and penetration in the radio world.

Machina Research, a leading analyst in the field of LPWA technology, defines a low-power wide area network as follows:

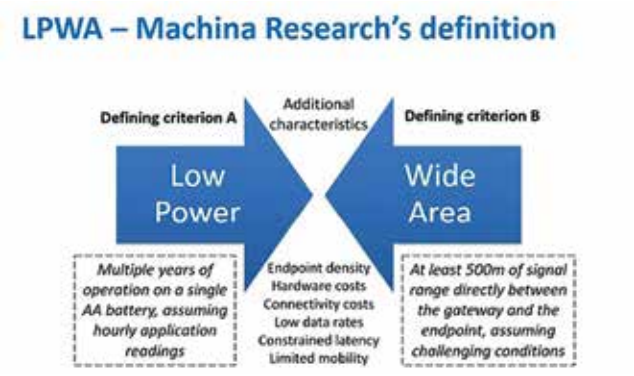


Figure 1: Definition of a LPWA network – Machina Research.

It is clear from the above definition that a LPWA network is not ideally suited to every application, but to those that it is well suited, it immediately stands out as the technology of choice to achieve ubiquitous and secure low-power connectivity. LPWA networks have been designed from the ground up with 'low power', 'long range' and 'low cost' as cornerstones, targeted at the rapidly growing demand for wirelessly connected devices that require extended battery life. By reducing data rates (as low as 293 bps in some cases), LPWA networks can communicate at a range of up to 15 km, using transmission power comparable to a handheld gate remote (25 MW).

ADR – Adaptive Data Rate
AES – Advanced Encryption Standard
GSM – Groupe Speciale Mobile
IoT – Internet of Things
LPWA – Low Power Wide Area
M2M – Machine-to-Machine
R&D – Research & Development
SNR – Signal-to-Noise Ratio
TCP/IP – Transmission Control Protocol/Internet Protocol
WAN – Wide-Area Network

Abbreviations/Acronyms

Leading industry research [2] predicts that globally, there will be approximately three billion devices connected to LPWA networks by 2023. The anticipated mass adoption of this technology is set to drive down hardware costs, densify network coverage and promote healthy competition among service providers.

> *'I desire fewer measurement points to analyse and act upon' – said no engineer, EVER.*

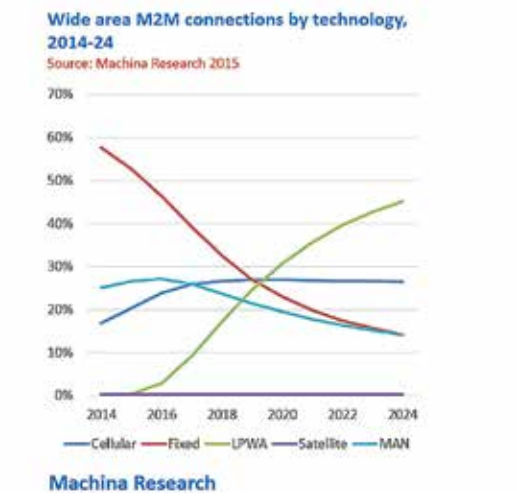


Figure 2: Predicted growth of LPWA networks [3].

How LPWA networks will benefit industry

There are countless solutions already available to address the wireless sensing and control market, some of which have been in operation for many years, with good operational track records. The move towards LPWA networks should not be viewed as a drastic shift from current methods, but should rather be seen as the next evolution in wireless data collection techniques, based largely on widely available and trusted technologies. In fact, several leading products currently employing LPWA radio technology have come from trusted manufacturers (www.homeridersystems.com), who are well-positioned in the wireless telemetry market, but have recognised the vast array of benefits associated with utilising LPWA networks.

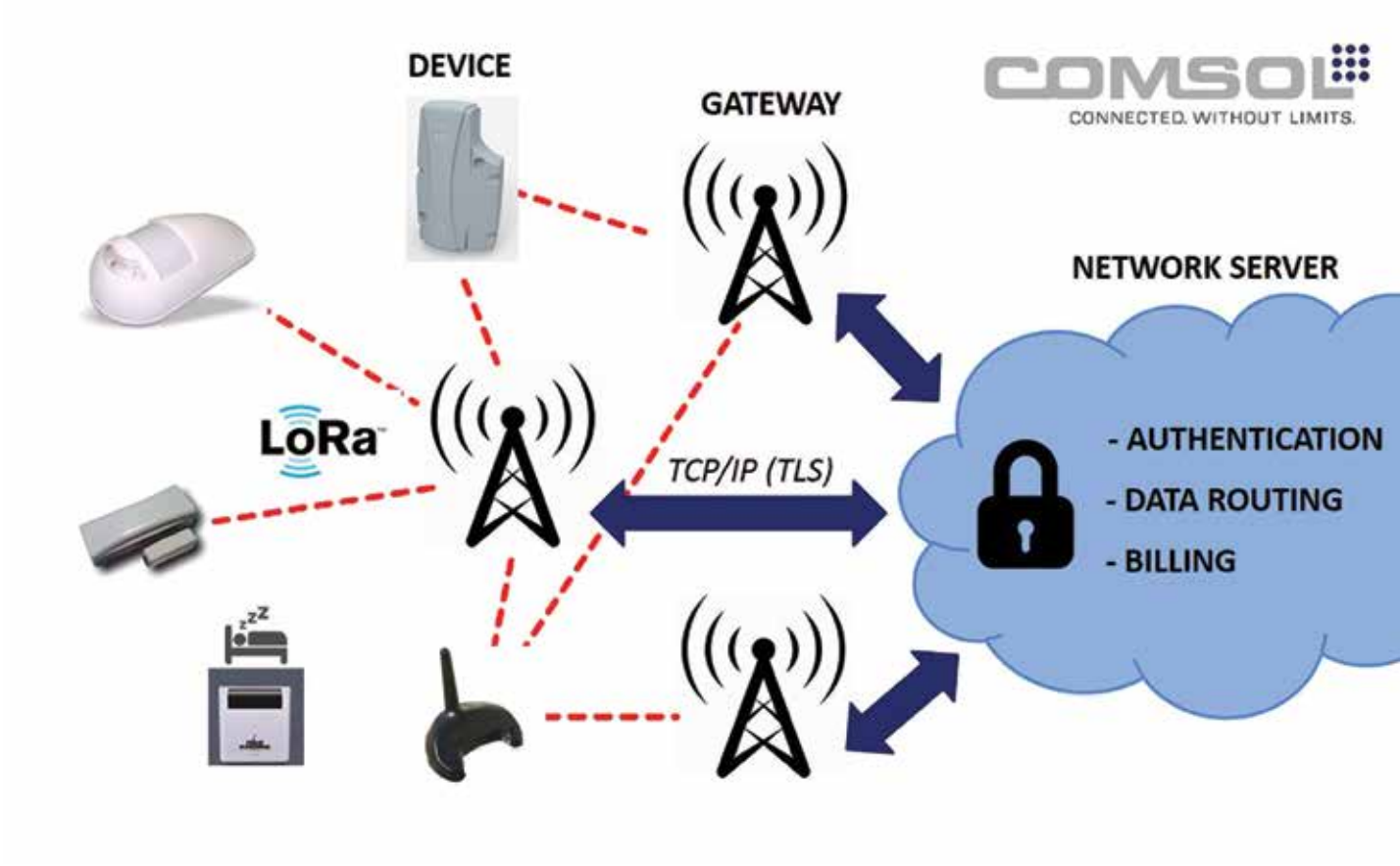
A major benefit of LPWA radio networks over traditional short-range deployments is the fact that each transmission is generally received by more than one network concentrator (usually several) simultaneously, thereby adding redundancy to the network. This is a powerful feature of distributed asynchronous networks, and is known as 'spatial diversity' – which decreases susceptibility to interference, mitigates fading effects, and substantially increases the statistical probability of successful packet reception [4]. Another major paradigm shift that LPWA systems offer over current low-power solutions, is the ability to preconfigure a device for network connectivity, without requiring detailed knowledge of the final deployment location of the device i.e. proximity to nearest proprietary network concentrator or mesh node. For applications requiring low data throughput, LPWA networks offer a solution that has the ubiquitous coverage of GSM/3 G, with the low device cost and battery life (> 10 years) of short-range wireless systems. Essentially, the best of both worlds! Companies no longer need to deploy their own proprietary low-power networks, but can rather leverage off a dedicated network provider, freeing them from the burden of managing complex communication platforms, and allowing them to focus on core operations. In addition to this, LPWA network providers are able to amortise capital investments and offset operational costs by addressing the entire Internet-of-Things (IoT) market (municipal, industrial, enterprise and consumer). This results in wide coverage and competitive pricing, offering the lowest total cost of ownership to users and solution providers.

The mass adoption of LPWA technology will promote greater standardisation between device manufacturers and vendors. Once the ecosystem is in place, users will have the option to replace underperforming devices with a competing brand, without sacrificing network connectivity or operational integrity, provided the replacement device is supported by the user's back-end software applications. This will help stimulate healthy price competition in the device market and enforce accountability. In parallel to this, device manufacturers will benefit from a reduction in core component costs due to economies-of-scale, as LPWA technology is widely adopted globally.

If LPWA networks are so powerful, where have they been?

Very little is 'new' when it comes to LPWA network technology, and one could argue that the capability to implement such networks has been around for many years. The emergence of LPWA networks is analogous to that of GSM networks in the early 90s. Long range two-way radios were extensively used as far back as World War II, but it took another 40 years for batteries, semiconductors and manufacturing techniques to advance to a point where mass adoption of cellular technology started to become technically and economically feasible. This encouraged cooperation in a highly fragmented sector, eventually culminating in the formation of the Groupe Speciale Mobile (GSM) [5] in 1982, which standardised the GSM protocol. This paved the way for mobile network operators and technology companies to invest a large amount of resources into network deployment and handset development. The rest, as they say, is history.

Machine-to-Machine (M2M) systems have steadily gained traction over the years, with solutions generally focussed at selected business verticals. The cost and power consumption of sensors and



semiconductor components has fallen sharply over recent years, whilst battery technology has steadily improved. These phenomena can be largely attributed to the mass adoption of smart phones, resulting in aggressive international competition and accelerated R&D cycles. The reduction in price, coupled with higher integration of core components and extended battery life, is quickly opening up new opportunities for connected devices. In order to effectively address this rapidly growing market, it is clear that a new communication platform is required.

Much like the collaboration between telecommunication leaders in the 80s to establish GSM, there has been large-scale industry collaboration to create LPWA standards, especially over the past three years. This has resulted in the establishment of several reliable, secure and commercially viable LPWA network platforms.

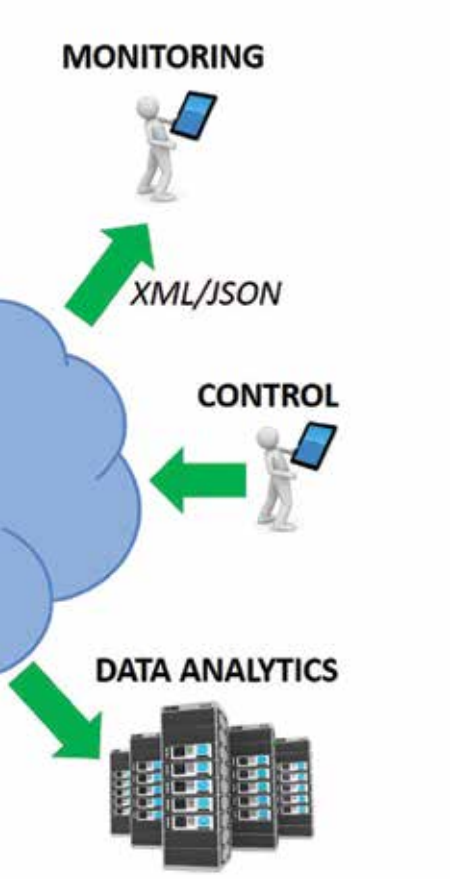
Figure 3: LPWA networks address the need for ubiquitous long range, low-power communication.

Open Access LoRaWAN network – a game changer

Comsol Networks has selected LoRa as the technology behind their LPWA network. The company has embarked on the largest roll-out of a LoRa Wide-Area Network (LoRaWAN) in Africa to date, aiming to cover four major metropolitan areas in Q1 2017, with more to follow. This company is not alone. National LoRa networks have already be deployed, or are being deployed in countries around the world. Notable examples are South Korea, Holland, France and the US, but the list is virtually endless. LoRaWAN will not be the only LPWA network technology available in South Africa, but it offers a unique set of features that set it apart from other options. The protocol was developed by global network and radio communication leaders in the form of IBM and Semtech respectively. LoRaWAN is a fully documented open protocol, which is overseen and managed by an international consortium known as the LoRa Alliance (www.lora-alliance.org). Membership to the alliance is open to any organisation, and today the alliance boasts more than 400 members worldwide, including some of the largest brands in the technology sector.

The LoRa modulation scheme uses advanced spread-spectrum techniques and forward error correction to minimise susceptibility to co-channel interference, allowing the receiver to decode signal levels well below the ambient noise floor. The Adaptive Data Rate (ADR) feature of the network dynamically adjusts the communication data rate (293 bps up to 5 kbps) of devices based on the received SNR, reducing unnecessary time-on-air, and resulting in longer battery life and greater network capacity. The bi-directionality of the LoRaWAN network allows for wireless actuation of devices in the field, as well as the remote updating of settings, or targeted bug fixes. Comsol's LoRa network operates within the 868 MHz licence-free spectrum, offering good range and penetration, whilst keeping antenna sizes within practical limits.

All transmissions within the network are secured via 128-bit AES encryption on both the network and application layers. Payload data received by the network is translated and presented to the user's application layer via a secure TCP/IP socket, in a variety of easily us-



able formats. LoRa has a rich development ecosystem encompassing chipsets, modules and software stacks, as well as a diverse selection of commercially available devices, with many more expected to become available throughout 2017.

Conclusion

LPWA networks are set to be a disruptive force, with endless application possibilities. Solution providers in the areas of remote measurement and control, stand to benefit greatly from the LPWA wave that is sweeping the globe. As resources become scarcer and more expensive, it is imperative that industries are able to properly monitor and manage as many points of interest as possible. LPWA networks are the ideal technology to facilitate mass deployment of Cloud-connected sensors, meters and actuators, ushering in a new era of industrial intelligence and agility.

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take note

- LPWA networks are set to become a disruptive force in the world of remote monitoring and control.
- The move towards LPWA networks should not be viewed as a drastic shift from current methods.
- LPWA networks should be seen as a positive move in wireless data techniques.

Sean Laval holds a Bachelor's degree in Electrical and Electronic Engineering Science from the University of Johannesburg, with 10 years of experience in component-level embedded system design, primarily involving GSM/3G and short-range wireless technologies. He currently oversees the deployment of Comsol's national LoRa network.
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Ster Kinekor is a cinema company based in Sandton, Johannesburg, South Africa

Connectivity Not Assured without a Dual Medium Fibre Approach

Brad Fraser, InfoProtect

High levels of cable theft have led to a more advanced approach that has been adopted to reduce loss in connectivity.

The universal adage that time is money has never been more accurate. In the current ultra-modern age, where technology is driven by daily innovation, any business seeking success simply cannot afford to be offline, or fall behind with its information technology infrastructure.

With high levels of cable theft, volatile delivery and frequent loss in connectivity, a more advanced approach is required, ensuring more reliable and consistent connectivity, making businesses more productive, with fewer frustrated employees and customers, and a positive bottom line.

When InfoProtect was approached by Ster Kinekor, the entertainment giant was experiencing major problems with its IT infrastructure and the technology being used. With a constant loss in connectivity, the network was unreliable since both primary and secondary connections were copper based.

The key is to operate in two different mediums. When both mediums are copper (such as Telkom offers), if there is a problem, the chances are you will lose both connections. However, with fibre as a primary line, and wireless or ADSL as a back-up, the two can run independently from one another. If the fibre line goes down, the client will not know, because the ADSL or wireless line will automatically take over. The key is reliability – and for that, fibre is the perfect solution. It is a fast, reliable connectivity medium, which offers a point-to-point, synchronous connection (meaning that the download and upload speeds are the same). This approach suited Ster Kinekor. The company was looking for a cost effective solution. It had also become imperative that the corporate WAN be upgraded to a highly available, burstable and vendor agnostic fibre solution.

The previous WAN solution comprised a mixed bag of 1 Mb Diginet link, with some sites on 2 Mb or DSL. This network was non-guaranteed, plagued by many outages and a great amount of downtime – sometimes lasting up to three weeks on some links. At any given time, there would be about three to four links down. Running at only 80 to 90% utilisation, the network was incredibly slow with no option to increase links.

With the understanding that a reliable WAN infrastructure is the vein that carries the life-blood of any organisation, and to tackle these challenges, a dual-medium network solution was recommended and this has eliminated Ster Kinekor's connection woes. The timelines to switch from MTN and VOX to InfoProtect were very, very tight (being three months). The network was upgraded to a highspeed fibre network countrywide, with the ability to burst up to 100 Mb per site, if required. DSL or wireless failover lines in an ACTIVE /ACTIVE set-up were included so that both links could be used at the same time.

With a managed service, Ster Kinekor is assisted with all maintenance and ongoing installations as it continues to expand with new

ADSL – Asymmetric digital subscriber line
CCTV – Closed Circuit Television
DSL – Digital Subscriber Line
ISP – Internet Service Provider
IT – Information Technology
MTN – Mobile Telephone Network
SLA – Service Level Agreement
UPS – Uninterruptible Power Supply
VESDA – Very Early Smoke Detection Apparatus
VOIP – Voice Over Internet Protocol
WAN – Wide Area Network

Abbreviations/Acronyms

> *The majority of cinemas now make use of fibre as primary connectivity, with Wireless or ADSL acting as the failover.*

cinemas, such as at the Mall of Africa. Delivering connectivity to cinemas situated within shopping centres, in particular, can be challenging due to the different rules and regulations that the respective management teams might impose on suppliers.

In terms of support, it is crucial to manage everything from site visits to centre management, especially when trenching to install fibre. This is intrusive work, with various health and safety compliance requirements. Landlords are wary, mall management must be consulted when undergoing revamps, and sometimes extensions to the buildings themselves are required.

For the existing sites, the WAN solution was designed with the availability of the infrastructure already confirmed, ensuring effective planning. The network is designed to offer redundancy and to have few to no points of failure. To achieve this, there are two completely separate networks deployed (primary and secondary). Each of these networks use different ISPs and infrastructure to connect the cinemas and head office to each other, and to the outside world.

The majority of cinemas now make use of fibre as primary connectivity, with Wireless or ADSL acting as the failover. In areas where fibre is not available, the cinemas make use of Wireless (licensed) as their primary connectivity, to ensure the best possible network uptime and experience at predefined critical sites.

The benefits of this approach are that the cinemas now all have uncapped internet, including international traffic, while the failover ensures consistent uptime. The network is resilient, and is driven by a fibre backend. The use of multiple internet breakout providers for each network results in a 1:1 contention. With full-time, around the clock monitoring, the networks are fully managed.

For the effective management of the firewall and router, all devices are managed and connected to the Network Operations Centre for early warning in the event of a connection being dropped. The firewall and routers are Juniper and Mikrotik respectively and were configured according to specifications before deployment. The benefits of this approach include fully managed devices that are reconfigured for deployment, constant monitoring and support, and no in-house skills are required within the customer's workforce.

The solution is proactive; informing the customer whenever there is an error on a line, confirming that the secondary line became active and that connectivity was not lost. It is always important to offer customers continuous added value. Additional enhanced services are available, by virtue of the WAN solution, which include managed off-site back-ups, full server hosting (physical or virtual), hosted lync, hosted SharePoint, hosted exchange, VOIP, and disaster recovery and business continuity. An innovative Data Centre offers guaranteed power by drawing electricity directly from the National Grid and a series of backup measures - including two Uninterruptible Power Supply (UPS) systems and backup generators. This to ensure continuity of service in the event of external problems. The result is: resilient connectivity; complete protection through climate control and Very Early Smoke Detection Apparatus (VESDA); rigorous security via CCTV monitoring, professional security staff, and access control; and a Network Operations Centre which monitors all dc and network activity and is manned by expert engineers.

The general Service Level Agreement (SLA) is considered a 'Financially backed SLA'. In terms of the solution prepared for Ster Kinekor, the fibre network adheres to a 99,5% uptime guarantee, 90% speed guarantee, a latency guarantee and a packet-loss guarantee. As such, and in the unlikely event that the customer suffers any downtime, lack of network, or infrastructure unavailability, Ster Kinekor shall receive a credit on their account.

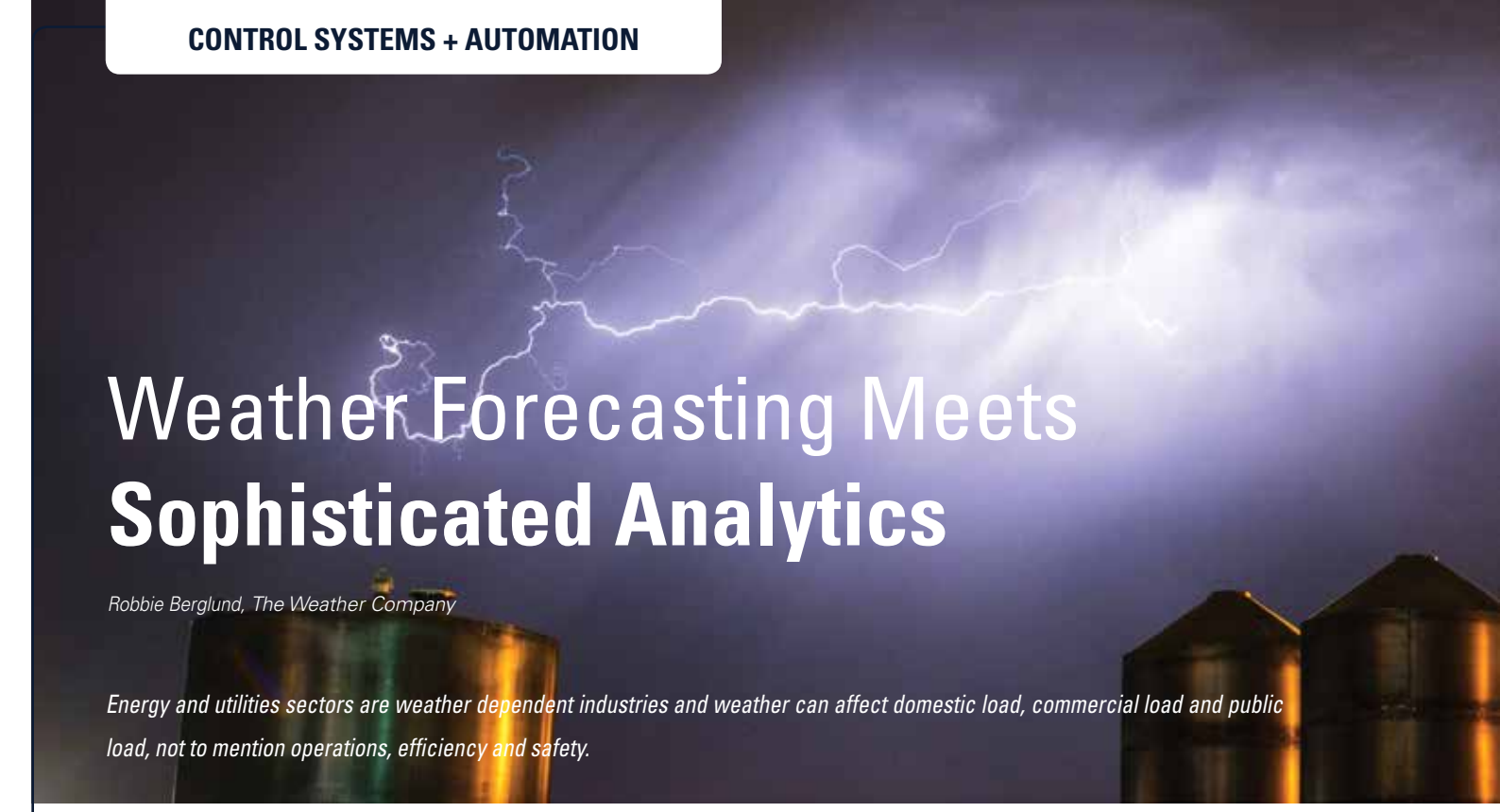
Conclusion

Ster Kinekor believes it is in good hands. A major part of this agreement is the fact that it can exit the agreement within 30 days if the guaranteed service levels are not maintained. This is a huge statement and goes to the confidence and support levels that the company stands by.

take note

- Ster Kinekor was experiencing problems with its IT infrastructure and technology.
- Fibre is a fast connectivity medium which offers a point-to-point synchronous connection.
- This approach suited Ster Kinekor which was seeking a cost-effective solution.

Brad Fraser is the Chief Executive Officer at InfoProtect. He seeks to achieve constant improvement through principles that are universal, timeless and self-evident. He has been instrumental in finding effective solutions to challenges in Enterprise Mobility, Connectivity, Data Centre Hosting Services, IT Security, Data Back-ups, Disaster Recovery and IT Outsourcing in large enterprises. Enquiries: Email brad@infoprotect.co.za



Weather Forecasting Meets **Sophisticated Analytics**

Robbie Berglund, The Weather Company

Energy and utilities sectors are weather dependent industries and weather can affect domestic load, commercial load and public load, not to mention operations, efficiency and safety.

Weather can potentially impact every person, and every business, on the planet, every day. When a company's profitability is dependent on weather, accuracy and insight can be paramount to success… not to mention the effect weather can have on utilities and industry.

An inexact – but critically important – science

Historically, load forecasting – in essence, predicting utility demand and consumption – has been a complex and uncertain process. The ability to accurately forecast load can help inform mission-critical decisions across all operations, from electric power generation and purchasing, to load switching, infrastructure and even staffing. In fact, forecasting, whether it's effective or not, can have ramifications for all entities involved in energy generation, transmission, distribution, marketing and financing.

One reason load forecasting has been challenging is that there are multiple variables to take into account. These include time (hour of the day, day of the week, weekday vs. weekend, and holidays); population usage (types of customers, increased or decreased numbers of customers, and changes in usage); special events (local, national or international); and current, recent or projected energy prices.

That said, weather is arguably one of the most important pieces of the puzzle.

Sunny with a chance of increased load

Extreme weather is often referred to as 'an act of God'. No one can predict the weather with absolute certainty. But, weather conditions can significantly influence load, which in turn, may significantly influence performance and profitability. Variables such as temperature and humidity have a direct correlation with energy consumption for cooling and heating.

Two standard industry measures, THI (Temperature-Humidity Index) and WCI (Wind Chill Index) are used by most utility companies. But other variables are important as well. Visibility, precipitation and cloud cover can also affect consumption. As can whether temperatures are above- or below-average, and how long a particular heat wave or cold snap lasts. Quite simply, we believe accurate load forecasting depends on accurate weather forecasting.

Leveraging accurate weather forecasts and data analytics

At The Weather Company (further referred to as 'the company'), an IBM Business, significant investments have recently been made in both:

- An improved weather forecasting system
- Data science capabilities

The resulting system was designed to create an industry leading product that provides accurate, timely, and spatially resolute weather forecasts while expertise in the latter allows us to convert these accurate weather forecasts into user-friendly products for clients in the utility and energy trading businesses.

The Load Forecast feature of our flagship, WSI Trader, is anchored in advanced and proprietary weather and data science. In our experience, good load forecasts are strongly dependent upon good weather forecasts. The company's weather forecasting engine (Forecasts on Demand, or FoD) is an automated system that produces hourly forecasts for all of the most relevant weather variables (e.g., temperature, dew point, wind speed, precipitation, cloud cover, snowfall) at 4- m spatial resolution across the globe, allowing for hyper-local insight – of particular value to ISOs.

Improved models can help improve load forecasting

Thes company's FoD forecasts are a skill-weighted blend of available weather models, including the ECMWF, GFS, and NAM models (deterministic and ensemble), along with GFS MOS and the company's proprietary high-resolution weather model (RPM).

Weights are assigned to each model based on the optimal combination of bias-corrected model forecasts over the most recent weeks. The first few hours of the forecast period are 'forward-corrected' based upon the latest observations.

Load forecasting comes of age.

ECMWF – European Centre for Medium-Range Weather Forecasts
FoD – Forecast on Demand
GFS – Global Forecast System
ISO – Independent System Operators
NAM – North American Mesoscale
RPM – Rapid Precision Mesoscale
THI – Temperature-Humidity Index
WCI – Wind Chill Index

Abbreviations/Acronyms

The two components of modern-day weather forecasting are:

Intelligently using all available computer weather model forecasts to provide the most accurate automated forecast

Having an expert and experienced local human forecaster who knows the 'local flavour' of the weather and can add further value (and better accuracy) than even the best 'machine' forecast

For South Africa specifically, the company employs the best weather forecasting models, including the European Centre for Medium-Range Weather Forecasting (ECMWF) model, the Global Forecasting System (GFS) model and its proprietary high-resolution Deep Thunder model. Given its high spatial resolution and advanced physics, the Deep Thunder model is able to handle the localised weather features that are unique to South African weather, from the daily ocean breezes in coastal regions to the unique circulations associated with the mountainous regions. Once the best forecasts are extracted from the stream of the various weather forecasting models, an experienced human forecaster is needed to improve the forecasts further. While weather forecasting models are quite good, there are still flaws that the expert forecaster can exploit, especially in extreme weather.

The Weather Company

Cognitive computing helps you outthink the weather

To convert weather data into useful load forecasts, data scientists developed a comprehensive set of self-learning neural networks for predicting load in different ISO zones. For each zone, more than 100 neural networks were trained using actual weather conditions.

Individual neural networks were trained to predict load for different types of days: regular weekdays, Saturdays, Sundays, and holidays.

The load profile for each holiday is treated differently based on a proprietary algorithm developed by examining historical load profiles on those days. This specialisation was further refined by training multiple neural networks for bal-day, next-day and medium-range forecasting for each day type.

Variable selection was used to optimise the appropriate set of weather parameters needed for each zone, type of day, and forecast period. The bal-day neural networks blend the most recent values of observed load into the raw forecast values using a forward-correction scheme similar to that used in FoD.

Make better decisions, with greater confidence

For utility companies, we see load forecasting as a critical key to success. It is one that requires and deserves a sophisticated solution. WSI Trader Load Forecast was designed so that energy decision-makers can:

- Gain a competitive edge in both near-term and long-range time periods by leveraging accurate, precise, and resolute data that the company has available
- Distinguish between types of holidays and how they can impact different sub-regions and zones by leveraging our proprietary holiday-forecasting algorithms
- Get accurate bal-day and next-day forecasts based on our proprietary forward-correction algorithms
- Leverage hyper-local forecasting designed to predict local weather likely to affect load demand in the very near term
- Quickly visualise forecasts with the graphical, intuitive WSI Trader user interface

Conclusion

In order to maintain consistent and reliable energy delivery – across peak periods as well as everyday usage – decision-makers need to leverage technically advanced load forecasting. Accurate weather forecasting, combined with state-of-the-art data science, can potentially help improve both short- and long-term forecasting.

take note

- Weather can and does have a huge effect on performance in utilities and industry.
- Predicting utility demand and consumption is a complex and uncertain process.
- Accurate load forecasting depends on accurate weather forecasting.

Rob Berglund leads the sales team for Energy & Utility (E&U), Agriculture, and Petro-Chemical for the Energy group at The Weather Company. Since the beginning of his career at the Weather Company, starting in 2003, he has developed business in regions around the world, with an industry specific focus of Energy & Water Utilities, Energy Commodities Trading, Agribusiness, and Oil & Gas. Enquiries: Email energysales@wsi.com

Ready for Industry 4.0

Drive and control specialists **Bosch Rexroth** – the joint venture partners of the Hytec Group of Companies in sub-Saharan Africa – have introduced new IPC-based control hardware that enhances the already impressive overall performance of the IndraMotion MLC control system. It connects motion, robotics and logic control with individual high-level language programming, opening up new possibilities for engineering Industry 4.0-capable solutions. Industry 4.0 increases the requirements of decentralised intelligence. Controls must process data in reduced time and adjust flexibly to changing framework conditions. To accomplish this, Bosch Rexroth optimises the control hardware and now offers three powerful device families with one consistent system design. They are finely scaled to cover various levels of complexity in automation.

The new embedded control hardware IndraControl XM2 offers higher processor performance than previously possible and also offers modular expansion options for more flexibility in automation. OEMs combine the control with IndraControl S20 I/O modules in the same form factor. Local integration of peripherals ensures high-performance, synchronous I/O real time data processing. The combination of hydraulic and electrical tasks is possible on all device platforms of IndraMotion MLC. Bosch Rexroth has integrated best-in-class controllers for hydraulic drive tasks and thus standardises the commissioning and operation of electrical and hydraulic axes.

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Improved connectivity in hazardous areas

Manufacturers and industrial operators can now bring devices deployed in hazardous areas intoThe Connected Enterprise via EtherNet/IP using the new Allen-Bradley Bulletin 1719 Ex I/O platform from Rockwell Automation. With the new platform, users can access data from field devices and more easily control process operations in hazardous areas.

As part of the PlantPAx distributed control system (DCS), the Bulletin 1719 Ex I/O allows users to monitor operations using a common platform that communicates with the DCS or other automation systems. This helps create a seamless flow of information throughout the plant and enterprise.

"The Bulletin 1719 Ex I/O platform is ideal for organisations that are embracing smart manufacturing and seeking to capitalise on the power of their own information in a Connected Enterprise," said Christo Buys, Business Manager for Control Systems, **Rockwell Automation** sub-Saharan Africa. "The platform's EtherNet/IP interface and HART 7 protocol support help users more easily integrate real-time device and sensor data into their PlantPAx system."

The I/O platform operates in a wide temperature range and is designed for use in industries with hazardous applications, such as oil and gas, chemical, life sciences, pharmaceutical, and food and beverage.

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Fastest on the market

Siemens has brought a tablet PC onto the market for the first time. The Simatic ITP1000 industrial tablet PC is currently the fastest tablet PC on the market. It has a projective-capacitive 10.1-inch Multitouch display, the latest Intel Core i5 Skylake processor technology, and the Trusted Platform Module. Designed for industrial use, the Simatic ITP1000 is especially suitable for service, production, measuring and testing, as well as for operator control and monitoring. The new industrial tablet PC supports Windows 7 and Windows 10. With many different interfaces and well-thought-out product features, the Simatic ITP1000 is versatile, can be used everywhere, and can be integrated in both new and existing plant concepts. With long-term availability of components, as with all Simatic PCs, the new Simatic ITP1000 tablet PC can be used for many years. To handle challenging tasks, a high-performance chip set with the latest Intel Skylake CPU technology is used in the Simatic ITP1000 industrial tablet PC. The DDR4 RAM can be upgraded up to 16 gigabytes, and a 256 or 512-gigabyte SSD (Solid State Drive) can also be added to the device. Even customized automation tasks can be handled flexibly with the practical industrial functions – such as RFID (Radio Frequency Identification), a bar code reader, camera, and six freely programmable function buttons.

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New inductive sensors for intelligent position monitoring

ifm's new inductive sensors with IO-Link incorporate several functions in one unit. They can be used as switching sensors with adjustable switch point or measuring systems with a measured value transmitted via IO-Link. The output signal can be set to NC or NO as well as PNP or NPN. This allows reduction of the multitude of types, reducing the cost of stock. The new sensors are so precise that they detect even minute changes. Even brake shoe wear, spindle monitoring for deformation or tension of a saw blade are reliably detected. If the target leaves the detection zone or comes too close to the sensing face, a warning may be given. All data acquired can be transmitted and recorded via IO-Link.

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Explosion proof antenna couplers

Solexy Explosion Proof Antenna Couplers are unique and patented devices that incorporate two technologies for protection. Firstly it is an Explosion proof-sealing gland that meets the most stringent requirements of IECEx, UL, ATEX, and many others. Secondly it is an intrinsically safe barrier providing an intrinsically safe output from the RF device to the antenna or cable connection. The intrinsically safe circuitry inside the antenna coupler protects the external antenna or cable from the supply voltage of the RF device. This is accomplished by a patented capacitive circuit, which only permits 'High' frequency voltage at 50 ohms impedance to pass through to the external antenna or coax cable.

Grounding: As a barrier, another unique feature of the Solexy Antenna Coupler is that no special grounding is required.

Explosion proof antenna vs the Solexy coupler: An Explosion Proof Antenna is frequency matched, and typically a monopole design. This limits the options of antenna designs to meet the demands of more challenging installations. The Explosion Proof Antenna has to be mounted directly to the housing and does not give you the ability to choose the best mounting position for your antenna.

Space saving: The Solexy Antenna Coupler is two devices in one, a seal fitting and an Intrinsically Safe RF Barrier. The Antenna Coupler threads into a standard conduit entry (NPT or Metric). There is no internal space utilised other than a small diameter coax cable connecting our barrier to the RF output source. Solexy can supply any RF fitting required to make the connection to the RF source. This allows the manufacturer to go from wired to wireless without having to make major changes to the product housing design.

Applications: The Antenna Coupler is used in Mining Machinery Telemetry, Oil and Gas for Wellhead monitoring, RFID in hazardous areas and for Wi-Fi networks in hazardous areas, UHF radios, Tetra systems, wireless video, GPS, and Cellular such as GSM and LTE (3 G and 4 G). The barrier is also used by many OEM wireless equipment manufacturers in their devices such as gas detection, flow meters and level controls.

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Report finds Africa's digital transformation on track

A potential $300-billion could be added to the African economy by 2026 through the adoption of 'digitalization' in industrial sectors ranging from transport to manufacturing.

Digital technology will drive African development rather than disrupt it, and future business leaders will be drawn from the 200 million Africans aged between 15 and 25 who are early adopters of technology. The **Siemens** 2017 African 'Digitalization' Maturity Report benchmarks four countries at the forefront of the African digital revolution. The report found that disruptive digital technology has potential to serve more than industry. It can also help to meet development needs. South Africa's diverse economy boasts high quality mobile broadband infrastructure, making it Africa's 'digitalization' leader. Some of African industry's main challenges include an unstable and costly power supply. Adoption of digital technologies can enable and support decentralised power generation using renewable energy, combined with intelligent grid management. In the transport sector, rail and road sectors have the opportunity to move beyond electrification and automation to true 'digitalization' which solves people's mobility demands.

African digitalization in action

The Jeffrey's Bay Wind Farm in the Eastern Cape is monitored 24/7 by a remote diagnostic centre in Denmark, which collects data from more than 10 000 Siemens wind turbines worldwide, thereby streamlining performance, maintenance and customer service

The Gauteng Nerve Centre is a centrally-controlled operations facility which is a core part of a new signalling system built by Siemens for the Passenger Rail Agency of SA as part of the Gauteng Resignalling Project.

It makes train operations safer and more efficient, enabling more trains to carry more passengers in Africa's major economic hub of Johannesburg. Concerns have been expressed globally about the impact of automation and digitalization on jobs. Yet 'digitalization' does not mean an economy needs to suffer direct job losses. Instead of making an employee obsolete, digital technology redefines the role of the worker, often leading to greater skills development.

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Figure 1: The constant increase of the degree of automation in modern production plants is more and more often supported by identification systems. Their tasks include, for example, the control or release of production steps or the assignment of information about each product. This is particularly easy to achieve if the RFID components communicate via the AS-Interface fieldbus.

RFID meets AS-I: Transparent Installation Monitoring

Andreas Biniasch, ifm electronic

When it comes to assembly technology, the worldwide leader in the development and production of vacuum cleaner nozzles, Wessel-Werk, counts on solutions such as ifm electronic's AS-i based RFID systems which result in lean and transparent installation monitoring of the nozzle production.

High-quality vacuum cleaner nozzles

A high-quality vacuum cleaner nozzle consists of at least a dozen different components. The assembly machines are developed and built in order to be able to promptly and flexibly implement innovative technologies. Inside these machines, workpiece carriers pass several assembly stations. On these carriers, different vacuum cleaner nozzles are assembled from chassis, brush strips, rollers and other parts. Wessel Werk produces flexible lots of different types in mixed operation. Conveyors transport workpiece carriers to different processing stations. Depending on the nozzle type, different assembly steps and conveying routes are required.

Each workpiece carrier can be clearly identified via a special RFID code.

Figure 3: Fully automatic assembly of a vacuum cleaner nozzle at several stations.

The code is read at each processing station and sent to the controller via AS-Interface. Depending on the nozzle type, the corresponding processing step is carried out and the distribution gates on the conveyor path are set. The clear identification reliably prevents processing failures in mixed operation.

RFID with AS-i

The industrially compatible DTS125 RFID system is used for a problem-free process flow. It is a compact and easy alternative for applications where, for example, optical identification cannot be used due to the ambient conditions.

It is also the first RF identification system for AS-Interface worldwide. It allows reading and writing of code carriers (ID tags), benefiting from the advantages of AS-Interface. It can be easily integrated into existing AS-i networks and is immediately ready for operation.

The highlight of the AS-i solution is the easy wiring. Up to 31 write/ read heads can be connected to 100 metres of AS-i cable. The cable can be branched as you like and laid according to the layout of the production line. It is especially suited for modular structures since both data and energy run over only one cable.

For reading, the RF identification system uses the common AS-i analogue protocol 7.4 for data transfer. Special software modules are not required. The read / write head stores transmission errors which can be retrieved for a targeted fault analysis.

Antenna, electronics and AS-i interface are integrated in a compact housing. The voltage is supplied via the AS-i network via a rotatable M12 connector. No additional operating voltage is needed. This facilitates mounting and minimises wiring.

Figure 2: Assembly machine for the production of vacuum cleaner nozzles.

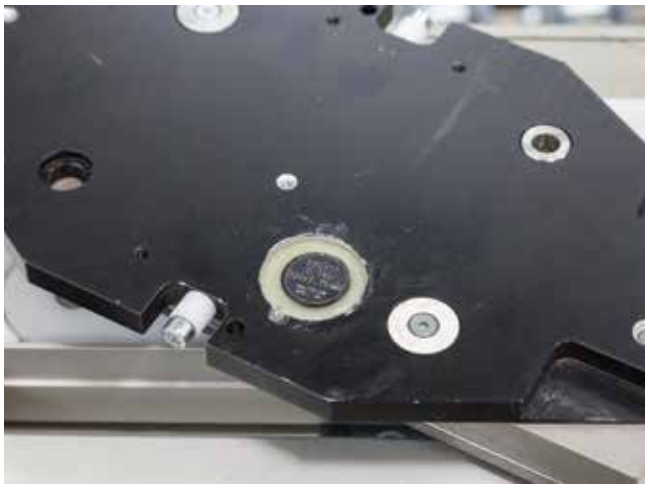

Figure 4: The ID tag chip is installed at the bottom of the workpiece carrier. The chip can store up to 224 bits.

The ID tag is available in different versions and offers flexible mounting options for workpiece carriers, tanks, etc. Using simple insulation displacement technology, the AS-I module can be connected with the yellow AS-i flat cable. To do so, the cable can be laid transversely or lengthwise through the module. The AS-i module is mounted without tools – for removing it you only need a screwdriver.

Not only RFID read / write heads, but other sensors, such as light barriers or inductive sensors can be connected via AS-i modules with the controller. This reduces even more wiring.

Being the head-end, the AS-i master collects all data for all common superior fieldbuses. Because of the integrated PLC functionality it can pre-process the data, supporting the plant controller.

> *AS-i based RFID systems result in lean and transparent installation monitoring of nozzle production.*

Figure 5: Sensors can be connected to any spot of the AS-i cable via a flat cable insulation displacement connector.

Conclusion

Gerhard Feyerabend, control engineer at Wessel-Werk remarks on the simplicity of the AS-i RFID system: 'Setting up the system is much simpler than expected because the read heads immediately send the data to the PLC after installation and addressing. A further configuration is not necessary!' For ifm, RFID in combination with AS-i is ideal for identification tasks in assembly technology which are easy to implement.

take note

- Nozzle production is complicated.
- The AS-i- based RFID system described is used for a problem-free process flow.
- This system is ideal for identification tasks in assembly technology.

Andreas Biniasch studied electrical engineering at the University of Applied Sciences in Bochum, Germany, from 1989 to 1994. From 1994 to 2000 he worked as a journalist in the IT sector and since 2000 he has been the senior editor and photographer for ifm electronic, marketing and communication.

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Inventor Develops **Self-Learning Systems**

Katrin Nikolaus, Siemens

Almost all modern machines and equipment are equipped with sensors that supply data about parameters such as energy consumption, temperature or noise.

Dr. Heiko Claussen (35) develops self-learning systems that use this data to learn how machines operate normally and to identify deviations. The key feature of his smart monitoring systems is that they analyse data that are produced anyway. The young researcher has had a meteoric career at Corporate Technology in Princeton, New Jersey. He has won an award as Inventor of the Year 2016 in the New Talents category.

Universal use

Heiko loves efficiency. For the young researcher, this specifically means getting additional benefits from existing data that has been collected. To this end, he develops self-learning systems that process data in real time and notice immediately, for example, if a machine is no longer running as it should. Heiko is particularly proud of a system that can be used universally for a variety of equipment. "You simply connect it and can monitor a machine," he explains. The system's software learns how a machine behaves in normal circumstances – for example which vibrations occur routinely in certain sections of the machine. If the data starts to differ from this learned behavior, the software notices and sends an alert over a wireless connection. "It is often not worth creating a mathematical model for data analysis of small items like boiler feed pumps, water pumps or ventilators in a power plant which are of the same type but are only used in small numbers," explains Heiko. "Our system is much easier to use and can be put into operation quickly to monitor matters efficiently."

> *If customers have a problem with their equipment, they need a solution on the spot!*

Gas turbines

Although statistical signal processing plays a major role in many fields of industry, Heiko mostly works for the Business Units in an energy context. At Corporate Technology in Princeton, he works in the Production Runtime Systems department on the development of prototypes for monitoring gas turbines, among other things. He looks back fondly at a system that analyses acoustic signals from the combustion chambers of Siemens' most powerful gas turbines, the SGT-8000H series, and monitors whether the flames are actually on in all of these chambers. "That is very important because the turbine could be damaged if a flame is not burning but gas continues to flow into the combustion chamber," he says. "If customers have a problem with their equipment, they need a solution on the spot. That spurs me on." Normally, the flames in gas turbines are monitored with an additional, expensive system of optical sensors. But the gas turbines are already fitted with sensors that pick up sound waves in their combustion chambers. The system invented by Heiko uses this existing data to monitor whether the flames are burning. It is connected to the gas turbine's T-3000 controller, which can automatically stop a gas turbine in an emergency. In addition to monitoring the presence of the flame, other key flame parameters can also be calculated in real time.

Conclusion

Heiko often learns which inventions could deliver concrete benefits in direct discussions with customers. "Basic research is interesting but, from the very beginning, I wanted to experience how my ideas are applied in industry," he explains. This is why he feels he is in exactly the right place at Corporate Technology in Princeton because: "Here, many colleagues collaborate closely with the Business Units and you get a very good overview and can gather experience." For his age, Heiko has undoubtedly already achieved a lot. Fifty registered inventions led to 49 patent families with 19 patents already granted – an achievement that speaks for itself. But success alone is not so important for him. What counts is the purpose: "I would not like to work for a company that only focuses on profit. Especially in energy issues, but also in many other areas, Siemens contributes a lot to improving society as a whole, and that is important for me."

Enquiries: Email carolyn.joiner@siemens.com or jennifer.naidoo@siemens.com

All-NEW 4 Port IO-LINK Master – AL1100

ifm's new IO-Link masters are the perfect choice, even for the most difficult environments: the materials and production methods are identical to the ifm jumper cables of the tried-and-tested EVC product series. The ecolink technology guarantees reliable, permanently ingress-resistant M12 connections of the connection cables. The IO-Link master offers the following features:

- Four IO-Link ports with full V1.1 functionality
- Master and devices configurable via the LR DEVICE software
- Two Ethernet ports 10/100 Mbits/s with switch for Profinet
- SAP ready via LR AGENT EMBEDDED
- Voltage supply via standard sensor cable, M12 A-coded

Many sensors require an energy-limited supply with UL class 2 approval. The limitation of energy is usually achieved via a corresponding power supply. With the AL1100 IO-Link master, sensors can be supplied according to UL class 2 without using an energy-limited power supply approved according to UL class 2. The IO-Link master comes in a polyamide housing with a brass nickel-plated socket and operates on 24 Vdc (20...30 Vdc).

Advantages and customer benefits

Configuration of sensors with LR DEVICE

The intuitive software finds all IO-Link masters in the Ethernet network and creates an overview of the whole plant. Besides, all sensors connected are indicated with the respective parameters. This means that parameter setting of all sensors in the system is possible from one central point.

Easy sensor connection

The sensors and actuators are connected via standard M12 connection cables without screening. Up to four IO-Link sensors can be connected and be supplied with up to 3,6 A. With the EVC693 accessories, additional auxiliary supply for the connection of IO-Link actuators can be supplied. The cable can be up to 20 m long.

Reliable digital data

The sensor data is transferred digitally. Unlike analogue signals, contact resistance and EMC interference cannot corrupt the signals.

Direct connection to the IT

The integrated LR AGENT EMBEDDED is capable of transmitting the process values directly to ERP systems, without detour via the PLC. This second communication path is available in parallel to PROFINET via the bus wiring.

Enquiries:
ifm electronic ZA
Tel: +27 (0) 12 450 0400
Email: info.za@ifm.com
Visit: Http://www.ifm.com

Smart process gating

Specialist sensing solutions company **Countapulse Controls** is making Leuze's smart process gating (SPG) technology available across sub-Saharan Africa. Countapulse Controls managing director Gerry Bryant says SPG offers a compact, space saving design as the bridging of a protective field can be done without additional muting sensors.

"Leuze has developed the SPG on the basis of the type 4 safety light curtains in the MLC 500 series, so muting sensors are no longer needed," says Bryant. "There is also reduced risk of tampering by operating personnel."

SPG system reduces installation and service costs because there is no setup or alignment of muting sensors; even interrupted parts and pallets with gaps between loading can be safely transported in sequence. The safety system offers high reliability and availability, since there is no risk of misaligned or damaged muting sensors.

Explaining the SPG process, Bryant says a signal is sent by the process controller to the safety light curtain shortly before the protective field is entered, in order to interrupt the protective device while the transported material is passing through.

The first gating signal comes from the system control (PLC), whereas the second one is generated by the safety light curtain itself when the protective field is interrupted. SPG therefore requires knowledge of the position of the transported goods so that the necessary PLC control signals are within the correct time window at the safety light curtain.

Enquiries: Gerry Bryant. Email bryant@countapulse.co.za

Ultra-compact magnetic sensor for machine construction

SIKO, represented locally by Instrotech,presents the latest stage of development in ultra-compact magnetic sensors for industry as well as machine and plant construction. Common applications for SIKO's latest compact sensors include linear actuators, stop adjustment for saws, and even measurement of the tracking of solar plants. The sensor measures paths, angles or rotational speeds – contactless and wear-free – in conjunction with the associated magnetic tapes or magnetic rings. The sensor reads the magnetic code of the magnetic tape or magnetic ring incrementally. This information is converted into digital square-wave signals and sent to the downstream electronics. The SIKO magnetic sensor MSC500 constitutes a significant development over previous MagLine magnetic sensors in terms of their performance and integrated technology. The sensor includes a clever, multicoloured status LED that aids in both commissioning and standard operation. The correct distance between the magnetic band or magnetic ring is can be monitored visually. If the reading distance between sensor and magnetic tape or magnetic ring is excessive, it will be indicated by the blue LED. A green LED indicates an intact power supply, while a yellow LED indicates that the encoded path information is being read correctly from the magnetic tape or the magnetic ring.

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

Robust submersible pressure sensors

WIKA has extended its portfolio by two high-performance submersible pressure sensors with a slimline design. As a result of the many options in a single instrument, they offer an exceptionally attractive price-performance ratio. The model LW-1 is suitable for level monitoring of water and wastewater.

The model LF-1 features long-lasting resistance within all common oils and fuels. Both submersible pressure sensors are, with their slimline case diameter of 22 mm (< 1 inch), ideal for use within pipes.

Thanks to a newly developed sealing concept, special cable and further options, such as Ex and overvoltage protection during lightning strikes, the instruments work reliably even under harsh conditions. The new submersible pressure sensors are available with a variety of output signals. The low-power signals enable battery operation from 3,6 V, and its life is increased enormously through the fast response times and a low current consumption.

The monitoring of the medium temperature is possible via an optional analogue output. The parameterisation of unit and error signal, and also the scaling of the measuring range, is carried out via HART communication.

Enquiries: Tel +27 (0) 11 621 0000 or email sales.za@wika.com

Radar level sensor for water at the cost of ultrasonic

VEGA launched the VEGAPULS 64 in 2016, and a new standard was set for radar sensors. This was the first radar sensor that operated at a frequency of 80 GHz, producing a beam angle of just 3°. The focused beam angle allows the sensor to be used in vessels with internal installations or heavy build up on the walls, producing accurate measurements even with foam, condensation or turbulent product surfaces. With the new entrant to the market, the VEGAPULS WL S 61 has reached what John Groom (VEGA Group Director for Africa), refers to as the 'holy grail' of achievement in the development of radar technology. Designed specifically for the water supply and sewerage sectors, this radar sensor comes with an equivalent price tag to the ultrasonic sensors, but with so many more added advantages. The WL S 61 comes standard with built-in Bluetooth capability, a submersion-proof housing and an encapsulated antenna system. Mounting options include a wall holder and a ceiling reflector for awkward angles. The integrated Bluetooth module enables wireless communication with a smart phone, tablet or PC, making commissioning of the instrument and diagnosis of operating parameters simpler and safer. As an aside, VEGA guarantees that Bluetooth can be retrofitted to any of their sensors sold since 1999. *(See page 39).*

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Financial Implications of Carbon Tax Liability

Silvana Claassen, CES South Africa

The aim of this article is to clarify how a company's carbon tax liability is determined, the amount payable, and relief-systems available for companies to reduce their tax payable.

Happy 2017! It is likely that this is the year during which the carbon tax regulation will finally be implemented in South Africa. This topic has been subject of discussion among governments and industry since over a decade.

Publication of the Draft Carbon Tax Bill (November 2015) and the Draft Carbon Offset Paper (June 2016) and the development of a Carbon Offset Administrative System as well as a National Atmospheric Emissions Inventory System (NAEIS) are all signals affirming that the infrastructure of a carbon tax system has been designed and is ready for the carbon tax regulation to come into effect.

Background and purpose of the proposed carbon tax

South Africa has committed to contribute to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that keeps the average global temperature from rising more than 2°C. This commitment means that South Africa has to reduce its greenhouse gas emissions significantly which can only be achieved by reducing the carbon intensity of its economy.

Policy-measures will be introduced and implemented, forcing companies to invest in energy-saving and cleaner technologies. To achieve the desired emissions reduction outcomes, South Africa wants to deploy a mix of measures among which the carbon tax. The carbon tax is expected to generate price signals that will stimulate industry and businesses to align their strategies to a low carbon economy.

How is a company's carbon tax liability determined?

For companies and businesses, two main questions are important when it comes to the carbon tax:

1. ***Is my business liable to paying carbon tax?***
2. ***What is the amount of the carbon tax payable?***

The answer to these questions is described in the Draft Carbon Tax Bill that was released by National Treasury on 2 November 2015 for public comment. However, in conjunction with Annexure I of Notice 172 of 2014, published in the GG No. 37421 of 14 March 2014. The latter document lists the activities that are subject to the carbon tax. Basically, the Draft Carbon Tax Bill states that a person (which includes a partnership and a trust) is liable to pay carbon tax if that person conducts an activity as set out in this list. During the first phase of the implementation of the carbon tax (2017 - 2020), the effective carbon tax payable is determined by three main parameters:

1. The total scope 1 (or direct) emissions of the liable entity
2. The maximum applicable allowance (determined by the sum of different types of allowances applicable to the liable entity [1]
3. The carbon tax rate; which is determined by National Treasury in the Draft Bill at R120 per tonne of CO_2-equivalents emissions

Let's assume a construction company with 60 000 tCO_2e scope 1 emissions in a given tax-year [2]. Construction-activities are listed in Annexure 1 of Notice 172 of 2014 as referred to by the Carbon Tax Bill. The table in Schedule 2 of the Draft Carbon Tax Bill [3] sets out the allowances that are applicable per sector, including the maxi-

CDM – Clean Development Mechanism
CES – Carbon & Energy Solutions
CMVP – Certified Measurement & Verification Professional
DEA – Department of Environmental Affairs
GDP – Gross Domestic Product
NAEIS – National Atmospheric Emissions Inventory System
SME – Small, Medium Enterprise

Abbreviations/Acronyms

mum allowance per type of allowance. According to this Schedule, companies in the construction sector can benefit from the following types of allowances:

- A basic threshold of 60%
- A trade exposure allowance of maximal 10%
- A performance-allowance of maximal 5%
- A carbon-budget allowance of 5%
- A carbon offset allowance with a maximum of 10%

Basic tax-free threshold

The implementation of the carbon tax regulation in South Africa features a phased approach to facilitate a smooth transition to a low-carbon economy, allowing companies to align their strategies timely in order to anticipate on the financial burden that the carbon tax may bring. The basic tax-free allowance is a feature of the first phase. It is expected that the tax-free allowance of 60% will be abandoned in the second phase or replaced with absolute thresholds. The first phase is said to last between 2017 and 2020. For our construction company the basic tax-free allowance implies a tax-deduction of R4 320 000 per tax-year.

> *An eligible project is any activity, not subject to the carbon tax, that results in verifiable reduction in greenhouse gas emissions.*

Trade exposure allowance

During the development of the Carbon Tax bill, concerns were raised that companies with markets outside of South Africa may struggle to remain competitive as their international competitors are not exposed to a nationally imposed tax-burden. The trade exposure allowance has therefore been introduced to address this potential negative impact of the carbon tax on these companies' competitiveness. This allowance allows for an additional tax-relief on top of the 60% basic threshold. For a company to be eligible to claim this allowance, its exports must be more than 40% of its domestic sales. The Draft Carbon Tax Bill provides for a formula with which the exact trade exposure relief can be calculated. However, this can never be more than 10% of total tax liability.

Let's assume our construction company delivers services outside of South Africa at a value more than 40% of its domestic sales. Let us assume that the exports amount 20% of total sales. In accordance with the formula provided in the Draft Carbon Tax Bill, the additional tax-relief will then be 8% on top of the basic 60% threshold. Effectively this means an additional tax-deduction of R576 000 for the tax-year.

Performance allowance

The performance-based or so-called 'Z-factor'-allowance was designed as a component of the Carbon Tax regulation to 'reward' early movers. These are entities that have already, and on a voluntary basis, implemented measures to mitigate their greenhouse gas emissions. The performance allowance provides for these entities to benefit from an additional tax-free allowance of 5% maximum. The exact amount of this allowance that an entity is eligible to benefit from is determined by the difference between an entity's specific carbon intensity and the industry-specific emissions intensity benchmark [4]. Development of greenhouse gas emissions intensity benchmarks for different industrial sectors and/or sub-sectors is being done in consultation with the different industry associations and/or companies and will be specified in the regulation accordingly.

Emissions intensities can be expressed in multiple different units, depending on the activity to which the emissions relate. Examples are: grams of CO_2e emitted per kWh produced, or tCO_2e per Gross Domestic Product (GDP), etc. At company level, emissions intensities are often expressed as the greenhouse gas emissions in tCO_2e per FTE or per unit of product, etc.

In short, a company is eligible to claim an additional performance allowance if its emissions intensity is below the established sector's benchmark figure that is specified in the carbon tax regulation. For the construction company in the example, an additional tax-relief of 5% would mean an effective tax-deduction of R360 000 over the tax-year.

Carbon budget allowance

The Department of Environmental Affairs (DEA) is considering to cap carbon emissions at company-level by allocating carbon budgets to greenhouse gas emitting businesses. Similar to the purpose of the carbon tax, the aim of this measure is to achieve the target that South Africa has committed to by signing the Paris Agreement. The first phase of this carbon budget measure covers the period 2016 to 2020; during this phase companies can voluntarily decide to participate in keeping their emissions levels below a certain carbon budget. Companies that do so are 'rewarded' with an additional 5% tax-relief in terms of carbon tax payable.

The second five-year phase of the carbon budget measure will include a mandatory system during which companies are bound to submit pollution prevention plans that indicate how they plan to achieve their respective carbon budgets. By voluntary participation in the carbon budget system, companies can anticipate on the second mandatory phase of the carbon budget system by implementing necessary measures to mitigate their carbon footprint, and benefit from an additional 5% tax-allowance that may raise the overall maximum tax-free thresholds to 95% for some companies.

The exact carbon budget allowance is either zero or 5% of total emissions; i.e. you are either eligible to claim the entire 5% tax-relief

or you are not eligible to claiming this allowance at all. If our construction company participates in the carbon budget system, during or before a tax period, it will be eligible to receive the additional 5% allowance. For our construction company this means an effective deduction of an additional R360 000.

Carbon offsets allowance

In our previous article, the proposed system for a carbon offsets system as a complementary measure to the carbon tax was elaborated on. Companies, and so our construction company, can offset their carbon tax liability with a maximum of 10% by purchasing carbon credits generated through verified carbon emissions reductions established by projects elsewhere in South Africa.

Definition of an eligible project: 'any activity, not subject to the carbon tax, that results in verifiable reduction in greenhouse gas emissions'. Tax liable companies and third parties can implement a carbon offset project as long as the project meets this definition. Let us assume our company invests in buying 5 000 carbon credits [5] from a registered Landfill Gas Recovery CDM-project, it can now reduce its carbon tax payable with an effective R600 000. This amount could be raised to a maximum of R720 000 (which represents 10% of total carbon emissions).

Figure 1 summarises the example of the construction company with an annual scope 1 emissions carbon footprint of 60 000 tCO_2e and how the different types of tax-relief mechanisms can have an impact on the effective amount of carbon tax payable. It should be noted that some of the tax-relief mechanisms, including the performance allowance, carbon budget allowance and offset allowance, may require a company to incur capital and/or operational expenditure.

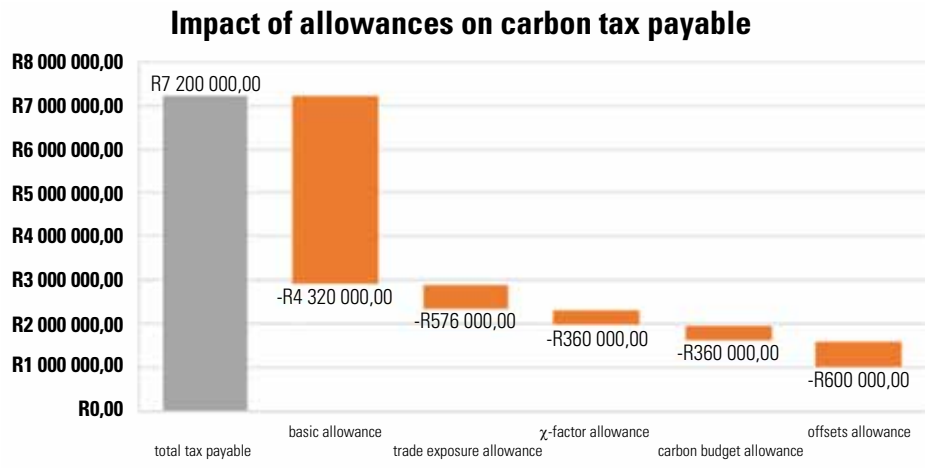

Figure 1: Impact of allowances on carbon tax payable.

Footnotes

[1] The allowances that a company may benefit from include: 1) a basic allowance; 2) a fugitive emissions allowance; 3) a trade exposure allowance; 4) a performance allowance; 5) a carbon budget allowance; and 6) a carbon offset allowance.

[2] A tax-year is 1 calendar year and carbon tax is payable twice: for every tax period commencing on 1 January and ending on 30 June and the period commencing on 1 July and ending on 31 December of that year.

[3] Page 33 of the Draft Carbon Tax Bill which was published on 2 November 2015.

[4] The Draft Carbon Tax Bill proposes that these industry-specific emissions intensity benchmark figures will include both Scope 1 and Scope 2 emissions.

[5] Each credit representing 1 tCO_2e reductions.

take note

- It is likely that the carbon tax regulation will be implemented in South Africa in 2017.
- South Africa has committed to contribute to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that keeps the average global temperature from rising more than 2%.
- This commitment means that South Africa has to reduce its greenhouse gas emissions significantly which can only be achieved by reducing the carbon intensity of its economy.

Silvana Claassen is the owner of CES South Africa, a consultancy-firm specialising in climate change and energy management. She is a qualified Certified Measurement & Verification Professional (CMVP) and has extensive experience in providing both government institutions as well as SMEs and major international corporations with strategic solutions to an increasing number of challenges related to the transition to a low carbon and resources constraint economy. CES South Africa can assist companies to achieve the maximum carbon tax-relief in a cost-effective manner. Enquiries: Email silvana@carbon-energy-solutions.co.za

IEC 309 HP Connection systems

GEWISS offers complete mobile and industrial power distribution and supply systems to meet every need. Construction site distribution systems (68 Q-BOX/Q-DIN range), energy and service distribution terminal systems (68 Q-MC range) and distribution boards (6 8 Q-DIN range) combined with plugs and socket-outlets (IEC 309 HP range) or interlocked socket-outlet systems (IB range). The new IEC 309 HP - HIGH PERFORMANCE range is the latest evolution in industrial connection, offering the best in terms of performance, functions and technical characteristics. The system comprises socket-outlets and plugs from 16 to 125 A with Index of Protection from IP44/IP54 to IP66/IP67 and now also IP68/IP69 for straight plugs and connectors. These devices are manufactured to include every possible earth hour reference, thus opening the door to a world of new applications and installation situations in the most specialised and heavy duty contexts.

- Traditional screw terminals and quick wiring spring terminals (for 16 and 32 A) or cage terminals (for 63 and 125 A versions)
- The new cable gland and halogen free plastic materials with nickel plated contacts (both pins and sleeves) are all factors that make IEC 309 HP the best solution in terms of resistance and protection
- The ¼ turn SAFE-LOCK coupling with body-grip system locks with a safety screw that indicates whether the system is locked
- The special shape and the rubberised surfaces in the 63 and 125 A versions ensure the best possible grip in any usage conditions, even when wearing work gloves and in the presence of water and moisture.

The extended IEC309 Connection System is widely available in Southern Africa.

Enquiries: Email refiloem@acdc.co.za

Ac power supply with integrated energy storage

The new **Phoenix Contact** uninterruptible power supplies (USP) from theTRIO product range for the DIN rail reliably supply ac loads with up to 750 VA/600 W.

The power supply is for 230 Vac and 120 Vac applications. Thanks to the integrated USB interface, high-level devices can be connected to it. In this way, any industrial PCs connected to the power supply can be shut down in a controlled way. The pure sine curve at the output enables a seamless transition, as the sine generated in battery operation runs in sync with the mains previously used for the supply.

Since a UPS module and energy storage are combined in one housing, the power supply is particularly space-saving. The integrated VRLA energy storage ensures long buffer times and can be extended with a further energy storage unit. Supplying loads from the energy storage is possible, even without mains input. The device also has LED status indicators for signaling and function monitoring, as well as active 24 Vdc switch outputs for forwarding to a higher-level control system.

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Wireless dc clamps improve measuring productivity

Fluke, represented locally by **The Comtest Group**, has on offer the dc current clamps to the Fluke Connect system of wireless test tools: the Fluke a3003FC wireless dc current clamp and the a3004 FC Wireless dc 4-20 mA Current Clamp. Both fully-functional current clamps can wirelessly send measurements to Fluke Connect enabled master units as well as the Fluke Connect mobile app so users can view measurements from multiple devices simultaneously, review equipment history, and share measurements with other team members for faster troubleshooting. The a3003FC wireless dc current clamp measures up to 2 000 A dc making it ideal for very high dc current measurements typically found in utility and dc machine controller applications. It features a large jaw size (64 mm) for clamping around and measuring on large, high current conductors. The a3004 FC Wireless dc 4-20 mA Current Clamp measures 4 to 20 mA signals without breaking the loop so process control technicians can make accurate measurements without interrupting the workflow. It features a detachable clamp with extension cable for measurements in tight locations. Both current clamps can record and store up to 65 000 measurements with the logging feature to isolate intermittent events or record fluctuations without even being there.

Enquires: Tel. +27 (0) 10 595 1821 or email sales@comtest.co.za

Fluke 709H Precision Loop Calibrator with HART Communications/Diagnostics

Assessing Control Valves and their **Performance**

Jim Shields, Fluke Corporation

To assess control valves and their performance … you need to understand the different types of valves and what they can be tested for.

For open/close shut-off valves without analogue control the tests are pretty simple. Do the valves open and close? When open, do they open all the way? When they close, do they close completely? Testing is mostly observational: looking at the valve and watching cause and effect in the process during the cycle.

Control valves are a different 'beast' altogether

These valves open and close proportionally, and vary the degree of travel depending on the percent of span of the 4 to 20 mA signal applied to them. Observing the valve's position, as reported on the visual travel indicator, gives the technician or operator a rough indication of percent of travel for a particular setting when in operation but does not provide any assurance of how the valve will operate under dynamic and changing conditions.

> *What is a meaningful test that can be used as a baseline?*

The most sophisticated valve performance tests require removing the valve and testing its performance on a 'valve prover.' This is an expensive test device, out of range for most instrument shops. The valve prover is often only used by valve manufacturers in testing the valve when shipped, or by highly qualified field service engineers. It offers a very complete test, but the tool is not feasible for most instrument shops.

So, what is the technician to use for testing a control valve?

What is a meaningful test that can be used as a baseline? Since most valves use a 4 to 20 mA input signal, any test tool with an mA output signal can provide the input mA signal to drive the control valve across its operating range. When applying a 3,8 mA input signal to a normally closed valve, the valve should be hard closed. It should remain closed at 4,0 mA and move slightly off its seat at 4,2 mA. At the other end of its operation, at 19,8 mA, it should be nearly full open. At 20,0 mA it should be fully open, and hard open at 20,2 mA (resting on the travel stop). Tests of this nature will determine if the valve is opening and closing correctly, but still fall short of testing the valve across the entire range where it provides control.

Many valves, including those that are 'smart,' have a feedback element built in that outputs the actual position as a percentage of open/close. This output can be a 4 to 20 mA signal or a digital HARTVariable that represents 0 to 100% of control valve operating span. Applying a varying mA signal, while simultaneously monitoring the output mA or percentage of span signal, gives a technician a means to see whether a control valve is operating correctly over its range. By recording simultaneously the applied mA signal and the output mA signal or PV percentage of span, the valve's performance can be documented. This documented test and result is often called a valve's 'signature'. The output should smoothly mirror the applied mA input signal. Any deviation from the applied signal is a potential indication of aberrant behaviour by the valve.

Maintenance strategy can reduce costs

A best-in-class maintenance strategy for control valves can reduce costs by both minimising the number of valves pulled physically from processing and minimising failure risks. Here's his advice. To

establish such a practice, the baseline condition of the valve at a known good state needs to be documented. Ideally the documentation occurs when the valve is commissioned or after it is overhauled. The technician records the signature of the valve in the ideal state, plotting the output mA or percentage of span signal versus applied input signal, and stores this information with the time, tag number of the valve, and the date the activity is performed. Calibration management software can be used to manage this information.

Once the baseline performance signatures of the valves are recorded, a maintenance interval for testing the performance of the valves needs to be established. Using existing maintenance intervals is a starting point. If there is no established maintenance interval, the service location of the valve needs to be evaluated. Rough service applications dictate a shorter maintenance interval than light duty service, for example. An interval of six months to a year to start (unless the service location is very hard on the valves) is a reasonable starting point. Some devices installed in safety and shut-down systems need to be checked every three months regardless of service location.

Conclusion

Once baseline valve signature data is recorded, the valves need to be tested at the defined intervals and the signatures recorded. The signatures can be compared to the baseline signatures to determine changes in their performance. If the output response curve has developed a nonlinear signature or has aberrations in the curves, the valve may be developing excessive stiction or hysteresis that may require it to be removed for service.

take note

- For open/close shut-off valves without analogue control the tests are simple.
- Do they open … and do they open all the way?
- When they close … do they close completely?

Jim Shields, Fluke product marketing manager since 2001, is an expert in field calibration and metrology. He is a published author of many articles on instrumentation and automation. He specialises in transitioning customer and channel information into new product concepts while managing the product marketing mix for field calibration product line at Fluke Corporation.
Enquiries: Comtest. Tel. +27 (0) 10 595 1821 or email sales@comtest.co.za

Step by step guide for testing control valve positioners

1. Set up the ProcessMeter in sourcing mode using the appropriate range of current for the positioner.
2. Insert the source current test leads into the mA output jacks.
3. Select the 4-20 mA range by moving the function switch from Off to the first mA output position.
4. Connect the meter mA output to the input terminals of the valve positioner.
5. To determine if the positioner is fully closes the valve at 4 mA, adjust the source current to 4,0 mA using the push button. The valve should be closed.
6. While watching the valve for any movement, press the Coarse Down button once to decrease the current to 3,9 mA. There should be no movement of the valve.
7. In setting the point at which the valve starts to open, make sure there is no counter pressure by the actuator against the force holding the valve closed when there is 4.0 mA on the controller's input. In a spring-to-close valve, there should be no pressure on the diaphragm. With a double acting piston actuator, there should be no pressure on one side of the piston. To ensure that there is no counter pressure at the closed setting, you may want to set the start of opening between 4,1 and 4,2 mA.
8. To check the opening of the valve, press the Coarse Range Up button from 4,0 mA. Each press of the Coarse Range Up button will increase the current 0,1 mA. You should adjust the zero adjustment on the positioner to set the valve for the closing characteristic desired.
9. To check the valve at the fully open position—called a span position check—adjust the source current to 20 mA using the range buttons and allow the valve to stabilise. While watching or feeling for valve movement, press the Coarse Range Up button once to 20,1 mA. The valve movement should be as small as possible and can be adjusted using the span adjustment on the positioner.
10. Using the coarse control, adjust current up and down between 20,1 mA and 19,9 mA. There should be no movement of the valve stem from 20,1 to 20 mA and slight movement from 20 mA and 19,9 mA.
11. In most valves, there is an interaction between the zero and span settings of a valve controller, so it is best to ensure proper valve position adjustment by repeating the test of the fully closed and fully open positions until no further adjustment is necessary.
12. For valves with linear action, linearity can be checked by setting the ProcessMeter to 4 mA and using the % Step button to step the current to 12 mA (50%) and confirm the valve position indicator is at 50% travel. If your valve is a non-linear type, refer to the valve manual for proper operation.
13. To check for smooth valve operation, turn the rotary switch to output mA and select Slow Linear Ramp. Let the meter ramp the mA signal through several cycles while you watch or feel for any abnormal operation of the valve. The valve should NOT oscillate or hunt at any of the step positions of the Slow Ramp. The valve also should not be sluggish. Set the gain of the valve controller to a point that gives the best response between these two conditions.

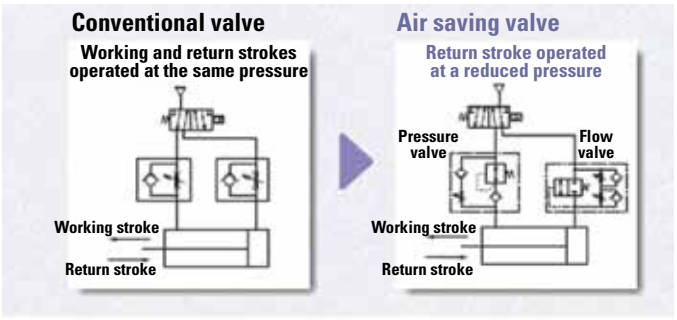
Reducing Operating Costs By Rethinking Air Consumption

Riaan van Eck, SMC Pneumatics

Answering to the call of reduced consumption to not only help lower operating costs but to alleviate pressure on the country's power is critical in today's manufacturing environments.

Energy efficiency, in the past was... and for the foreseeable future will remain ... a hot topic. With end-users becoming more and more discerning and government and economic policies placing pressure on the business sector, the need for a competitive advantage through lean manufacturing and new thinking becomes crucial. Businesses are now under a proverbial microscope where every output needs to be matched by a sustainable and efficient input.

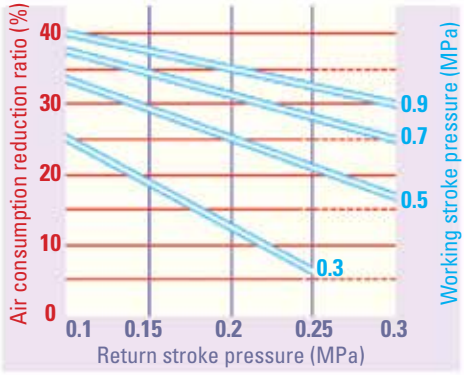
SMC Pneumatics (further referred to as 'the company') has long looked for innovative ways to reduce consumption. Amongst its array of energy saving solutions and energy saving assessment tools and software are air saving valves. These valves reduce air consumption by up to 40% by operating the return stroke at a reduced pressure.



Conventional valve versus air-saving valve

According to Compressed Air Best Practices, as industrial automation produces even more sophisticated technology with the advance of robotics, benefits of weight reduction and power conservation, pneumatic valve designs have begun to find their role in a larger strategy of environmental technology. The company invests 6% of its annual turnover back into R&D each year. Today, alternatives exist and are being designed and bettered on an ongoing basis. As valves evolve to meet needs along with modifications to most pneumatic components taking place on a very regular basis, the birth of components such as that of the company's air saving valves becomes more and more necessary. The company offers a pressure valve in the form of the ASR series as well as a flow valve from the ASQ series. These work in conjunction with a speed controller to assist with minimised installation time, reduced mounting height and a more compact machine design. In using the company's air saving valves, the following benefits become apparent:

- Smooth operation of working and return strokes possible thanks to speed consistency through the prevention of jerky movements of working strokes
- Improved response time due to less delay of the return stroke by the use of a quick supply and exhaust valve
- Easy piping as the body and one-touch fitting allows for 360 degree rotations and the sealant on the male thread is standardised
- Pressure can be fixed (at 0,2 MPa) or variable (between 0,1 and 0,3 MPa)



Other applications for these air saving valves would be jerk prevention in the vertical operation of a cylinder and quick air charge at the end stroke for press applications.

Why so much air wastage?

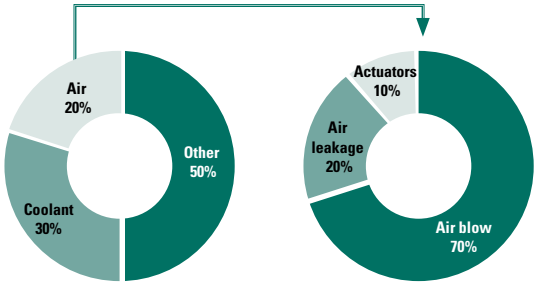
According to a study conducted recently by the company based on Europe's consumption, the estimated annual industrial electricity consumption is 400 TWh which is divided into three main energy related categories:

take note

- Energy efficiency is a hot topic.
- Every output must be matched by a sustainable and efficient input.
- Air-saving valves embody this sentiment.

- Coolant
- Compressed air
- Others

The electrical energy required to manufacture compressed air for these facilities accounts for around 20% of this total industrial consumption. In an average facility, 70% of the generated compressed air is used in air blow applications, 10% for actuation with the remaining 20% lost through leakage. Most compressed air users are unaware that their systems often offer poor energy efficiency and that by specifically focusing on these systems savings of between 5 - 50% are the norm. Therefore, translating these losses into a monetary value equates to millions. Locally, the picture looks much the same with added pressure relating to power outages, strikes etc.



Conclusion

Through energy saving audits conducted by an energy saving team, the company follows five crucial steps to realise greater energy savings in all markets, these include:

- Reason for improvement
- Measurement (current consumption, air quality, leakages, analysis and improvement of factory processes)
- Implement improvements
- Measurement (verify consumption after improvement)
- Energy savings

Riaan van Eck is the Training Manager for SMC Pneumatics South Africa. Riaan has been in the pneumatics business for many years working for some of the world's top pneumatic brands. He has experience in manufacturing, factory automation, process control, pneumatics and PLCs, among others. Enquiries: Email rvaneck@smcpneumatics.co.za

Competitive advantage through lean manufacturing and new thinking is crucial.

A little more...

Back when gasoline was 35 cents a gallon, the term 'environmental technology' was not well known. Engineers did not often promote the benefits of building low-energy consumption pneumatic valves among their peers. Recycling or conservation of resources was seldom discussed with any seriousness. In reality, the conversation was more likely to have turned to the muscle cars of the day and how much horsepower they would generate.

The 'bigger-is-better' philosophy not only produced big block engines with three carburetors, but also pneumatic valves with large direct solenoids and bulky steel construction. Then one day some of us woke up to find out the meaning of an Arab Oil Embargo. Suddenly the thought that our energy supply was cheap, plentiful, and secure evaporated. A typical pneumatic solenoid valve of that era may have consumed 6 Watts of power and lasted 10 million cycles. Today a pneumatic valve can be operated with power consumption as low as 0,1 Watt with a life of over 200 million cycles. This is an amazing 60 times less energy with 20 times the life. How is this now possible?

Transition to Modern Valve Design

One technique that dramatically lowered the energy consumption of a pneumatic valve was using the concept of flow amplification. A very small 3-port, 2-position, direct-solenoid valve is used to operate a much larger air-operated valve. The small solenoid results in low power consumption. At the heart of this transformation is the development of advanced design direct solenoid valves that are diminutive in both size and power consumption.

The solenoid pilot valves have undergone specific design changes to improve their performance and use less energy. As valve design evolved, materials changed from zinc die cast to anodised aluminium, to engineering plastics. This has resulted in valves with streamlined shapes and lower mass. The internal passages, spool and sleeves, and poppet designs changed to increase flow capacity.

The advent of serial communications systems that use coded signals to operate individual solenoids on banks of valves mounted together on a common manifold has eliminated cumbersome wiring harnesses and improved electrical efficiency. Now entire networks of valves can be controlled, monitored, and programmed from a remote location.

Transferrable Benefits of Energy Conservation

There are over 600 coal-fired electricity plants operating in the United States today. A typical 500 MW coal plant will discharge 10 000 tons of sulfur dioxides; 10 200 tons of nitrogen oxide; 720 tons of carbon monoxide; 125 000 tons of ash and 3 700 000 tons of carbon dioxide in addition to tons of other disagreeable waste products. We don't need an alarmist to remind us we do not want ourselves or our children breathing pollution, but this issue is often as invisible as the air. It's not just asking about what we can change over the next decade, but how our very next decision in regards to purchasing and applying pneumatic valves can work to both our immediate and long term advantage.

The long-term benefits of reducing energy consumption are the short-term rewards that can be realised by machine builders, maintenance personnel, plant managers, or anyone applying pneumatic valves. The most immediate profit for end users is from a reduction in electricity consumption, but for everyone there is a strategic advantage gained from the 'transferable benefit' created.

SMC Insider Best Practices 5.0.

Inside The Manufacturing **HUB**

A visit to an actuators factory

Actuator Technical Services (ATS) is situated in Jet Park, Boksburg, one of the vibrant manufacturing hubs of Ekurhuleni, South Africa. Established in 1979 by Fanie Opperman, ATS locally designs and manufactures Quarter Turn, Linear Pneumatic and Hydraulic actuators to customer specifications, locally and in many parts of the world.

A little history

In Fanie Opperman's words: "After working a number of years for an international actuator company based in South Africa, I saw the possibilities of a local Company, which will specialise in manufacturing Pneumatic valve actuators and various other related products. In May 1979 my wife, Barbara, and I took the bold step, and started Actuator Technical Services cc. The only finance we had was our Metal Industries Pension Fund valued at +/- R3 500. In 1992, we moved into our own premises in Jet Park and set-up a very successful manufacturing plant". Casper and Elize Broodryk (the Opperman's daughter) became owners of the company in 2010 when Fanie retired.

The ATS actuator range

The ATS actuator range is adaptable, trusted and reliable. A wide range of valves can be fitted with ATS Actuators, e.g. Butterfly valves, Knife Gate valves, Ball valves, Plug valves, Gate Valves ,Globe valves, Diaphragm valves and Pinch valves.

Product identification

The products are identified by the letters BG for Quarter Turn, followed by another letter, i.e. 'L' indicating that the actuator has a linear motion or 'BG/H' indicating that the actuator is Hydraulic powered. The Pneumatic actuator is designed for the local market and is distributed worldwide on valves through valve manufacturers in South Africa. The Scotch yoke, with its unique design, is used to cater for various valve torque requirements. BG Quarter Turn actuators do not have side loads within the frame, as the side load is taken up by a slide bar within the frame which eliminates friction and wear. All single acting units are fitted with a spring that is encapsulated to prevent death or serious injury when the actuator is dismantled.

Design

Casper discusses the design: "The BG Quarter Turn design is based on one type of frame to which different size cylinders can be mounted which has great advantages when sizing different types of valves. Cost saving, adaptability, inline maintenance and interchangeability are some of the benefits. The actuators' high quality and reliability make our products a sound investment".

Spring valves

Asked about Spring valves, Casper responds: "In the past and, unfortunately still today, actuator manufacturers have not, and do not appreciate that Spring Return Actuators or Double Acting Actuators are very dangerous pieces of equipment". In ATS actuators the capsulated design is utilised for many reasons which include (among others):

- The spring capsule can be removed without danger
- By compressing the spring 1 mm, the full pre-set thrust is achieved
- The spring cannot flip or jump as all the energy is within the capsule
- The spring coils are not exposed and therefore cannot nip or amputate fingers
- The spring cannot damage the bore of the cylinder
- The pre-set of the spring cannot be tampered with

The team

A very close-knit enterprise, ATS has retained the values instilled in the early years. The company comprises a team of dedicated individuals – management and employees – who value each other; therefore regular training takes place, mentorship is ongoing and 'wellbeing for all' is the order of the day.

Enquiries: Tel. +27 (0) 11 397 4756 or email sales@actuator.co.za

ATS Admin staff: Tanita, Casper, Elize, Japie, Magda, Rebecca, Alishé and Gert.

ATS factory staff: (Back): Japie, Sam, Vuyo, Zolani, Jimmy and Jacob. (Front): Raymond, Alfred, Stanley and Thimoti.

Efficient motorised actuator for globe and diaphragm valves

The **GEMÜ** eSyDrive motorised actuator sets new standards in the areas of compact design, speed and accuracy. GEMÜ has designed this actuator as a response to increasing requirements in the area of motorised valves, while recognising the current trend in the area of process automation. Pneumatically operated valves are increasingly being replaced with electrical versions. The development of this new actuator has been based on decades of experience in the area of motorised actuators. Designed on the basis of the hollow shaft principle in conjunction with technology that does not use brushes or sensors, the GEMÜ eSyDrive sets new standards in terms of compact design, reliability and accuracy. The self-locking actuator also offers a high level of reproducibility for positioning and is therefore particularly suitable for use in precise control applications. The Ethernet-based eSy-web interface, in conjunction with an integrated web server, enables the exchange of parametrisation and diagnostics data and the networking of several devices.

Motorised valves are primarily used in areas where the use of compressed air is not desired or possible. Large-scale production plants are cited as examples of such areas, as distribution of compressed air is uneconomical in such facilities. Another example of the areas of use of these valves is mobile or decentralised facilities for drinking water treatment.

Enquiries: Ivona Jovic.
Email ivona.jovic@gemue.de

Innovative desiccant dryer ensures consistent gas purity

In the business of industrial gas production, consistent product quality is an absolute requirement. To ensure this consistency is maintained, raw gas from production facilities is tapped off their main supply lines for analysis.

However, this gas is often saturated with water, which hampers reliable analysis. Here **RTS Africa Engineering**, a Tshwane-based engineering solutions provider to industry's toughest challenges, has come up with an innovative solution in the form of the RTS Africa desiccant dryer.

"Our desiccant dryer ensures reliable analysis and, consequently, stable and consistent quality for users of industrial gases," points out Ian Fraser, Managing Director of RTS Africa Engineering. In some applications, moisture in gases used in industry can cause serious damage to plant and loss of production, he points out.

'Wet' gas is piped into the dryer through its 1/4" NPT stainless-steel needle valve, which regulates the gas flow. The dryer consists of a transparent PVC or Perspex tube fitted with PVC ends. The gas passes through a water-absorbing bed consisting of fused-alumina pellets. While the RTS Africa desiccant dryer is most commonly used to dry hydrogen or oxygen, it is suitable for drying numerous other gases. The dryer can be installed in plants of varying sizes, as it will handle a flow rate of between 100ml/minute and 1 000 ml/minute and a maximum pressure of 0,5 kPa. In its operating environment, it will function efficiently in temperatures of up to 75˚C.

Enquiries: Tel. +27 (0) 11 462 6188

Simple, flexible and efficient standard valve

Tectra Automation, part of the Hytec Group of Companies, has brought the Aventics ES05 Essential Valve System series to South African shores. The ES05 series offers a clever, economic and user-friendly solution for applications with standard requirements in industrial automation. Designed specifically to reduce the number of components, assembly is completed with one single tool, making life easier for distributors, machine manufacturers and system integrators with the added benefit of reducing the risk of faults.

The ES05 series was developed by Aventics in response to customers' requests for a simple, flexible and efficient standard valve with reduced components – tailored to their application.

"The new series, therefore, focuses on ease of handling for distributors, machine manufacturers and system integrators," explains Malan Bosman, Pneumatic Product Manager, Tectra Automation. "They can configure their customised solution online from a set number of readily available components. Assembling a valve system has never been faster or easier."

The ES05 is a modular system and, as all components are unique and only one tool is required for the job, incorrect installation is virtually impossible. All fittings are of the same type and tightened with the same torque, which further simplifies assembly and prevents errors.

Enquiries: Malan Bosman.
Tel: +27 (0) 11 971 9400
or email malan/bosman@tectra.co.za

Official distributor of valves for Africa mining sector

Afrivalve, part of the eDART Group of Companies, have further expanded their range to now offer the Gemü Valve and Control Systems range in the mining and metal refining sector in Africa. This further compliments the eDART Slurry Control Valves, C-Tech knife gate valves, Red Roc Pinch valves and AVI range of industrial valves. Gregor Hopton of Afrivalve has over 20 years of experience selling the Gemü range in South Africa and knows the quality and reliability that the brand offers. This gives Afrivalve the ability to offer a complete valve solution typically from Mill discharge all the way through the process to the final refined metal. This was a necessary addition due to Afrivalve's success with larger projects in the mining sector and the customer's preference for a single source solution.

Enquiries: Email gregh@afrivalve.co.za

Gregor Hopton, Afrivalve.

New 'Hall' effect micro clamps

Universal Technic France offers more than 3 500 products for ac/dc current measurement from 1 mA - 15 000 A. The newest addition is the MX Series of 'Hall' effect micro clamps which measure low current ac and dc up to 50 kHz in ratios of 20 A/1 V and 100 A/1 V. These are available from **Denver Technical Products.**

Enquiries: +27 (0) 11 626 2023 or email mervyn@denver-tech.co.za

New safety midi torch

Wolf safety has introduced the ATEX led M-85 midi torch, a new zone 0 and 20 high power primary cell led midi pocket torch for use in potentially explosive gas, vapour, mist and dust atmospheres. The torch is available from **Denver Technical Products**. ATEX and IECEx certified, the high powered LED light source gives light output up to 189 lumens. The bespoke optics deliver a high intensity narrow beam with a lower output wide angle fringe light, making the new M-85 Midi Torch ideal for inspection and maintenance work in conditions of darkness or reduced visibility. The new Midi torch is safe for use in Zones 0 (gas groups IIC/T3/4) and 20 (dust group IIIB / T200°C), has a gas ambient temperature range from -40°C, to +40°C and is approved for Group I M1 mining areas. This single-handed push button switch has a rubberised switch cover and raised surface to allow easy operation even with gloved hands. The strong, durable torch body enclosure has excellent chemical resistant properties and a proven impact resistance, even at sub zero temperatures. The rubber armoured lens ring gives enhanced grip and shock protection with a shatterproof polycarbonate lens providing excellent resistance to impact damage.

Enquiries: Tel. +27 (0) 11 626 2023 or email denvertech@pixie.co.za

Mobile power for Kamoa-Kakula Mine, DRC

The development of the world's largest high-grade copper deposit – the Kamoa-Kakula Copper Project in the Democratic Republic of Congo (DRC) – now is running on power from the DRC's national grid using a mobile substation recently commissioned by South Africa's Gauteng-based Zest Energy. The 120/11 kV mobile substation will serve the construction of the planned initial mine at Kamoa-Kakula, a project whose existing mineral resource has been independently verified as Africa's largest copper find. Kamoa-Kakula's principal owners are Ivanhoe Mines, Zijin Mining and the government of the Democratic Republic of the Congo.

"Due to the high cost of running on diesel generators, the mine developers decided to purchase a mobile substation to interface with the network of the DRC power utility SNEL to provide power during the construction phase of the project," Alastair Gerrard, managing director at Zest Energy, says. Zest Energy – part of the **Zest WEG Group** – undertook the design, manufacture, supply, testing, delivery, installation and commissioning of the complete mobile substation, including the trailer, transformer and related electrical equipment. It also provided a protection system, earthing, site work (with full commissioning and testing) and site training.

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

Increasing local assembly capability

Paying a visit to the South African head office in Johannesburg recently, **SEW-EURODRIVE** GmbH President and Managing Director, Jürgen Blickle, commented that, while the mining industry was still in a slump, "We are still very strong in mining." Blickle revealed that the OEM planned to ramp up its local assembly operations, with an expanded assembly facility on the cards.

Another key focus for future growth was boosting the aftermarket sector, which has seen SEW-EURODRIVE South Africa establish a new Field Service Department and Repair Centre. "We want to increase the service business, including servicing brands other than our own.

This is an international trend, whereby we find customers approaching us for this particular service," Blickle stressed.

However, Blickle added that the main focus is still offering complete replacement units wherever possible. "As so many of our products are largely identical and interchangeable, we will simply offer a replacement unit as opposed to repairing an old one." In South Africa, the Johannesburg assembly facility has invested significantly in installing the latest Assembly Islands to streamline production and reduce waste, an upgrade that will be carried through to the local branches in Nelspruit, Durban, Port Elizabeth, and Cape Town.

Enquiries: Jana Klut.
Email JKlut@sew.co.za

SEW-EURODRIVE GmbH President and Managing Director, Jürgen Blickle.

ABB wins $100 M order to upgrade historic HVDC link in the US

ABB has won an order worth more than $100 M from the US utility Los Angeles Department of Water and Power (LADWP), to modernise the existing Sylmar HVDC (High-Voltage Direct Current) converter station in California. This station is an important part of the electricity link between the Pacific Northwest and southern California commissioned in 1970. The Sylmar converter station, located to the north of Los Angeles, is the southern station of the Pacific Intertie, a 1 360 kilometre HVDC link that connects to the Celilo converter station near the Columbia River, Oregon. The Pacific Intertie transmits electricity from the Pacific Northwest to as many as three million households in the greater Los Angeles area. Normally, the power flow is from north to south, but during the winter, the north consumes significant quantities of power for heating while the south requires less, and the power flow is reversed. The Pacific Intertie allows power to flow between the Northwest and Southern California, helping to balance supply with demand. "The Pacific Intertie was the first major HVDC link to be installed in the US and has been providing power to millions in the U.S. for nearly five decades", said Claudio Facchin, President of ABB's Power Grids division. "We are delighted to return to this pioneering project. After the success of Celilo, the Sylmar upgrade will help to secure power supplies while providing greater efficiency and reliability with an exceptional level of control."

'Digitalization' will be a key feature in the upgrade, as the latest version of ABB's most advanced digital MACH control and protection system will be installed.

Enquiries: Email Shivani.Chetram@za.abb.com or media.relations@ch.abb.com

Three complete power packs for Lesotho mine

SEW-EURODRIVE is continuing its involvement at a major diamond mine in Lesotho by supplying three complete power packs for use on the tailings side of the operation. This follows the earlier successful supply of 20 power packs for the same project.

The initial order was received in December 2014, with technical clarification in 2015, and delivery in February 2016. The latest order, for the three additional power packs, was received in May 2016, and fulfilled in September 2016. Despite the differing lead times, SEW-EURODRIVE's local stockholding and value-added service offering meant that the requirements of the two orders were met comfortably, according to Head of Projects, Rudi Swanepoel.

Each power pack consists of an X-Series Industrial Gearbox with high- and low-speed couplings, motor and base plate. These preassembled units represent significant cost-savings and reduced downtime, as the power pack is supplied with the input coupling shaft with the alignment already carried out. Combined with the above-mentioned shaft alignment, in general there are only two interfaces that need to be fitted. "If all the civils are done correctly, this is a major benefit for the client," Swanepoel comments. The X-Series of versatile and powerful IG units from SEW-EURODRIVE provides an ideal solution for conveyor belt drives, with a torque range from 6,8 kNm to 475 kNm. It also features a large number of accessories to allow for maximum flexibility, and a wide range of gear ratios for helical and bevel-helical gear units.

Enquiries: Email Jklut@sew.co.za

Process monitoring made easy

The new Liquiline CM44P transmitter from **Endress + Hauser** offers multichannel and multiparameter functionality for process photometers and Memosens sensors. Processes such as chromatography, fermentation and phase separation now have the ease of use and simplified maintenance of the Liquiline platform and Memosens technology.

Processes such as chromatography, fermentation, filtration or phase separation require monitoring of multiple parameters. Liquiline CM44P measures 16 different parameters by taking inputs from up to two process photometers and four Memosens sensors simultaneously. Plant managers can obtain all quality control-related parameters from one transmitter and increase profits with reduced installation time and lower equipment costs.

Full flexibility and seamless integration: Liquiline CM44P offers multiple I/O options and plug and play functionality for Memosens sensors leading to perfect adaptability to a wide range of applications

User-friendly and convenient: Standardisation on a single transmitter platform such as Liquiline brings the benefit that all devices operate in the same way, reducing potential operating errors

Cost-effective but safe: Process photometers allow precise and reproducible in-line measurement of absorption and turbidity

Perfect sensor combinations: Liquiline CM44P is the first transmitter to offer the possibility of combining process photometers and Memosens sensors in one transmitter, resulting in the perfect combination for many applications

Enquiries: Jan Swart. Tel. +27 (011) 262 8000 or email jan.swart@za.endress.com

Official opening of Schneider Electric Rainbow Hive building

Casper Herzberg, Schneider Electric Zone President Middle East and Africa, officially opened The Schneider Electric Rainbow Hive on 12 December 2016. This building, which serves as the new Schneider Electric South African headquarters in Waterfall City, Midrand, is designed to provide an exciting and fun, yet functional and dynamic work space that enables better collaboration and engagement which leads to improved productivity. The building is also energy efficient and environmentally friendly with energy generated from solar panels on the roof and recycling of materials such as wood from packing cases used in the construction of the building.

Enquiries: Prisca Mashanda. Email prisca.mashanda@schneider-electric.com

From left: *Casper Herzberg - Schneider Electric Zone President Middle East and Africa, Charlotte MONTEL - Honourable Deputy French Ambassador to South Africa, Joe Madungandaba - Schneider Electric Non-Executive Director, Albert Fuchet - Schneider Electric Country President Egypt & North East Africa, Eric Leger – Schneider Electric Country President Southern Africa.*

Launch of VEGA's latest radar level sensor

"I believe that 80% of all level measurement sensors sold within the next three years will be radar sensors, making ultrasonic technology obsolete", declared John Groom, VEGA Group Director for Africa at the launch of VEGA's latest radar sensor the VEGAPULS WL S 61. Speaking at the Roodepoort Golf Club where the launch took place, John Groom reminded the assembled guests that when VEGA launched the VEGAPULS 64 in 2016, a new standard was set for radar sensors.

(See page 25).

Enquiries: Chantal Groom.

Email Chantal.groom@vega.com

VEGA Group Director for Africa, John Groom and Business Development Manager, Frikkie Streicher.

APPOINTMENTS

The Magnet Group

Pieter Grove,
Project Technician
(Magnet Energy)

SMC Pneumatics

Alfie Branchina,
Senior Sales Engineer,
Gauteng

Aurecon

Portia Derby,
Senior Regional Director
for Gauteng

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The Africa Energy Indaba will host the Sustainable Energy for All Initiative (SE4ALL) countries that will be showcasing their High Priority Renewable Energy Project Opportunities, identified at country level as the 'High Priority Projects' to provide energy to the respective country. The actual project owners (country government representatives) will be providing the full Investor Prospectus at the Africa Energy Indaba and showcasing the High Priority Project Opportunities to the private sector to consider for investment.
Enquiries: Email liz@energyindaba.co.za

Power & Electricity World Africa 2017
28 – 29 March 2017
Sandton Convention Centre, Johannesburg
Incorporates 'The Solar Show Africa' (meet with the right customers in the solar industry), 'The Water Show' (discover the latest services and innovation) and 'Energy Efficiency World' (bringing together buyers from across the energy spectrum).
Enquiries: Email Courtney.Harty@terrapinn.com

Domestic Use of Energy (DUE) Conference
'Energy efficiency in the home'
3 – 5 April 2017
Cape Town campus,
Cape Peninsula University of Technology (CPUT)
Prospective delegates may register for the conference by contacting. Delegates are also invited to present papers at the conference. Delegates who would like to present papers should submit provisional titles of their presentations. Full papers are to be submitted before 30 January 2017. Brief abstracts of about 200 words may be submitted.
Enquiries: Nadia Cassiem.
Email cassiemn@cput.ac.za
Visit http://energyuse.org.za/due/

Securex 2017
30 May – 01 June 2017
Gallagher Convention Centre, Midrand, Johannesburg
Securex is Africa's leading security and fire exhibition. The exhibition enjoys the support of a number of industry associations, a fact that underlines the credibility of Securex as Africa's leading security and fire exhibition.
Enquiries:
Email leighm@specialised.com

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