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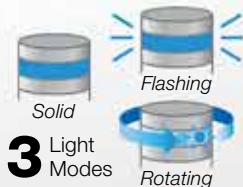


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Once again, it's the time of year for reflection. Time to review not only our personal growth and development, but also that of many organisations and of our nation.

It has been a tough year for this country, and the region. The fact that we are facing a drought in much of southern Africa, hardly assists.

The challenge is in how we plan and manage the future – given our understanding of the past and our predictions of the way ahead. This is a basic requirement in any organisation, and it takes thought, time and leadership. It is also true that we have to acknowledge that these commodities are not always available – at the right time and in the right place.

In some cases, things turn out in ways that may not have been obvious at the outset – and that must inform our planning. For instance, who would have imagined that load shedding would end quite so soon – and that the primary reason has been a significant drop in demand? Part of that may well be more efficient practices; but another part is a slow down within industry.

This brings into stark focus the way we drive the energy agenda. I have made the point previously that we need to do two things: We need to secure a reliable base load to serve industry; and we need to explore alternatives that will ensure a more sustainable energy future.

All of this is premised on a number of assumptions, and a sound understanding of our history. It is fairly clear that we have been brought up on an energy-intensive and commodity-based economy. Over the years, we have come to realise that the required amount of energy (power, actually) is available when needed. You have to be producing at that moment; the machinery must be spinning and be able to deliver.

As an aside, we have therefore begun to accept that, as consumers (any type), we should have unrestricted access to energy. This has become our philosophy. Imagine, for a moment, a future that suggests that this may not be possible? It may seem devastating in the context of energy – I wonder if it really is the case?

I would like to challenge everyone to end the year thinking of a future ... where we can supply a base

load (but at reduced levels), restructure how we do our business in order to use energy more effectively and more efficiently, and possibly reconsider the pace at which we do things.

I extend my personal appreciation to Karen Grant, who has successfully completed 'year one' in the role of Crown publisher. For a busy and challenging 2015, thank you to the Editor of Electricity+Control, Wendy Izgorsek; advertising managers, Helen Couvaras and Heidi Jandrell; layout artists Adél JvR Bothma and Anoonashe Shumba ... Adél for the layout of our monthly magazine; Karen Smith, Adél and Anoonashe for the monthly newsletters, E+C Spot Ons and Electricity+Control Face Values. And of course, thank you to Jenny Warwick for her ongoing involvement and support.

Finally, I wish you – our readers and advertisers – your families and your colleagues, the very best over the year end. I have no doubt everyone needs and deserves a break!

May 2016 be everything
you wish it to be!

From the Electricity+Control team.



Ian Jandrell

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

Ian



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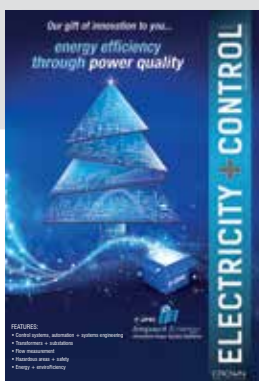
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The ability to take the guesswork out of Power Quality implications and engineer this into improved reliability and real value into Power networks is achieved through leading edge **ElSpec** Power Quality Measurement and Solutions Technologies. *Read more on page 17.*

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7 Steps to designing an optimal battery-based solution to reduce diesel costs of telecom towers

By D Shah and R Kuberkar, Schneider Electric

Telecom tower companies (TowerCos) in regions where the grid is unreliable or non-existent depend on diesel generators as their primary source of power. In recent years the costs associated with diesel generation have increased significantly.

The price of diesel has almost doubled in the past decade and refuelling and maintaining generators (diesel generators frequently break down) in remote sites is expensive. Diesel theft is also a problem. The costs associated with running diesel generators for long hours every day at telecom tower sites can be more than 20% of the total revenue of such companies. Furthermore, diesel generators are noisy and carry a high carbon footprint.



Figure 1: Operating diesel generators in regions with unreliable or non-existent power grids account for over 20% of a company's expenses.

To address these issues, a growing number of TowerCos are adopting battery-based solutions including the integration of solar energy to power telecom towers at remote sites. There is no universal 'one size fits all' design. Each site has unique challenges (environmental conditions, load profile, number of generators, monitoring needs), which call for different solutions.

Off-grid telecom tower sites operate diesel generators on a continuous basis. Generators run most efficiently when they run closest to full load capacity. Yet most TowerCo diesel generators operate

at sub-optimal efficiency with low loads because they are oversized for various reasons:

- Prime power generators (designed to run continuously at variable loads) with low power rating and sufficient capacity to handle occasional demand peaks are not readily available everywhere
- Even if the average site load is low, the start-up surge rating of some of equipment, like an air-conditioner, is very high
- Capacity for future expansion of the site needs to be available

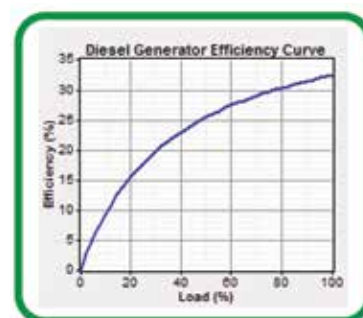


Figure 2: Generators run less efficiently at lower loads and require more maintenance.

Battery-based solutions

Battery-based solutions essentially create a 'hybrid' power system, where instead of the telecom tower site depending solely on the diesel generator for energy, it can draw power from batteries. There are two major approaches to battery-based solutions:

- Charge-discharge Cycling (CDC)
- Solar integration

- BTS – Base Transceiver Station
- CDC – Charge-discharge Cycling
- GSM – Global System for Mobile communications
- HMI – Human Machine Interface
- IEC – International Electrotechnical Commission
- OPEX – OPerating EXpenses
- PV – Photovoltaic
- ROI – Return On Investment
- SCC – Solar Charge Controller

Abbreviations/Acronyms

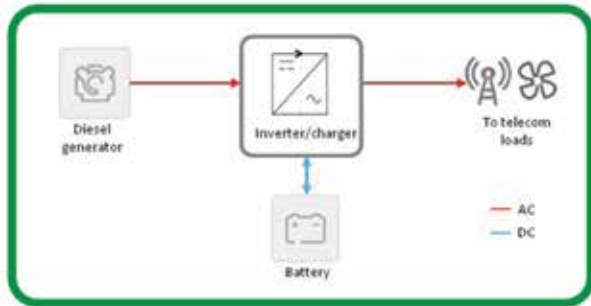


Figure 3: A CDC battery solution allows the generator to run at higher capacity for shorter periods of time.

Both approaches lower carbon emissions, reduce fuel costs and maintenance requirements, and improve overall system efficiency. Such a hybrid system can cut Operating Expenses (OPEX) and reduce carbon emissions by more than 35%. Furthermore, both may be implemented either for new-build sites or as retrofit solutions.

Charge-discharge Cycling (CDC)

Rather than continuously running a diesel generator at lower capacity, a CDC battery solution allows the generator to run at higher capacity for shorter periods of time. Batteries are charged by the generator when it is running at higher loads (when it is more efficient), and discharged to support the site loads when the generator is switched off (see Figure 5).

Solar integration approach

The CDC battery solution can be further extended to integrate solar energy to charge the batteries and further reduce dependence on the diesel generator. For example, rather than the generator running at 30% capacity 24 hours a day, it operates at more than 75% capacity but for only four hours a day with solar energy integrated into the battery-based solution. Some remote sites without diesel generators can opt for a 100% solar solution using solar charge controllers. As the cost of solar decreases, the integration of solar into telecom tower sites is becoming a more attractive option, especially in regions with a lot of sunshine.

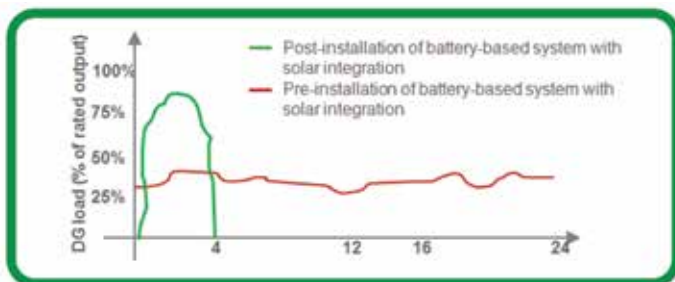


Figure 4: A solar battery solution further reduces dependence on the diesel generator.

STEP 1: Determine objective

- Reduce carbon footprint
- Reduce diesel dependency (reliability)
- Reduce diesel costs (efficiency)

No matter what the final design is like, the telecom tower site’s carbon footprint will be reduced by installing a battery-based solution. Telecom tower site owners express the following objectives:

- The need to reduce diesel operating costs and operate efficiently
- Minimise diesel dependency at the telecom tower site

STEP 2: Evaluate loads

- Load profile
- Grounding needs

A telecom tower site typically has three major types of loads:

- **BTS** - A Base Transceiver Station (BTS) is a piece of equipment that facilitates wireless communication between user equipment (like mobile phones) and wireless communication networks that use technologies like GSM (Global System for Mobile communications). The size of the BTS load depends on the number of BTS co-located at the site. Generally, each BTS has on an average 800 W dc of continuous load. Newer BTS equipment is more energy-efficient and may consume less power.
- **Cooling** - Cooling needs vary significantly from one site to another. These depend on several factors:
 - BTS characteristics
 - Battery characteristics
 - Thermal design of the existing shelter and choice of cooling equipment
- **Site location**
- **Call density**
- **Miscellaneous loads**
 These are generally minor loads (e.g. lighting, internet router, smoke detectors)

Grounding needs: Telecom systems are traditionally positively grounded to avoid corrosion of copper wires. Photovoltaic (PV) modules available on the market today have different technologies (polycrystalline, mono-crystalline, crystalline-Silicon, thin-film) and new manufacturing styles (such as back-side connected cells) to achieve higher efficiency. Understanding the different Solar Charge Controller (SCC) types and grounding schemes enables the designer to make an informed choice on which components to use and how to wire.

STEP 3: Identify energy sources

- Number/quality of diesel generators
- Grid reliability
- Solar potential

Diesel generators: Many telecom tower sites have two diesel generators installed. This ensures that a back-up energy source is available if the main diesel generator fails. To accommodate this requirement, the selected inverter-charger needs to have dual ac inputs with an internal transfer switch. The inverter-charger should facilitate smooth transition to the back-up generator if the main generator fails.

Grid availability: Grid power availability varies greatly from one location to another. A clear understanding of grid availability is important to design an optimal solution.

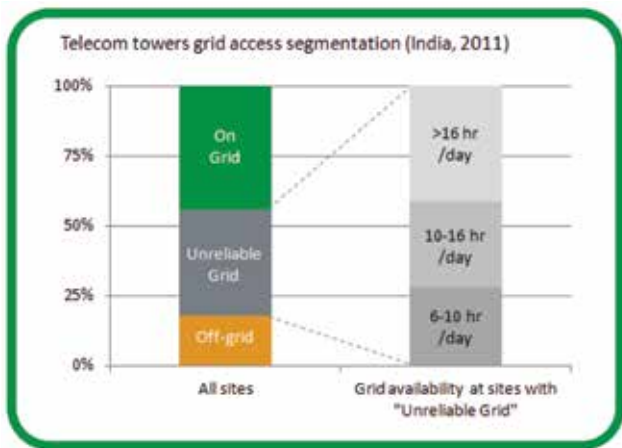


Figure 5: Grid availability at telecom tower sites varies significantly from one location to another.

Solar PV generation potential

The potential for solar PV generation varies significantly from one location to another. At a given location, it can vary significantly from one season to another. A detailed understanding of solar PV generation potential throughout the year is important for designing the optimal solution.

STEP 4: Analyse communication needs

- Remote monitoring
- Data access

It is always a good practice to install a monitoring solution that analyses system configuration and performance using a Human Machine Interface (HMI). The monitoring solution should also allow data to be exported in a suitable format like .csv. This is critical for detailed troubleshooting any system problems. It is also important to choose a data logger with a programmable relay that can be activated in case of a fault. Select a router that can function under the operating conditions within the BTS shelter or enclosure.

STEP 5: Understand installation space

- Indoor vs. outdoor
- Footprint limitations

Indoor versus outdoor BTS

Indoor: Telecom tower sites can either have an indoor BTS or an outdoor BTS installed. Conventionally an indoor BTS is installed within a shelter at the telecom tower site. It is important to choose equipment (inverter-charger, solar charge controller, batteries, etc.) with an optimised footprint so that all components of the solution fit inside the shelter. An inverter charger or solar charge controller with high charging capacity is advantageous to reduce the amount of equipment required to charge batteries. If there is not enough space inside the shelter to house all the components, it will be necessary to design a separate outdoor-rated enclosure to house the equipment.

Outdoor: Outdoor enclosures should ideally conform to the International Electrotechnical Commission (IEC) IP65 rating, (defining enclosures' protection against dust and water), be non-corrosive and rugged, and include proper locking mechanisms to avoid tampering/theft. The fans and filters should also be chosen for suitability in the outdoor environment. Installers often settle for locally sourced enclosures not designed for outdoor installation. This eventually hurts system performance. Evaluating the operational considerations through the first five steps will yield sufficient information and data for setting parameters around selecting equipment. The following checklist categorises these various criteria to facilitate designing a solution schematic and sizing and selecting equipment.

Minimise energy requirements

Wherever possible, make design decisions to minimise energy requirements as much as possible. For example, the optimal recommended temperature for batteries is ~25°C, while the BTS can operate optimally up to ~40°C. Using a single air conditioner to cool both batteries and the BTS inside the shelter will of course consume more energy to maintain the lower temperature of 25°C. There are two possible ways to minimise energy consumption in such cases:

- Design an outdoor-rated enclosure with a small air conditioner for housing the equipment (inverter-charger, solar charge controller, batteries, etc.)
- Install the equipment (inverter-charger, solar charge controller, batteries, etc.) inside the BTS shelter if there is free space available. Continue using the fan-cooled ventilation mechanism to keep the BTS operating optimally turning on air conditioning only when the fans are insufficient and use a battery chiller to cool the batteries

STEP 6: Select best-in-class equipment

- Design to minimise energy requirements
- Choose equipment with rich and versatile features set
- Source from a reliable and bankable manufacturer

Always choose equipment from reliable manufacturers. Selecting equipment with a rich and versatile feature set enables TowerCos to work with the same equipment across several sites even though each has different needs.

STEP 7: Validate objectives and finalise design details

- Validate solution vis-à-vis design objectives
- Thermal considerations

As with any installation project, ensure that the proposed solution actually meets its objectives. Particularly when the objective was not to reduce diesel dependency 'at any cost,' perform a high-level cost-benefit analysis to confirm that the realisable ROI is consistent with the target ROI before proceeding to finalising design details, ordering equipment, and preparing cost proposals.

Thermal considerations

Optimal thermal design plays an important role in ensuring maximum output and safe operation under various environmental conditions. Some best practices:

- Ensure optimal spacing between equipment inside the enclosure/shelter, especially when the components use convection cooling
- Analyse the head-dissipation data for the equipment to consider worst-case operating conditions for efficiency
- Mount the enclosure in a location that it is not exposed to direct sunlight and allows cool air to circulate into the unit

A 7-step investigative approach enables companies to identify operational challenges in advance and address them in the design phase.

Site accessibility

Keep in mind the accessibility of the site(s) for the final deployment of the solution. If a site is very difficult to access, the pre-assembled enclosure cannot be transported to the site. Individual equipment must be carried separately and then the solution assembled at the site. But if the site is easily accessible, the pre-assembled enclosure can be transported to the site.

More people in more places on Earth are becoming connected by cell phones and other mobile devices. Increased cellular data traffic means more telecom towers are needed particularly in developing and emerging regions of the world where electrical grids are either unreliable or non-existent. Telecom tower companies have long relied on diesel generators to power installations in such locations. But diesel generators frequently operate at low efficiency, carry a large carbon footprint, and can be expensive accounting for over 20% of a typical telecom tower company's operating expenses.

To reduce their dependency on diesel generators, telecom companies have begun to adopt battery-based solutions — including the integration of solar energy — at their towers and base stations in remote sites. Rather than continuously running a diesel generator at lower capacity, a battery solution allows the generator to run at higher capacity for shorter periods of time. Batteries are charged by the generator when it is running at higher loads (when it is more ef-

- Running a remote site on diesel alone is not a cost-effective solution.
- Battery-based site solutions offer significant benefits.
- Solar supply is easily incorporated into a battery-based solution.

take note

ficient), and discharged to support the site loads when the generator is switched off. Such a hybrid system can cut operating expenses by more than 35% and greatly reduce carbon emissions.

Conclusion

Each site is unique in many ways (environmental conditions, load profile, number of generators, monitoring needs, grid reliability) and needs its own unique solution. However, even though each site has its own set of characteristics that need to be considered, the overall approach and principles for designing a battery-based solution for telecom tower sites remain the same for every installation. A systematic 7-step investigative approach enables companies to identify potential operational challenges in advance and address them effectively in the design phase: **Step 1:** Sets contextual framework that informs everything that follows. **Steps 2 – 5:** Collect information and data about the tower site that become the parameters and (**Step 6**) inputs for selecting components and equipment for the solution. Finally, **Step 7,** it needs to be confirmed that the proposed solution actually meets its objectives.

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Stellenbosch wins PneuDrive Challenge 2015

The successful **PneuDrive Challenge 2015**, a mechatronics design competition for engineering students throughout South Africa has seen Stellenbosch University once again walk away with top honours. The theme of this year's competition was to design a game changer for the food and beverage industry. The judging panel announced the TopThreeTeams for the 2015 Competition on Friday 6 November 2015.

First place:

Stellenbosch University

The Mechabrewers team came out tops with their design. The Stellenbosch University team visited local micro beer brewer, Stellenbrau, and analysed a specific problem – the need for an efficient, inexpensive and automated application for transporting empty beer bottles on to the capping machine. The solution proposed by the team aims to improve and add value to the company by allowing better utilisation of labour, and improvements in time and efficiency, by automating the process of transporting empty beer bottles onto a capping machine, BottleBot, which has a low energy consumption and can be controlled by a smart phone or tablet device. The BottleBot can increase efficiency and accuracy through complete automation and elimination of human error and contamination.

Second place:

WITS University – The Potato Game Changer

This team addressed the problem of transforming waste into useable energy in a potato chip factory. Potato chip making factories produce significant quantities of starch laden waste water and solid vegetable wastes such as potato peels. The starch waste water can be very harmful to the environment and potato peel waste is of zero value

to factories. At a local chip factory in Gauteng, this waste is presently underutilised. This project proposes that a system using Anaerobic Digestion (AD) be employed to dispose of the solid waste and clean the waste water while producing a useful by-product in the form of biogas. This biogas can be used to supplement any existing system in the heating of the chip cookers, reducing energy costs.

Competing students:

Micha Dedekind, Craig Daniel and Richard Grieves under guidance from Professor Joao Nobre.

Third place (and Innovation prize):

WITS University – Automated Warehouse Cleaner

This team from WITS identified a health and safety risk of broken bottles and spillage on the Rosslyn brewery factory floor. During the conveyor packing process, filled bottles of beer are often broken due to the high pressure applied during the filling process. They proposed an autonomous cleaning machine as their solution to this obviously unacceptable problem.

Competing students:

Vuledzani Madala, Portia Sibambo, Nkosinathi Shongwe, Tisetso Ramolobe under guidance of Professor Joao Nobre.

Formal prize giving for this competition takes place in January 2016. The new theme for 2016 will be announced by end November 2015.

Enquiries: Lindy Ndaba. (SEW-EURODRIVE). Tel. 011 248 7000 or email Indaba@sew.co.za or Riaan van Eck (SMC Pneumatics). Tel. 011 568 2407 or email jbester@smcpneumatics.co.za



The Stellenbosch team: Reghardt Pretorius, Johannes Leuvennink, Madeli du Toit, Josua Blom and Jean Swart.



The judging panel: John Menasce (Hatch), Brian Abbott (SMC Pneumatics, SA), Johan van Graan (SEW-EURODRIVE), Riaan van Eck (SMC Pneumatics SA), Dr. Mark Gordon (ESKOM), Eugene Tondolo (South African Fluid Power Association), Conrad Pilger (SEW-EURODRIVE), Tobias Nittel, (SEW-EURODRIVE, Germany), Greg Perry (SEW-EURODRIVE SA).

Gauteng Nerve Centre for rail

Siemens has built a new state-of-the-art control centre for centralised rail traffic management called the Gauteng Nerve Centre (GNC) in the province of Gauteng, which is operational and will start with the changeover of stations from January. The new operations control centre now accommodates the existing 35 control rooms in one place. The GNC constantly monitors each and every one of the over 600 trains in operation every day, and can immediately respond to any operating failures, accidents and other incidents. Siemens has been upgrading the signalling systems for the entire railway network of the Passenger Rail Agency of South Africa (PRASA) since 2011.

'Eye' for PRASA

The new building covers an area of around 3 400 square metres, and acts as the 'eye' overlooking the entire Passenger Rail Agency of South Africa's (PRASA) network. The control room at the heart of the GNC is equipped with a video wall over 52 metres long and two metres high, monitoring all train movements and displaying traction power supply, weather information and operational data. The train movements are controlled via 30 multiscreen workstations, which are each fitted with an integrated communication module, combining telephone, trunked radio and GSMR communication. The GNC also includes the

centralised control of passenger information systems, monitoring equipment for the overhead contact line systems and CCTV systems for the stations.

Gauteng signalling systems... more than eighty years old

The signalling systems currently in use in the province of Gauteng are obsolete. They comprise a mix of technologies, with some dating back to the 1930s. Upgrading the trackside equipment will help develop the densely populated province of Gauteng as an economic region, as the advanced track systems are designed to reduce the headway between successive trains from 15 minutes to around 2,5 minutes, thus increasing operating capacity and ensuring greater flexibility, a higher level of safety and fewer train delays. Siemens is upgrading one quarter of the obsolete signalling systems in Gauteng for completion in 2017. The follow-up order awarded in 2013 is to replace the remaining three-quarters of the trackside signal-

ling systems. Three of the total 92 stations to be modernised are now up and running with Siemens interlocking technology.

Heavy investment in rail

Covering an area of 18 000 square kilometres, Gauteng (twelve million inhabitants) is the smallest but most densely populated province in South Africa. With the cities of Johannesburg and Pretoria, it forms the economic centre of the South Africa. It is responsible for generating around 10% of Africa's total GDP. To strengthen Gauteng's position as an industry and trade hub, PRASA, the state-owned rail operator, is investing heavily in locomotives and rail cars and in the expansion of railway infrastructure.

Enquiries: **Keshin Govender**
Email Keshin.govender@siemens.com



New releases – paperless recorders and data acquisition system

Yokogawa has introduced Release 3 of the SMARTDAC+ GX/GP series paperless recorders and GM series data acquisition system. This new release includes a number of new features and capabilities for the SMARTDAC+ system's GX series panel-mount type paperless recorder, GP series portable paperless recorder, and GM series data acquisition system.

This latest SMARTDAC+ release includes an advance reminder notification and calibration correction feature that will help customers in the heat treatment industry comply with the requirements of the National Aerospace and Defence Contractors Accreditation Program (Nadcap) and the SAE AMS2750E standard, and options that facilitate communications with a variety of industrial equipment, a key requirement for the Industry 4.0 initiative. In addition, the release features multi-batch capability, a dc power supply module (GM series only), and a pulse input module, and also adds support for a communications protocol used by Supervisory Control and Data Acquisition (SCADA) systems and Human Machine Interfaces (HMIs).

Recorders and data acquisition systems (data loggers) are used on production lines and at product development facilities in a variety of industries to acquire, display, and record data on temperature,

voltage, current, flow rate, pressure, and other variables. Aerospace companies often need to certify that their heat treatment and other industrial processes are Nadcap compliant. This SMARTDAC+ release includes a new option that addresses this need.

With this release, four new firmware options and two new optional hardware modules (a pulse input module and a GM series dc power supply module) are available.

Enquiries: **Tel. 27 11 831 6300** or
email Christie.cronje@za.yokogawa.com





Saving Power Quality Rands

By S Kuwar-Kanaye, Impact Energy

The Energy Saving Concept described quantifies Technical Energy (kWh) loss and savings potential across key components in the network i.e. transformers, cables and loads. In this article, emphasis is placed on the loss components (measured in kW), as an estimate of the energy losses (measured in kWh).

The effects of poor Power Quality (PQ) for any business are established by critically examining two core areas:

- Operational losses such as downtime, equipment failures, scrap, rework etc.
- Demand-related costs and penalties as a result of poor Power Factor (PF)

Impact Energy (referred to in this article as ‘the company’) represents the Elspec (referred to in this article as the global company) PQ Energy Saving Concept to add a third dimension to defining and quantifying the PQ Blue Print.

Power bill energy (kWh) related costs owing to technical network losses

Establishing a PQ consequence and cost fingerprint for any site is the key step in driving reliability and engineering value back into power networks. The company provides the transition from establishing PQ consequence and cost baselines into real financial value through PQ measurement and solutions technologies.

Innovative and systematic PQ approach

Energy is supplied on a continuous cycle by cycle basis, therefore PQ analysis and loss analysis should be done on a cycle by cycle basis for an accurate representation of the performance of a power network.



Figure 1: Innovative and Systematic PQ approach.

Technical losses (kWh)

Technical losses are an inherent facet of any power network resulting in losses and inefficiencies across key components on the network. These losses have historically been an acceptable and ignored cost implication for all business types. In the current and future context of power constraints and business profitability impact, ignoring any opportunity in optimising efficiency, is unacceptable.



Figure 2: Degradation of assets occurs in the form of heating of cables, insulation degradation, cooling fan problems, tripping of VSDs during unbalance conditions which ultimately result in damage to equipment and reduction of asset lifecycle.

Reactive energy increases the RMS current through components such as transformers and cables, resulting in progressive and more often than not premature ageing.

If we add the long term effects of I²R heating with anomalies such as switching transients, lightning surges, hot connections, sub-standard equipment, poor maintenance practice etc., this simply compounds the degradation process of critical assets. This has a direct impact on the capital planning process and impacting the sustainability of any business.

Transformer losses (kWh)

Transformer losses occur as a result of a few factors seen in the formula, here we focus on harmonic currents, eddy currents, hysteresis and resistive losses common to transformers.

The presence of harmonic currents increase the transformer core losses, copper losses and stray flux losses. The NO LOAD losses which

The Technical loss considerations and associated implications are tabled and hold true for almost all types of industry regardless of customer perceptions. Energy (kWh) savings potential of up to 13% can be estimated with a confidence level of 80% or greater. This, together with any form of quantified operational loss analysis serve as a sound basis for investment into PQ Solutions.

Description of change in supply conditions	Range of saving (typical values)	Accuracy of estimation using continuous cycle by cycle measurements (error in %)
Savings due to reactive current and Harmonics Reduction		
Transformers • Current reduction • Harmonics Reduction (Skin Effect, Hysteresis)	0,25% - 0,75% 0,25% - 1,0% (*)	± (5 - 10)% ± 50%
Cables • Current Reduction • Harmonics Reduction (Skin Effect)	0,5% - 1,0% (**)	± (5 - 10)% ± 15%
Load • Harmonics Reduction (Skin Effect, Hysteresis, Negative Sequence field due to 5 th , 11 th , etc)	1,0% - 3,0% (*)	± 30%
Saving due to optimal voltage control		
One step - 2 - 5%	2,0% - 4,0%	±(5 - 10)%
Two steps - 5%		6,0% - 8,0% ±(5 - 10)%
Total range saving	(4 - 9)% Approximately	(6 - 13)% Approximately ±m20%
• Pending on the THD(V) and THD(I) level • (**) Pending on distance		

Table 1: Energy saving (kWh) – typical values.

Simulations and modelling

Once the comprehensive PQ Study has been completed using G4K metering devices, site network data are captured that feed into the formulation of site electrical models. The data includes transformer short circuit impedances and tap positioning, cable impedances, type and lengths and other relevant data. The models are then used for simulations of various PQ scenarios to determine network losses, potential solutions and savings, and the formulation of an official energy saving report.

Simulation

In this step the plant is presented by one line diagram for simulation purpose where static load is replaced by dynamic (cycle by cycle).

Saving due to current reduction

In this step, losses saving due to current reduction as a result of reactive power compensation are calculated by simulation.

Saving due to Harmonic losses

The harmonic losses, including skin effect, hysteresis and negative sequence are calculated and estimated in two modes of operation:

- Without compensation and filtration
- With compensation and filtration

The saving is the difference between the two modes.

Saving due to voltage control

The minimum voltage level is determined based on long period of measurement. The consumption before and after voltage tap down is calculated by simulation and the saving is the difference.

Total saving is the sum of the losses reduction due to current and harmonic reduction and the saving which is created due to voltage tap down.

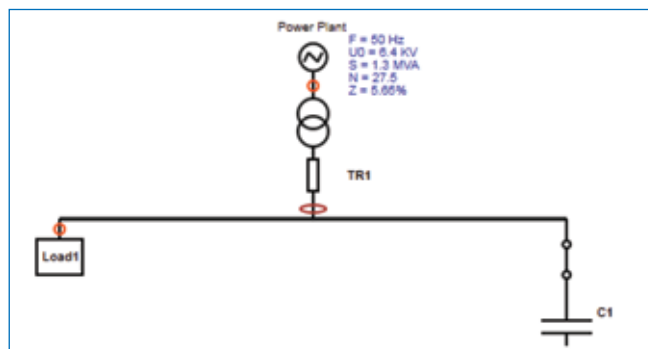


Figure 4: Total saving.

Energy efficiency concept in action

Two cases are presented where clients engaged the company on their PQ and Network Optimisation Studies. The progress to date on both these projects are advanced based on the systematic approach described earlier with clients being presented Savings and Business Case Models to inform their investment decision.

The identity of clients cannot be revealed at this stage. During post-implementation of the projects with verification of PQ enhancements and energy savings realised, further project information will be made public.

Case Study 1: Fast Moving Consumer Goods (FMCG) industry in SA

The client in the FMCG industry has branches located across the country and is using the Business Case Models for one site to inform a group wide roll-out of the project.

In this case the site has two 11 kV municipal feeders stepped down through two 11/0, 4kV transformers into a 400 V distribution and load network.

The site has poor PF of 0,8 and instances where PFs drop significantly to levels of 0,4 during large reactive load start-up and demands. The site also has high 5th harmonic component due to inherent loads connected.

	Transformer A	Transformer B
Savings due to current reduction	0,07%	0,09%
Savings due to harmonic reduction	0,5%	0,5%
Savings due to voltage control	2,37%	2,52%
Total energy savings potential for the site	6,05% (kWh)	
Total demand savings potential	300 kVA	

Table 2: Through the introduction of distributed 400 V Equalizer 1 220 kVAR real-time PFC tuned to filter the 5th harmonic the site has the savings potential as quantified through the Energy Saving Concept.

The simulations demonstrate the increased and stabilised voltage levels (V) for Transformer A, the reductions in RMS current (A), the increase in True Power (P) and the reductions in Reactive Energy (kVAR).

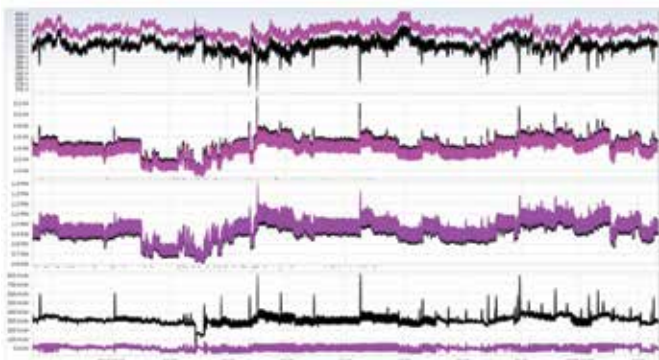


Figure 5: Measurement without compensation (black) and simulation with Equalizer (pink).

Technical losses are an inherent facet of any power network resulting in losses and inefficiencies across key components on the network.

Case Study 2: Commercial building in Gauteng Province

The client manages a large commercial building in the Gauteng area and has an installed base of approximately 17 MVA transformers. The site has distributed traditional contactor based PFC that has been switched out of service for an extended period due to technical failures over the years. The Municipality supplies the site at 11 kV through multiple feeds onto bus and cable distribution networks.

Poor PFs as low as 0,4 during peak reactive loading start-ups and 0,8 during steady state nominal loading are seen consistently across majority of the load centres. The site does not have high loss incurring individual harmonics. Some transformers are significantly under-loaded and present an additional opportunity to optimise networks and reduce losses.

Through the introduction of distributed 400 V Equalizer 4 MVAR real-time PFC detuned 7% the site has the following savings potential as quantified through the Energy Saving Concept.

	Transformer A	Transformer B
Savings due to current reduction	0,04%	0,06%
Savings due to Harmonic Reduction	0%	0,5%
Savings due to Voltage Control	3,75%	3,26%
Total Energy Savings Potential for the Site	4,0% (kWh)	
Total Demand Savings Potential	1 200 kVA	
Total Energy and Demand Cost Savings Potential over 6 year period 2016-2021	R29,3 M (based on 12 months latest historical billing and annual tariff escalations of 8%)	

Table simulations of two transformers that are representative of the other transformers that run similar loads and hence representative of the site as a whole.

Conclusion

The energy constraints and rising costs facing South African power users impose a critical examination of all inefficiencies within the operation, and specifically within power networks, in order to drive profitability and ensure sustainability. The global company's Energy Saving Concept, backed by proven PQ measurement and solution products, takes the guesswork out of quantifying the PQ Energy Cost Blue Print. Energy optimisation projects are in process around the country with energy users embracing the concept of turning PQ Technical losses into Saving PQ Rands.



Sishal Kuwar-Kanaye has spent several years in HV project, commissioning and maintenance environments. He holds a BTech Elec degree, a Masters Certificate in Project Management (GWCPM), Certified Energy Manager (CEM), Certified Measurements and Verification Professional (CMVP) and he is registered with ECSA. He is Group Project Engineer at Impact Energy.
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Specific requirements for success of mobile substations

By C Vrey, Zest Energy

Engineering a mobile substation is not a simple exercise. It requires a clear understanding of the specific requirements – not only from an electrical perspective – but also from a road ordinance viewpoint of the country in which the solution will be deployed.

Zest Energy's interaction with various utilities, including Eskom, for more than ten years has developed its understanding of the stringent design requirements on both electrical and mechanical components. As a result, the company is able to develop fit-for-purpose mobile substation solutions.

Two important mobile substation components

The two most important components of a mobile substation are the high-tech transformer and the trailer, which must comply with road ordinance legislation in regard to weight and equipment dimensions. The effects of trailer deflection and movement on the integrity of the transformer are also important design considerations.

Design

Since each country's road ordinance specifications are different. Mobile substations need to be designed in accordance with the relevant requirements of the country in which they are intended for use. This company utilises trailer designs with proven industry technology to assist with manoeuvrability. It makes use of combination trailer con-

figurations to better distribute the overall weight and to ensure that the axle weight limitations of the specific country are not exceeded.

A mobile substation needs to be deployed as quickly as possible, without the need for escort vehicles and special permits.

Trailer

The heart of the mobile substation is the trailer itself. This comprises a gooseneck, articulated steerable axle system, air suspension, ABS braking system, trailer stabilisation legs and fold away type access platforms, which allows safe access to the secondary plant.

Essentially, a mobile substation should meet all or most of the attributes of a fixed substation, with the added benefit of mobility, which affords the customer the flexibility to move the unit to wherever it is needed. While the standard configuration of a high voltage substation is consistent, certain customers have specific requirements which are informed by their own reticulation requirements and specifications. It is not difficult to adjust the design to conform to these requirements,

The 33kV/22kV//22kV/11kV, 10MVA mobile substation on route from the manufacturing facility to the operational site.



ABS – Antilock Braking System
 ODAF – Oil Directed Air Forced

Abbreviations/Acronyms

- Mobile substations can be designed, built and deployed rapidly.
- A mobile substation can be built in a purpose-designed factory and then taken to site.
- Mobile substations must be purpose-designed for the specific application.



take note

but it is essential to have an understanding of these requirements up front. Mobile substations are custom engineered to ensure that they can be configured for individual applications and will seamlessly integrate into the existing electrical network.

Quick deployment

The main idea is to facilitate the deployment of a mobile substation as quickly as possible, and these units therefore need to be engineered to ensure the highest level of mobility for transportation without the need for escort vehicles and special permits. This means that the weight and the physical size must be taken into account, as well as the weight distribution of the substation components. Height is also a restriction, both from an installed space perspective as well as in terms of safe passage of the trailer under bridges and other structures during transport. Another factor that needs to be considered is that the components that make up the installation need to be able to withstand the impacts of being transported on road networks. When it comes to ensuring the optimum mobility of the substation, it is essential to take into consideration the forces applied to the equipment during transportation. This requires an in depth understanding of each of the elements and how these are affected, to minimise internal movement.

Electrical network considerations

Electrical network considerations are critical and Zest Energy leverages WEG's 20 years of experience in engineering transformer technology that allows for multi ratio primary and secondary voltage transformers. This will permit customers to use the mobile substation in areas where different voltage reticulation networks are found, thus improving operation flexibility. The company has factored into the design the specifications of the utility with respect to electrical equipment. Every utility has its own specifications for primary and secondary plant; it is most important that equipment is in line with these standard specifications.

Conclusion

The company ensured that all these specifications and standards relating to Eskom's standard protection schemes which were incorporated in the overall mobile substation solution, were analysed as part of the overall design process, to ensure complete compliance with Eskom's requirements.



An ODAF (Oil Directed Air Forced) cooling system is utilised to minimise the physical size and overall weight of the transformer.



132 kV/88 kV//33 kV/22 kV, 40 MVA multi-ratio mobile substation set up for transport mode and ready for deployment to the operational site.



Coenraad Vrey is co-founder and managing director of Zest Energy. Founded in 2008, Zest Energy has been part of the Zest WEG Group of companies since 2009. Coenraad completed his B.Eng. degree in Electrical Engineering in 1992 and his Master's in Power Electronics in 1994 both at the Rand Afrikaans University or University of Johannesburg, as it called today. Coenraad became a professional engineer in 1997 and has over 20 years' experience in the Electrical Power Engineering field. He has been involved in multimillion electrical infrastructure and co-generation projects in South Africa as well as in other African countries. Coenraad is a member of the Engineering Council of South Africa (ECSA), a senior member of the South African Institute of Electrical Engineers (SAIEE), the South African National Energy Association (SANEA) and the Institute of Electrical and Electronics Engineers (IEEE).

Enquiries: Kirsten Larkan. Tel. 011 723 6000 or email kirstenl@zest.co.za

Faster automated cable identification

Brady's Wraptor Wire ID Printer Applicator now offers even more automation opportunities. A new system software update allows the integration of Schleuniger Cut & Strip Machines with the Wraptor for faster cable preparation and handling. This will enable faster workflows for operators. In cooperation with Schleuniger, the **Brady Wraptor** system software has been upgraded to allow full integration with Schleuniger Cut & Strip Machines. This enables faster and more streamlined workflows for operators. The Wraptor Wire ID Printer Applicator is a great tool to control manufacturing cost and enhance identification quality. In less than five seconds, the Wraptor prints and applies

labels around wires and thus eliminates the need to print labels in advance and the time needed to apply them by hand. The Wraptor's technology enables 300 dpi prints for barcodes, logos and diagrams, and a tight label wrap around the wire, with minimal bubbling or wrinkling.

Without any adjustments, the Wraptor can identify cables from 1,52 mm up to 15,24 mm in diameter and apply labels with varying widths up to 50,8 mm, and lengths between 19,05 mm and 76,20 mm. A versatile tool, the Wraptor can easily be transported to different workstations to identify a great variety of cables. Coupled with Brady LabelMark software for easy

label design, barcoding and serialisation, the Wraptor becomes a highly practical process efficiency increaser, even more so when integrated with Schleuniger Cut & Strip Machines.

Enquiries: Email
emea_request@bradycorp.com



Gold standard in electrical calibration

Since 1988 the 5700 range of Fluke calibrators, has set the standard for multifunction calibrator performance in calibration laboratories worldwide. Represented in South Africa by **Comtest, Fluke** has introduced what they are calling the 'gold standard' of multifunction calibration – the very impressive 5730A high performance multifunction calibrator.

Like its predecessors, the 5730A calibrates a wide range of digital multimeters, up to long-scale 8,5 digit DMM's as well as RF voltmeters when equipped with the wide band option. But this new model features improved specifications that will help users increase test uncertainty ratios (TURs) and increase test confidence. Also, the improved specifications will reduce the need to guardband, giving users confidence and peace-of-mind with calibrations.

The 5730A is designed for calibration professionals who require the most accurate dc/lf signals available in a multifunction calibrator. Metrologists in national laboratories, the military, third party calibration laboratories, and corporate users with high-end workload value the performance and reliability of the 5730A. All 5730A calibrators are traceable to international standards and are produced in the factory with ISO/IEC 17025 accredited calibrations. Specifications are stated to the standard Fluke Calibration 99% confidence level (as well as 95% confidence level) to support easy measurement comparisons, according to international quality standards. Specifications are absolute and include the uncertainty of the calibration standards used. No additional analysis is required.

Enquiries: Comtest. Tel. 010 595 1821 or email sales@comtest.co.za



IO-Link capable Uprox3 sensors

Turck, supplied locally by **RET Automation Controls**, is offering its flagship uprox3 sensor in an IO-Link-capable version. The intelligent interface makes the factor 1 inductive proximity switch a universal sensor that can be parameterised to suit over 100 000 requirements. For example, the two separately adjustable switching distances (each either NC or NO, as well as PNP or NPN) enable early warning functions to be set for targets subject to wear. The user can thus take action before a failure occurs. Various timer functions can also be set, for example an off-delay for speed monitoring. These options are already possible in I/O mode, in which the sensor can be operated on a conventional digital input.

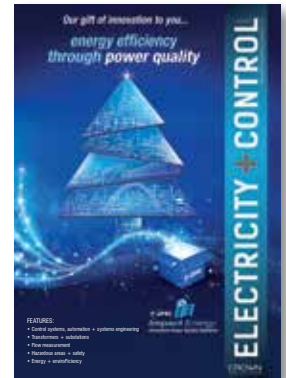
In IO-Link mode, the sensor is operated on an IO-Link master. This enables access to all parameter and evaluation functions. The intelligent data retention with IO-Link 1.1 allows a sensor to be exchanged without having to reset parameters. Already in the process data uprox3-IOL provides further analysis options such as application-specific switch points, temperature limits or an identification number. These can be used to identify 256 different nodes. The presence control of workpiece carriers or change tools and their simultaneous identification can thus be implemented with a single sensor.

Turck is initially offering four variants of uprox3 IO-Link: an M12 variant with a switching distance of up to 6 mm, an M18 variant with a switching distance of up to 10 mm – both in a chrome brass housing, as well as PTFE-coated variants for welding applications.

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



Power Quality, Probability and Profitability – Energy Saving the Elspec Way!



Power Quality Implications

Estimating the financial losses associated with Power Quality (PQ) disturbances can be complex as there are many uncertainties involved. Where effective analysis has been conducted these costs have been found to be significantly high compared to the overall cost base of an organisation.

How to Spot the Opportunity

It is common, widely published knowledge that continuous mining and manufacturing process plants and digital industries are the most vulnerable to power quality related disturbances. Of similar significance is the growing awareness of economic losses that supply related entities i.e. Eskom, IPPs and municipalities have to factor and account for as part of economic sustainability. Network components suffer extra losses, reduced operational efficiency, abnormal tripping, progressive degradation and premature failure because of various PQ anomalies. The long term financial losses as a result of poor power

quality are those that are not commonly and easily quantified i.e. production losses, scrap, inferior product quality, rework, additional labour and maintenance costs, increased and frequent sustaining capital investment etc. So spotting the opportunity is simple, the challenge really lies in quantifying the size of the prize.

Probability is defined as the extent to which something is likely to happen or be the case. And the likelihood of the occurrence or event is usually expressed as a percentage (%). This expressed likelihood can also be referred to as a 'confidence level' and forms a pivotal aspect of any energy saving project. Burning questions: Elspec has made the linkage between PQ and Probability through several years of research and development of their leading edge PQ Measurement and Solutions technologies. The uncertainty associated with historical burning questions are now answered with confidence with the Elspec tools in hand.

- What are the areas or opportunities for energy saving?
- How much can I save and what is the payback?
- How confident are you that the savings can be achieved?

Description of change in supply conditions	Effect on equipment
Savings due to reactive current compensation and Harmonic reduction	
Transformers • Harmonics reduction • Current reduction	The presence of Harmonic current increases the core losses, copper losses and stray-flux losses. These losses consist of 'no load losses' and 'load losses'.
Cables • Current reduction • Harmonics reduction	Additional 'Ohmic losses' (I ² R losses) in the line and neutral conductors. The Eddy Current, which is generated due to the relative motion of the electromagnetic field and circulating current in a conductor, is the root cause of Skin Effect.
Capacitors • Current reduction • Harmonics reduction	Voltage Harmonics increases dielectric losses in capacitors and reduction of operational lifetime of PFC capacitors. Resonance and possible catastrophic failures of capacitor bank systems.
Load • Harmonics reduction (Skin Effect) Hysteresis, Negative Sequence Field due to 5 th , 11 th , etc.	Increased motor currents in individual phases, resulting in heating and copper losses. Other mechanical/electrical issues e.g. torque reductions, cooling fan problems, insulation degradation. Tripping of VSDs during unbalance conditions.
Saving due to optimal voltage control	For non-linear loads, voltage variation due to load variations affects power consumption patterns. Through cycle by cycle reactive energy compensation, voltage is increased and more stable. It is possible to tap down transformers and this has a potential energy saving benefit.

Typical Technical Loss (kWh) Opportunity Considerations.

Profitability

The Technical loss considerations in estimating PQ losses and proposing benefit/saving opportunities can only be made possible if PQ is approached in a systematic manner and backed by technologies that can 'deliver the goods'. Profitability through PQ involves addressing the losses associated with:

- Operational losses such as downtime, equipment failures, scrap, rework etc.
- Power Bill Demand (kVA) related costs/penalties as a result of poor Power Factor (PF)
- Energy (kWh) the distinctive offering by Impact Energy, brand ambassadors and exclusive agents for the Elspec product and service portfolio

Enquiries: Impact Energy
Tel. 0861 357 732/ 082 325 3574
or email sishal@impactenergy.co.za



800 kV HVdc transformer for India

Alstom has successfully manufactured and delivered India's first 800 kV High Voltage direct current (HVdc) power transformer for the prestigious Champa-Kurukshetra Ultra High Voltage direct current (UHVdc) Phase 1 link. The project will connect the power station of central India near Champa to the demand centre in northern India at Kurukshetra, through a 1 365 km transmission line, creating an 'energy superhighway' of efficient power transmission. This is the first out of nine power transformers for the project that has been built in Alstom's largest transformer manufacturing and testing facility in India. The transformer is 13 m long, 5,3 m high and 5,1 m wide; it weighs 310 tonnes. Once erected at site, it will weigh an additional 175 tonnes. The transformer travelled over three months to cover a distance of 2 000 km to reach the project site at Champa. The second transformer, already dispatched, is expected to reach Champa in December (2015).

Patrick Plas, Senior Vice President, Grid Power Electronics and Automation, Alstom Grid said, "Alstom is delighted to have achieved such a significant milestone for this project. These massive transformers will substantially improve grid connectivity by seamlessly transferring power across five electrical regions of India. Alstom has been a key player in HVdc for over 50 years and the company is

currently executing two 800 kV UHVdc bi-pole projects in India. The 800 kV HVdc transformers are locally manufactured from Alstom's world class facilities and reinforce its leadership in the transformer market."

Enquiries: Email.julie.khoo@alstom.com



Predictive analytics to minimise risk associated with ageing assets

It is common knowledge that an ageing asset infrastructure is of major concern in the power industry, and this infrastructure is even more stressed when you consider the growing populations and urbanisation trends that demand increased generation capacity. In addition, most utilities face pressure to keep electricity costs low while delivering reliable power, which can lead to challenging budget constraints. Thus, operators, engineers and plant managers continually strive to make every plant's operation and maintenance Rand stretch as far as possible.

While operating assets for as long as possible can be cost effective and efficient, the practice can have quite the opposite outcome without proper preparation. Ageing equipment can contribute to outages, failures, downtime, higher costs, decreased efficiency and a number of other associated problems. Ageing assets could also cause regulatory, environmental compliance and safety issues.

Effective maintenance is a critical component to ensuring that assets, plants and entire fleets continue to operate reliably for long periods of time.

Plant personnel employ a combination of maintenance techniques depending on the criticality of each asset, and organisations that do not have a comprehensive maintenance strategy in place are putting the operation at risk. If a potential asset failure could result in significant damage, safety issues or power outages, a proactive maintenance approach is needed.

Predictive maintenance involves continuous monitoring of the health of equipment and comparing its state to a model that defines normal operation to detect subtle early warning signs of potential failure. Predictive maintenance typically uses advanced pattern recognition and requires a predictive analytics solution for real-time information about equipment health. The insights from a predictive analytics solution like Schneider Electric's Avantis PRISM helps engineers and plant operators better determine when an

ageing asset can continue running as is, needs to be serviced or needs to be replaced.

When applying predictive maintenance strategies, utilities are able to make smarter decisions about when and where maintenance should be performed. These decisions are based on the criticality of the asset, the asset's performance history and the goals of the plant managers. Predictive analytics solutions allow decision-makers to extend maintenance windows by delaying maintenance that may not be immediately necessary. Rather than completing maintenance exactly as suggested by the original equipment manufacturer, the maintenance could be performed during a more convenient and cost-effective time. As power infrastructure continues to age, it is more important than ever to understand how and why an asset is performing the way it is in order to avoid costly failures. The amount of data available to engineers and plant personnel also continues to grow, creating opportunities to further improve plant reliability and efficiency. Through predictive analytics solutions, this information is being used to monitor the health and performance of equipment and prevent failure of older assets.

Enquiries: [Isabel Mwale. Email Isabel.mwale@schneider-electric.co.za](mailto:Email.Isabel.mwale@schneider-electric.co.za)





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Launch of circuit designs

PowerWindings circuit designs have been officially launched to the market and that InventionShare is now looking for transformer company partners to licence or acquire the design for manufacturing or sublicensing.

Developed by a senior inventor, the PowerWindings circuit design bench test results have been verified by simulation testing completed recently at UCLA; the report is available to interested parties. These tests demonstrated a 30% greater transformer output with the same core materials and operated at lower temperatures. This resulted in greater reliability, with an increased temperature range for peak power and power surges plus an increase in efficiency with less heat generated. Transformers using PowerWindings circuits can also be designed with 30% less materials, delivering similar output, operating temperature and efficiency, resulting in reduced product costs. Additionally, using the same or comparable core but replacing copper windings with aluminium windings achieves the same output while maintaining the same overall specifications at even lower costs.

Greg Waite, Chief Executive Officer of **InventionShare**, said, "These results are significant - it shows that the PowerWindings circuit designs give transformer manufacturers much greater flexibility for increased reliability, efficiency and lower product costs. All variations demonstrate an improvement over today's traditional designs, especially with the reduced heat which can be important for applications requiring extended product life and better reliability."

Enquiries: Email ktracy@inventionshare.com

Ease of testing at high currents and voltages

The new **Yokogawa** 2560A precision dc calibrator offers a simple, stand-alone solution for the testing and calibrating dc measuring instruments such as analogue meters, clamp meters, thermometers, temperature transmitters and data loggers. The 2560A generates signals over a wide output range to enable the testing of products over their full operating ranges. In particular, it can generate dc voltages up to 1 224 V and dc currents up to 36,72 A. By connecting two instruments in parallel, a maximum current of 73,44 A can be generated. These values are produced with high accuracy, high stability, and high resolution over the full voltage and current range. Intuitive operation is provided by rotary dials and switches for each digit and function, along with traditional 7-segment LEDs to provide clear visibility. In addition, a range of computer interfaces enable the 2 560 A to be integrated into an automatic test system.

Enquiries: Colin Forbes. **Protea Electronics.**
Tel. 011 719 5700 or email colinf@protea.co.za



How the Tetris model has influenced Eskom's maintenance programme

In the game of Tetris, a player is required to fit different building blocks into a constrained space, by ensuring that the orientation of the blocks is correct to fit into identified available spaces. These building blocks come in different shapes and sizes, and they need to be arranged in such a manner that the tower does not grow bigger than the constrained space. The same principle was used for the development of the **Eskom** Maintenance Tetris model. Eskom's planned maintenance takes into account many complex variables that the Tetris game analogy uses to simplify the maintenance planning methodology by associating the blocks in Tetris to planned shutdowns. If the maintenance tower grows bigger than the con-

strained space, Eskom will have to implement load shedding. The critical difference between prior maintenance planning and the Tetris way of planning is that now it is more visual, user friendly and in real-time. The system is an automated online system that can be manipulated immediately should any of the variables in the system change. This enables senior executives to make informed decisions and come up with sustainable solutions regarding the planning of maintenance. Furthermore, the tool is currently being used in the Group Capital Division as a planning tool for the delivery of the New Build Programme.

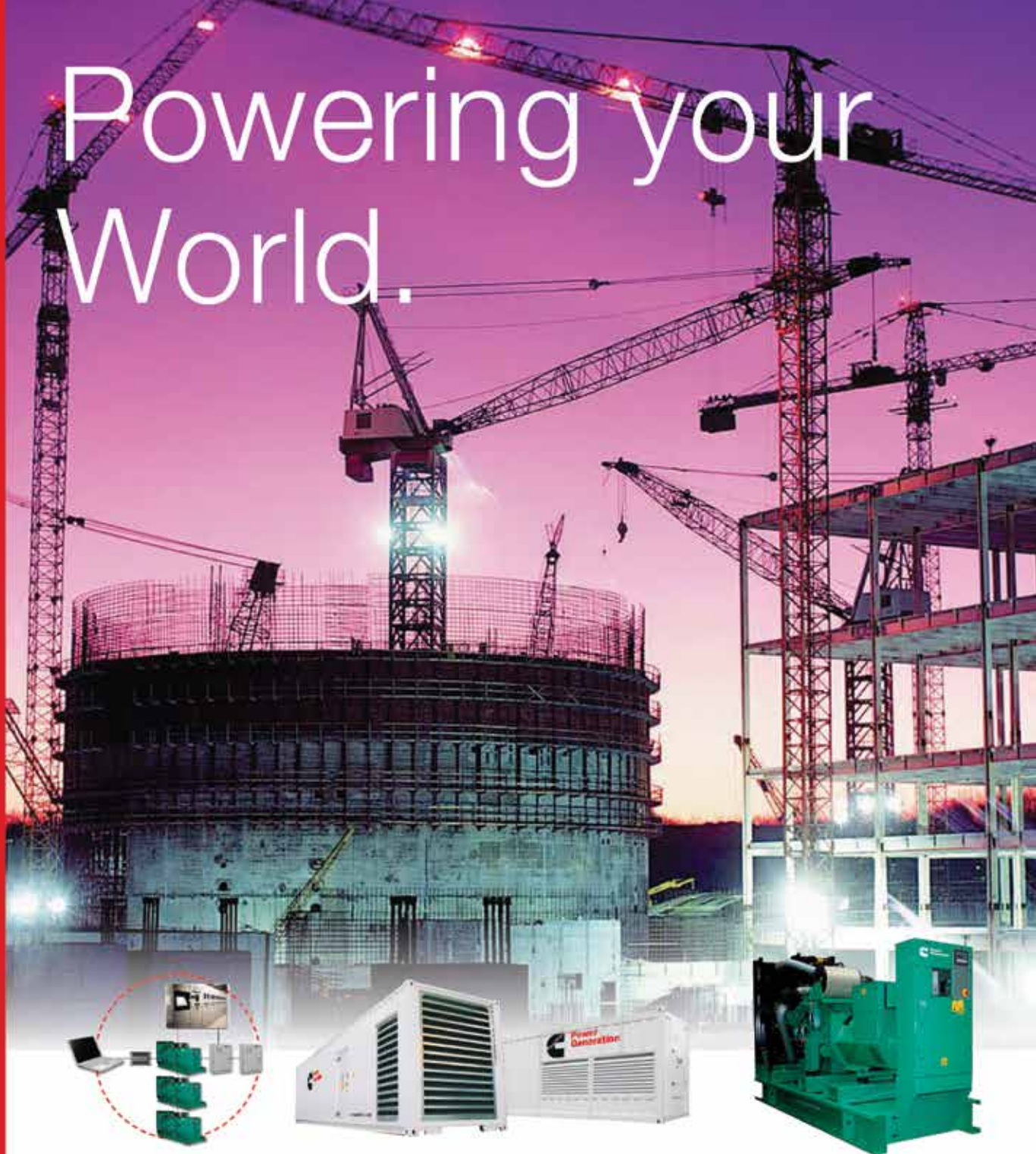
The tool was developed by two young engineers who are part of Eskom's Top Engineers Programme, namely Christo Murray and Lyle Timm. The Top Engineers programme is a leadership development programme, developed by Eskom senior executives to expedite and develop the leadership capabilities of Eskom's young top talent. The Top Engineers programme provides young engineers the opportunity to work on Eskom's high visibility, high priority projects where they can harness their skills and bring forth their creativity, diversity and innovation in the multiple projects in which they are involved.

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Flow monitors using the float principle

By A Krueger, WIKA

Anyone looking for a universal system for flow measurement will find it with flow monitors using the float principle. These robust all-rounders measure the volume flow continuously for both liquids and gases – independent of pressure and without the need for an external power supply.

Companies in the automotive industry use lasers to cut the predetermined breaking points for airbags into the vehicle dashboards. Since one of the most important safety functions of the vehicle depends on the precision of this production step, the focal lens of the laser must not be contaminated under any circumstance. Compressed air prevents any foreign particles from settling on the lens and impairing the cutting process. For the constant flow of air, flow monitors are an essential instrument. They check the volume flow of air and ensure process safety. Furthermore, downtime is also minimised.

Such an airbag laser is a typical application example of flow monitors using the float measuring principle. The method, which was first used some 100 years ago, is principally suited to applications where flow limits have to be monitored visually or electrically. Here the measured values are displayed locally on a sight glass or via a movement, depending on the operating pressure. The electrical monitoring is generally made via reed contacts which are switched by a permanent magnet within the float.

With flow monitors, users have access to a wide range of designs. For example, the FWS series from WIKA covers a total of 13 different

models, including viscosity-compensated variants and ATEX certified instruments for use in hazardous environments.

Flow monitors are compact measuring instruments which can be put in almost any environment. Whether an instrument can be installed at different inclinations or only in a vertical direction within a plant or machine depends on the basic design. For instruments which measure only in the vertical direction, the float is placed within a measuring tube, whose effective diameter increases towards the outlet. The flow direction runs from bottom to top. The flow moves the float to the point in the measuring tube where the local rate is high enough that an equilibrium of forces occurs and the float then floats. In this position, the weight of the float, the flow resistance and the hydrostatic buoyancy cancel each other out. The higher this position is, the higher is the flow rate.

With the variable design, the flow monitor also functions with a cylindrical measuring tube. An integrated spring generates an additional restoring force. The flow acts on the length of the spring, which in turn designates the position of the float. The interaction of the physical forces, enhanced through the restoring force of the spring, even enables a horizontal flow measurement with this design.



Figure 1: Selection of different model FWS flow monitors.



Figure 2: Cooling of the laser by automated laser-cutting equipment.

- Liquid gas flow measurement is commonly required in industry.
- The float principle of flow measurement is well established and suited to both visual confirmation of flow as well as electronic sensing.
- Float instruments are robust, responsive and cost effective.



Owing to their physical design, flow monitors are resilient measuring instruments. Stainless steel models within the FWS series, for example, are specified for operating pressures up to 350 bar. The combination with potential-free reed switches, selectable as either normally-open or change-over, supports this robustness. The medium and the electrical components of the measuring point are hermetically isolated, so the yield strength remains unchanged.

Flow monitors are compact measuring instruments which can be placed in almost any environment.

The reed contacts are triggered by the magnet integrated into the float. At a specified maximum point, the float reaches a stop. Thus, it is impossible to float beyond the switching range of the reed contact. For switching, the flow monitors generally operate with short response times, and the FWS series instruments also exhibit a low hysteresis.

The switch points are adjustable within the respective measuring range. For the FWS models, the spans range between 0,6...2,2 and 200...650 NI/min for air and between 0,1...0,8 and 35...110 l/min for oil, where, for this, the viscosity of the medium must lie between 30 and 600 cSt. Values higher than 600 cSt must be individually calibrated.

With hydraulic oil applications, flow monitors using floats have only a small pressure loss in comparison to volumetric methods, since the cylindrical measuring cylinder opens a lower annulus.



Figure 3: WIKA flow monitors for higher safety.

With the FWS models, the value is from 0,02 bar to a maximum of 0,4 bar. The float principle also comes into play in many pneumatic applications. Here, the designs and materials used are matched to the respective applications. In particular, floats from plastic are frequently used, in order that the instruments are optimised for operation with gaseous media.

Since they only have a few moving parts, measuring instruments with floats require very little maintenance. The function of the switch contacts, the leak tightness of the instrument and the correct movement of the float must be checked on a regular basis. In addition, for media with magnetic particles the flow monitors should be cleaned, with the intervals for this able to be significantly extended by the use of a filter with a magnetic separator.

Conclusion

The universal application possibilities and robust design alone, coupled with the short response times and on-site display, are strong arguments for flow monitors using the float principle. Over and above that, as a cost-effective measuring solution, these mechanical flow measuring instruments offer an option as an additional safety function.

This applies, for example, to plants or machinery where the flow is only measured through pressure measurement. The pressure, however, is not indicative of the actual flow behaviour of the medium – since the pressure is always present, even if the pipe is obstructed.

Andreas Krueger is product manager for KSR Kuebler, part of the WIKA Group. Enquiries: WIKA Instruments. Tel. 011 621 0000 or email sales@wika.co.za



Figure 4: Monitoring of the gear lubrication in generator sets.

Ceramat retractable fittings for process spectroscopy

Knick's Ceramat retractable fittings allow for a safe automatic cleaning of optical sensors without process interruptions and thus ensure reliable process control. Featuring an indestructible ceramic sealing between sensor and process, Ceramat sensor lock-gates are suitable for extremely demanding measuring tasks in various fields of applications, where conventional fittings fail. In addition, special Ceramat design is compatible with Hellma sensors. The sensor can be directly immersed in the stream. Measurements are no longer dependent on a conventional immersion tube.

UV/VIS/NIR and Raman spectroscopy are established measuring technologies in process analysis. Optical immersion probes, directly adapted to pipe or reactor, usually serve as interfaces to the process for these systems. Depending on the medium, however, the optical window can be contaminated, leading to a significant impairment of measuring precision or even an altogether faulty measuring signal. To avoid this, measurement then has to be interrupted to cleanse the sensor or put on hold until the next cleaning interval of the production facility. Optical measuring methods were therefore rarely used when dealing with difficult mediums such as glue or moist powder. Working with Hellma and tec5, Knick has solved this problem and specially adapted the tried-and-tested Ceramat retractable fitting and the cleaning and calibration system Unical 9000 to the requirements of spectroscopy with optical fibres and optical immersion probes. Any contamination of the optical window is detected by the spectrometry software via the measuring signal. The probe can then be cleaned when necessary or automatically according to a set cycle. The probe is rinsed with up to four cleaning or calibration liquids and dried with pressurised air.

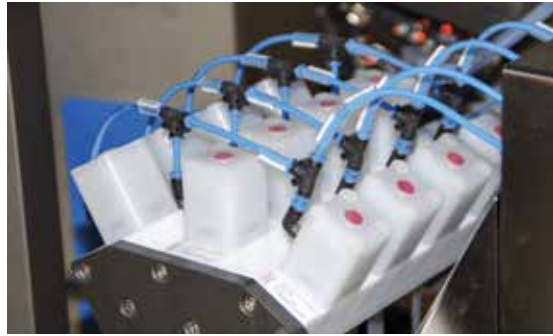
Mecosa is the sole agent for Knick Elektronische Messgeräte in Southern Africa.

Enquiries: Tel. 011 257 6100 or email measure@mecosa.co.za



Valve designs for filling and dosing processes

Various requirements are placed on the design of valves, depending on the application and the industrial sector in which they are used. The type of valve and actuator must be matched to the right body material and selected based on the required dosing accuracy, the type of media in use, the aggregate state and the quantity that will need to be dosed or filled. The valve that is selected varies greatly depending on the particular requirements that it must fulfil. In addition to resistance to the medium used and the temperatures that will be reached in the process, the switching speed is another



key variable that needs to be taken into consideration. Valves in the **GEMÜ iComLine** series are used primarily in processes in which having an adequate resistance to media is just as important as the dosing output. The **GEMÜ SonicLine** flowmeter, which takes

fully contactless ultrasonic measurements, is another highlight of the product range. An integrated batch control function can be set to actuate the relevant valve. Offering not only a broad product range but also the **GEMÜ** modular system means that customers can choose from a wide variety of valves and different design options. As regards the necessary process automation, **GEMÜ** offers the convenient option to provide its valves with the appropriate positioners and process controllers ex-works.

Enquiries: Email ivona.jovic@gemue.de

Efficiency in system configuration and engineering

Yokogawa has introduced an enhanced version of the ProSafe-RS safety instrumented system (SIS). This new version, R4.01, features an exciting expansion of Yokogawa's line-up of I/O devices and introduces crucial new SIS components. In addition, the FieldMate Validator software has been enhanced to work with this latest version of ProSafe-RS. In the oil, natural gas, petrochemical, iron and steel, and other energy and basic materials industries, accident prevention and protection of the environment are paramount concerns in plant operations. Accordingly, there is a growing demand for SISs that can detect abnormal conditions and safely initiate emergency shutdowns.

To keep pace with the ever evolving business and technology landscape and respond to customers' needs for solutions that will deliver maximum return on assets and minimise total cost of ownership, Yokogawa



has continued to strengthen the functions of the ProSafe-RS SIS. With R4.01, plant operators can be assured of an optimum engineering environment that spans the entire plant lifecycle, from plant design and the engineering and installation of systems and devices to the start-up of production, maintenance, and renovation. The new features include:

- N-IO (Network I/O) field I/O device with smart configurable I/O that can handle multiple types of I/O signals
- FieldMate Validator software tool for use with field I/O instruments to check field device wiring and verify that devices are operating correctly
- Automation Design Suite (AD Suite) integrated engineering environment

Enquiries: Christie Cronje. Tel. 011 831 6300 or email Christie.cronje@za.yokogawa.com

Precise measurement of consumable fuels in automobile industry

KOBOLD Instrumentation, represented in South Africa by Instrotech – a Comtest Group company, was asked to look into, and supply a solution to an ongoing headache for an established Japanese automotive company – how to accurately record the exact quantity of fuel received on-site, daily.

In order to track every single part and consumable needed to get the 28 000 cars this manufacturer produces monthly, up and running, it goes without saying that the logistics department's records have to be highly accurate and instantly accessible. One of the most important consumables is fuel, both gasoline and diesel. These fuels are not only used for car testing, but also for utility purposes like fork-lifts, emergency electric generator, inter-plant transportation, etc. The flow and level metering of the fluids, had always been of concern to management.

The automotive company routinely purchases fuel, which arrives at the plant site by fuel truck. It is unloaded and stored in several dedicated storage tanks. The existing gear flow meters had been running for more than 10 years and the operation was handled by a single field operator, using simple log book. The level meters were even more traditional, using only mechanical floats and simple on-the-tank-side scale.

KOBOLD proposed using their TME coriolis mass flow meters and NMC capacitance level transmitters, integrated with a PC-based centralized data acquisition unit, to be located in the Logistics Room.

Enquiries: Tel. 010 595 1831 or email sales@instrotech.co.za



First reasonably-priced camera package with 90° lens

The Optris PI 640 thermal imaging camera launched onto the market in 2014 is available with two additional changeable lenses. Three lenses with 33°, 60° and 90° fields of view are now available for different measuring tasks and customer requirements. "With this offer, we are launching the first reasonably-priced VGA thermal imaging camera with a 90° lens," explains Torsten Czech, Product Marketing Manager at Optris (represented in South Africa by Instrotech). The offer includes both calibration and open source software.

The Optris PI 640 is used in different industries worldwide. Many applications offer very little space between the measured object and the thermal imaging camera. This is where IR users require greater flexibility. The proprietary software also enables the use of the thermal imaging camera as a line scanner, allowing it to reach a scanning angle (Field Of View, FOV) of up to 120°.

Developed, manufactured and calibrated in Germany, the lenses have unique components, including the germanium lenses typically used in the longwave infrared range (LWIR), where each respective lens is calibrated for the thermal imaging camera.



The open source software included, is free of charge with the delivery. Optris offers a discount on the cost of adding another lens to a thermal imaging camera including calibration.

Enquiries: Tel. 010 595 1831 or email sales@instrotech.co.za

Ultrasonic heat and cold measurement for water

Instrotech representing, ELIS PLZEN, Czech Republic manufacturer and supplier of flow meters, has on offer the SONOTHERM 3070 – an ultrasonic heat and cold meter intended for measuring absolute heat/cold quantities delivered to plants or otherwise consumed in closed hot-water heating/cooling systems. When used as a commercial meter, the SONOTHERM 3070 can be located either at the input hot-water piping to heated buildings or premises, or at the output of heat sources ahead of a heat exchanger.

The SONOTHERM heat/cold meter measures and stores information on heat quantity calculated from the water temperatures measured at the input and output piping by means of coupled resistance temperature sensors Pt 100 (Pt 500). The heating/cooling water flow-rate is measured by ultrasonic flow meter. It has a temperature range of 0 to 150°C with a Min.Temp differential of 2°C and a flow-rate range of 0,05 to 23 000 m³/h.

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Remote monitoring of bulk explosive storage facilities

By T Cousins, TLC Engineering Solutions

Ammonium nitrate is the cheapest and safest source of readily deliverable oxygen for blasting applications. The extensive use of ammonium nitrate in Ammonium Nitrate Fuel Oil (ANFO) and water-based commercial explosives have largely displaced the nitro-glycerine-based dynamites. Ammonium nitrate industrial explosives are low cost, safe, versatile in performance and application, and have better storage stability than dynamites.

A large number of formulations are available for almost all purposes. The use of ammonium nitrate mixed with a fuel was proposed as a commercial explosive as early as 1867. It was only with the development of anticaking agents in the 1950s that ANFO became practically useful for rock blasting. Ammonium Nitrate Fuel Oil compositions (ANFOs) consist of 94% ammonium nitrate prills coated with an anticaking agent and 6% absorbed fuel oil [1]. ANFOs are relatively insensitive to detonation and usually require a high explosive booster to initiate detonation.

The sensitivity of ANFOs to initiation is affected by its composition, physical characteristics, and environment. Decreasing the particle size and density of ammonium nitrate or increasing its porosity increases the sensitivity of the mix to initiation. Maximum sensitivity occurs at oil concentrations of around 2%–4%. The presence of water decreases the sensitivity. The detonation velocity increases as the oil content increases to a maximum at around 6% oil. Maximum velocity is about 4300 m/s for large diameter ANFO charges. Confinement also increases the detonation velocity. The addition of metallic fuels, such as aluminium or ferrosilicon, increases the energy content. Stabilizers and inhibitors may be added and the fuel oil may be dyed to identify specific compositions [1]. The ANFOs may be mixed on site simply by adding oil to a bag of prills. More effectively, they can be prepared in onsite trucks equipped for the purpose and then augered into boreholes.

Historically a number of miners have been killed or injured by explosives and blasting agents. Most explosives-related injuries and fatalities in surface mines occur when workers are struck by rock, either because they were too close to the blast or rock was thrown much farther than expected. The second leading cause was blasts

that shoot prematurely. In underground mines, most explosive-related fatalities were caused by miners being too close to the blast, followed by explosive fumes poisoning, misfires, and premature blasts. Misfires lead to injuries and fatalities as miners try to shoot explosives that failed to detonate in the original blast.

Premature blasts occur without warning while blasters are near the explosive-loaded boreholes; the explosive may be initiated by lightning, the impact of explosives being dropped down a dry borehole, or careless handling of the initiating system (blasting caps) [2].

Ammonium nitrate will not explode due to the friction and impact found in normal handling, but it can be detonated under heat and confinement or severe shock. Ammonium nitrate is classified as an explosive and assigned to Class 1 of the UN classification system. Consequently the transportation, storage and handling of ammonium nitrate falls under the Explosives Act of 2003. In order to avoid hazards and minimise the potential consequences of an incident, the basic principles that should be adopted are the same as for all other explosives operations. This is 'Always expose the minimum number of personnel to the minimum amount of explosives, for the minimum period of time' [3].

The practical implementation of these principles requires that the quantities of explosives and raw materials must always be kept as low as practical. There should also be as few people as possible involved in the process. Ideally there should either be only one operation per location one operation at a time.

During handling the amount of energy going in must be kept to a minimum. Automation and remote monitoring can be used to address a number of these requirements.

ANFO – Ammonium Nitrate Fuel Oil
 CIE – Chief Inspector of Explosives
 PPAN – Porous Prilled Ammonium Nitrate
 SIL – Safety Integrity Level

Abbreviations/Acronyms

Bulk explosives storage safety monitoring and control

A discussion on the deployment of safety control systems in bulk explosives delivery trucks, underground controllers and other safety systems is described in [4]. The loading of bulk explosives into drill holes for production blasting is performed by a bulk explosive truck which has a mobile manufacturing plant. During a typical mining cycle these trucks may need to be reloaded one or more times with bulk products. This necessitates the placement of bulk storage silos at a convenient location on the mine. The size of the storage silos is a trade-off between the daily consumption and time to refill from road tankers. Road transportation of bulk explosives by tanker is costly and subject to additional hazards. The following materials are stored on-site for the manufacture of blasting agents:

- **Porous Prilled Ammonium Nitrate (PPAN):** Low sensitivity to shock, friction or impact, is comparatively safe to handle [5]
- **Ammonium Nitrate based Emulsion:** Low sensitivity to shock, friction or impact, is comparatively safe to handle and use. Non explosive until the emulsion has been gassed, or mixed with PPAN [6]
- **Diesel Fuel:** Even though its flash point is greater than 60°C, catches fire quickly and hence has to be kept away from AN and AN/FO in storage. Under the right conditions diesel vapour / air mixtures in storage tanks are flammable or explosive

‘Always expose the minimum number of personnel to the minimum amount of explosives, for the minimum period of time.’

The products in the bulk storage facility contain material that have not been mixed and are thus relatively insensitive to detonation. Nevertheless products that contain ammonium nitrate are still able to detonate under conditions of high pressure, temperature and confinement. Analysis of possible hazard locations and history of accidents in the last 10 years has shown that pumps are equipment with highest risk [7]. Several situations can occur during the pumping operation which can put extraordinary heat, friction, and compression on the product leading to explosions. Hazardous situations which can arise in most water-based emulsion explosive pumping operations include:

- Blocked inlets
- No feed from the storage tank
- Blocked outlet
- Worn out pump rotor or stator
- Foreign object stuck inside the pump
- Pumping against a deadhead

These hazards can be detected by the measurement of pressure, flow, level and temperature. An electronic controller is commonly used to monitor and control the loading and unloading processes. The following conditions are monitored and will trip the transfer process and generate an alarm:

- Temperature above or below pre-set safety thresholds
- Pressure above or below pre-set safety thresholds
- Flow above or below pre-set safety thresholds

These safety monitoring and control units are linked to a remote control room where the alarm and trip information is recorded and relayed to supervisors.

The silo level is also monitored to determine the site production and when the product need to be replenished. The level of the bulk material in the silos is manually measured or monitored using ultrasonic level probes. These are mounted at the top of the silo with the sensor element focused towards the base of the silo.

A length of cable is routed from the top of the silo to the base where the level sensor control unit and display is located. 4-20 mA process loops are typically used to connect this to the silo monitoring system. The equipment used for the bulk silo safety monitoring and control is not required to be SIL certified at present.

Case study:

Non-intrusive level monitoring

The use of an ultrasonic level sensor in this application has a number of operating and installation hazards. Although the ultrasonic level sensor uses a non-contact principle, the sensor needs to be positioned inside the silo.

This will be in contact with the potentially hazardous dust or vapours present inside the silo. Installation and repairs are also hazardous as they require working at height. Permits and special safety gear are required when installing or repairing on this equipment. Field experience has proven that the sensors are prone to failure in high lightning areas which requires frequent repair.

Various alternative level sensing technologies were considered which could reduce or eliminate the hazards described. An indirect level measurement technique is being evaluated where the silo level is measured by weighing the mass of the silo and then converting this to a volume through the material density.

This requires the fitting of a load cell sensor onto to each of the support legs. Since the load sensors are installed onto the steel supports the hazard due to contact between the sensor and the product is eliminated. A load cell fitted to the silo support is shown in *Figure 2*.

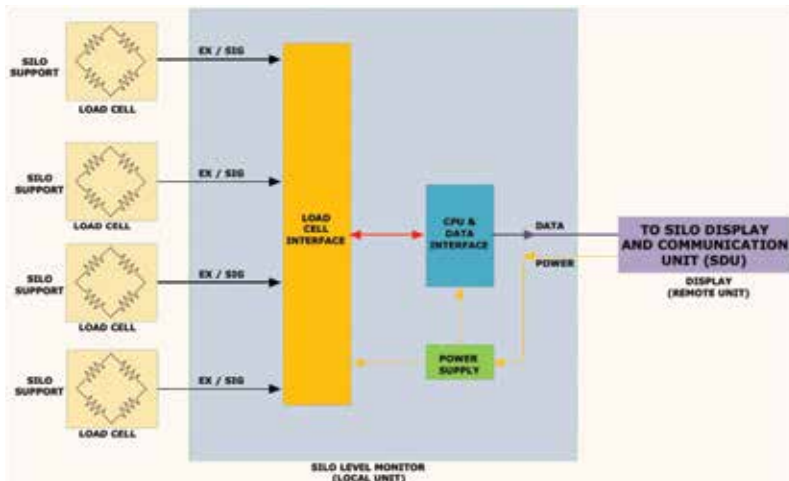


Figure 1: Bulk Explosives level monitoring.

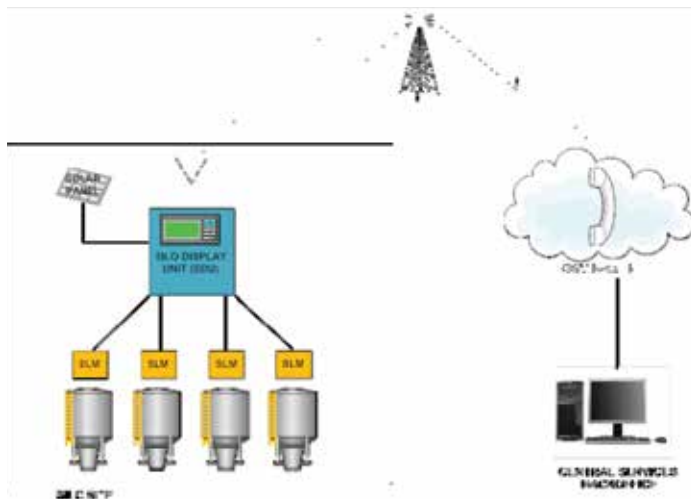


Figure 2: Silo level transmission to control room.

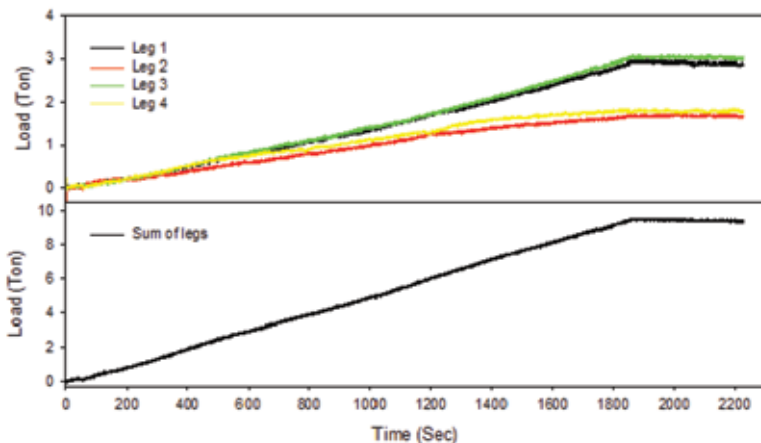


Figure 3: Load cell calibration curve.

The load cells can be located at a convenient height near the base of the silo so the hazard due to working at height is also eliminated. The load cells that were selected have been used in numerous other applications where there is high lightning activity and have proven to be reliable. There are typically four supports that need to be instrumented. The signal from each load cell is taken into a junction box on the silo. The load cell signals are then sent to the display and communications unit which can be located a safe distance from the silo. The safe distance between the silo and the display is provided by the Chief Inspector of Explosives (CIE).

The sites may have up to four silos located in close proximity as shown in Figure 1 [8].

The signals from the individual silos are connected to a data concentrator which is connected to the display unit. The display unit provides a local indication of the silo level as well as transmitting the level data to the control room.

To convert the silo mass to a level, the equipment is calibrated by pumping a known flow rate of product into the silo. The level is measured manually and entered with the quantity of product. A calibration curve is calculated which converts the mass measured to a level. This process need to be repeated annually to ensure accuracy. A typical load calibration curve is shown in Figure 2.

To date the equipment has been installed at three test sites. The load cells used initially were found to be sensitive to temperature fluctuations. This problem has largely been eliminated using load cells that use additional temperature compensation. Following a full evaluation of the results and finalisation of the load cell configuration, this system will be used in all new silo installations and on silos where the ultrasonic level sensor needs replacement.

Conclusion

The application of electronic monitoring and control equipment provides for the safe storage and transfer of material in bulk explosives silos. A novel application of load cells has the potential to further reduce the existing hazard of sensor contact inside the ammonium nitrate environment by the application of non-contacting level measurement. The use of load cells can also reduce the hazards of installation and repair compared with the traditional ultrasonic sensors.

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- Explosives are commonly used in mining applications.
- Storage and safe handling of explosives can be improved by using measurement and monitoring systems.
- Electronic systems have now been designed to incorporate various technologies to ensure optimal safety.

take note



Terry Cousins is an electrical engineer with over 35 years' experience in heavy industrial, power distribution, mining and IT. He is the cofounder of TLC Engineering Solutions. Terry is an active conference and web presenter and has authored numerous papers on power quality, energy measurement, instrumentation, communication and equipment design. Terry has a BSc Electrical Engineering degree from University of the Witwatersrand as well as a BComm and MBL degrees from the University of South Africa. Terry is a fellow of the SAIEE, member of the IEEE and SAE and an accredited Green Building professional. Terry is an Academic Board member of the Engineering Institute of Technology, Perth, Australia.

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ROUND UP

HAZARDOUS AREAS + SAFETY

Improving fire and emergency safety in South Africa

In addition to successfully launching two new lifesaving safety solutions at the 2015 South African Emergency Services Institute (SAESI) expo in early November, **MSA Africa** was honoured with a certificate of recognition for its support and contribution towards the improvement of fire and emergency safety in South Africa. Among the two successful product launches were – the first-of-its-kind alphaBELT, which is the only rescue loop approved for self-rescue with a self-contained breathing apparatus (SCBA); and the G1 SCBA – MSA's first top-of-the-line SCBA to meet and exceed all high-level international quality and safety standards, such as NFPA (North America) and EN (Europe).

alphaBELT: In addition to restraining and positioning, it creates the rapid formation of a safe rescue seat for self-rappelling, and can be easily integrated into an SCBA to

dramatically reduce the risk of suffocation. The alphaBELT features a secure class B rescue seat which can be detached from the belt to be used separately as an anchor point or a rescue loop in the event of an emergency. It is resistant to heat, and is durable and smooth to ensure user comfort. The adjustable lanyard is easily demountable, and features a tri lock carabiner to increase safety levels.

G1 SCBA: Providing more functionality than ever before, the G1 Control Module, which is the 'brain' of the system, has both dual analogue and colour digital LCD displays, making certain that important status indicators are available at all times. The G1 SCBA also boasts new features, including the elimination of all electronic components from the face piece. Instead, a 'Central Power' feature powers the entire unit from a single battery compartment, while darkness

and smoke-piercing 'buddy lights' provide visible indicators of critical air supply data from any angle.

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MSA Africa's respiratory and fire helmets product manager, Suraksha Mohun, demonstrates lifesaving solutions at the recent SAESI Expo.

Collaboration results in 'oil and gas' hazardous area certification

Rockwell Automation and local electro-mechanical equipment solutions provider **ACTOM Electrical Machines** have been awarded a hazardous area certification for the oil and gas industry 'by EX-PLOLABS. The Exn certification was awarded subsequent to the testing and assessment of the ACTOM MS4 452-4 non-sparking Ex nA IIA and IIBT3 motor and Allen-Bradley PowerFlex 7000 Medium Voltage ac Drive combination(s) for compliance to Electrical apparatus for explosive gas atmospheres – General Requirements (SANS 60079-0: 2012 Ed 5) and Equipment protection by type of protection 'n' (SANS 60079-15: 2010 Ed 4).

As a subset of a larger project, five Allen-Bradley PowerFlex 7000 Medium Voltage ac Variable Speed Drives by Rockwell Automation and five ACTOM motors which will be used by Engen Petroleum's Greenfields project to control Flowserve's 1 320 m³/h centrifugal

pumps, facilitating the movement of product from Engen's Island View facilities to Transnet's NMPP Island View West site. Rockwell Automation's PowerFlex 7000 are fitted with an 11 kV to 6,6 kV integral transformer to power ACTOM's 650 kW, 6 600 V, 4 pole motor situated in the hazardous area.

The VSD and motor combination test was conducted to determine the maximum surface temperature of the ACTOM Electrical Machines motor in accordance with SANS 60079-0: 2012 Ed 5 Clause 26.5.1.3 and Annex E, which included the monitoring of the motor winding temperature; ambient temperature; DE & NDE bearing temperatures; and motor supply voltage, current and rpm. The combination test was conducted at the motor's maximum duty point for eight continuous hours.

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Prevent dangerous working conditions with effective H₂ detection

Numerous industries rely on hydrogen (H₂) for operational processes. The gas has to be closely-monitored, as any leakage can pose a serious danger to workers.

Owing to its light form, H₂ molecules rise quickly in a room, and its vapours are colourless, odourless, tasteless and highly-flammable. Failure to detect the gas can result in an explosion or fire, while exposure can lead to suffocation and respiratory ailments. H₂ leakages can have cost implications, as long-term exposure can damage equipment too.

MSA Africa Fixed Gas and Flame detection product manager Robbie Taitz explains that it is important to make sure that gas detection is available and that it is effective enough to maintain safety. "Combustible gas detection placed in potential H₂ collection areas can provide gas concentration information, enabling the user to take corrective action before an explosive condition occurs."

The USA-based National Fire Protection Association (NFPA) requires that a sensor with an explosion-proof rating be installed in classified areas, where the volume of space that exists from the ceiling is 18-inches (46 cm) or below. The sensor should be connected to a transmitter or controller which is either explosion-proof, or is installed in a nearby non-classified, general-purpose area.

The transmitter or controller can be configured to send a signal to a building automation system, or can be used as a stand-alone system. The transmitter or controller are guaranteed to communicate the gas concentration to the end-user's internal network for notification purposes.

Taitz asserts that new facilities that use H₂ should be designed with adequate gas protection measures, while older facilities should be revisited to ensure that hazards are minimised.

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New intrinsically safe infrared thermometer

The **Comtest Group**, Fluke's authorised Test and Measurement distributor, has the newly launched Fluke 568 Ex, intrinsically safe (IS) infrared thermometer which meets intrinsically safe certifications from all major safety agencies for Class 1 Div. 1 and Div. 2 or Zone 1 and 2 hazardous environments.

Ideal for use in environments such as petroleum, chemical, oil and gas or pharmaceutical environments, the Fluke 568 Ex is one tool that can be used anywhere, worldwide.

The unit measures between -40°C to 800°C with ±1% accuracy. Measurements from further away are accurate with a 50:1 distance-to-spot ratio. The Fluke 568 Ex captures up to 99 points of data and is versatile, with a multiple language (user select) interface and adjustable emissivity, built-in material table.

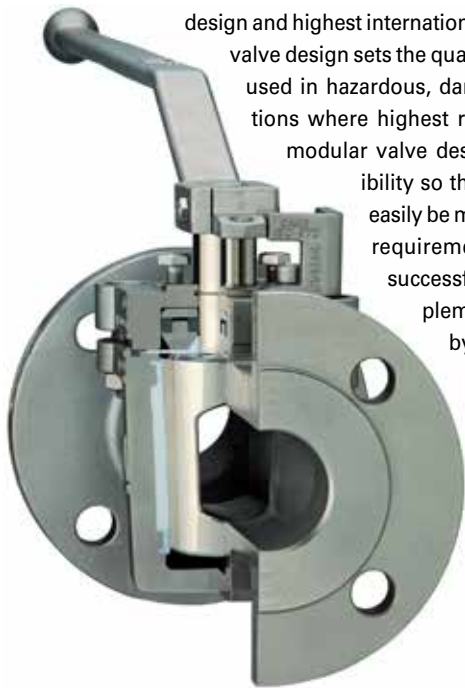
The Fluke 568 Ex is compatible with standard K-type mini-connector thermocouple probe (KTC) and is shipped with a conductive case for carrying into hazardous areas.

Enquiries: Tel. 010 595 1821 or email sales@comtest.co.za



Safe, reliable – improved valve design

The AZ-Armaturen Group has further developed its high quality plug valve range with the positive result of a very safe, reliable and modular sealing and mounting arrangement. AZ-Armaturen is a German owned and globally leading manufacturer of plug valves, special valves and allied products. AZ-Armaturen South Africa is the only South African manufacturer of sleeved, self-lubricating plug valves and the leading supplier in Sub-Saharan Africa. The AZ Group has further production plants in Germany, Brazil and China



which all manufacture the valves according to the same German design and highest international valve standards. The unique valve design sets the quality benchmark high for valves used in hazardous, dangerous and difficult applications where highest reliability is needed. The new modular valve design provides maximum flexibility so that the basic valve design can easily be modified according to customer requirements. After an extensive and successful development, test and implementation phase accomplished by the German headquarters, AZ-Armaturen South Africa will supply the new valve design to the sub-Saharan market from early 2016.

Enquiries: Email
sales@az-armaturen.co.za

Control systems order for large methanol plant

Yokogawa's subsidiary, Yokogawa Corporation of America, has received an order from Orascom E&C United States of America to deliver control and safety systems for the Natgasoline LLC methanol plant.

Currently under construction in Beaumont, Texas, this facility will have a capacity of approximately 1,75 million metric tons per year when it starts production in 2017, making it one of the world's largest methanol plants. Based on nameplate capacity, it will be the largest methanol plant in the U.S.

For the process control and safety of the Lurgi MegaMethanol process technology and auxiliary facilities throughout this plant, Yokogawa will deliver the CENTUMVP integrated production control system, ProSafeRS safety instrumented system, Exaquantum™ plant information management system, and Plant Resource Manager (PRM) software package. Yokogawa Corporation of America will be responsible for the engineering and delivery of these systems, and will provide support with installation and commissioning. The delivery of all systems will be completed by August 2016.

Yokogawa won this order because of its excellent track record in completing projects and demonstrated ability to deliver comprehensive, integrated solutions that help optimise operations.

Enquiries: Christie Cronje. Tel. 011 831 6300
or email info@za.yokogawa.com



Under a new umbrella

R&C Instrumentation advises that Raytek, Ircon and Datapaq have become **Fluke Process Instruments**. The new name will be used as an umbrella brand to integrate the current brands under a single identity. This will communicate the broad portfolio of products and solutions on offer. R&C Instrumentation is the sole distributor for Fluke Process Instrumentation in Southern Africa.

Enquiries: Tel. 086 111 4217 or email info@randci.co.za



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Rapid African growth results in dire need to understand the Water-Energy-Food Nexus

By A van Eeden and J Muller, Frost & Sullivan

Insight into the African growth story and the subsequent Water-Energy-Food nexus; the interdependence of resources and planning functions.

Various countries in Africa are experiencing GDP growth rates of above 5%. High growth rates accompany an increased need for energy supply and generation, agricultural transformation and a secure supply of water to further drive economic growth and cater for the needs of the industrial, commercial, agricultural and residential sector.

In order to overcome competing requirements and sectorial developments in silos, it is critical for integrated planning to be implemented at country level, and at inter-regional level, along with adequate scenario planning and the involvement of all relevant stakeholders.

African growth

African economies currently rank among the fastest growing in the world. Over the past five years, of the ten countries enjoying the highest rates of economic growth globally, seven of these were in Africa with the average GDP growth rate on the continent being the highest in the world; just more than 5% annually. Along with this unprecedented growth, population growth on the continent has seen similar figures with sub-Saharan Africa's population of 900 million set to grow at a net rate of 2,7% per annum; also currently the highest in the world (the global rate is 1,2%, South Asia 1,3% and MENA 1,7%). This translates into a population of over 1,4 billion by 2030, 50% of whom will be living in cities.

Urbanisation and the rise of the middle class are emerging trends on the continent. As a study by the African Development Bank has indicated, the middle class has grown at an average rate of 3,1% per annum over the period of 1980 to 2010, estimating the figure to be at 330 million. This has partly translated into the growth of large African cities, many set to double in size between 2010 and 2025, including Dar es Salaam, Nairobi, Kinshasha, Luanda and Addis Ababa, while twelve other cities will host more than five million inhabitants.

This economic development and rapid population growth demands a greater need for resources such as energy, water and food.

Water-Energy-Food nexus in Africa

The Water-Energy-Food nexus is a concept that recognises the inter-linkages between these three resources. Also, through planning and eventual implementation involving one of these resources, there is an interconnectedness of the system.

For example, while a national development plan may call for large-scale agricultural development to combat the issue of food insecurity; this will require large amounts of water – as well as energy resources – for irrigation. Furthermore, a large amount of energy is also required to collect, treat and distribute water and wastewater.



CSP	– Concentrated Solar Power
GDP	– Growth Domestic Product
MENA	– Middle East and North Africa
PV	– Photovoltaic

Abbreviations/Acronyms

The nexus concept not only recognises the interdependencies of these three resources, but also emphasises the interlinkages between the (a) natural environment and its resources, (b) social and economic development through water, energy and food security, as well as the need to (c) coordinate and integrate management and governance across multiple sectors. A research study by Karlberg et al (2015) has illustrated these interlinkages. The water-energy-food nexus will, however, differ across geographies and national boundaries and the challenges faced and solutions provided for the global North will not be similar to those challenges and solutions provided for the global South. The company that the authors represent has embarked on a study that highlights these challenges across four different regions; namely: the USA, Middle East, India and China. As a result, six types of technology solutions based on reduce, recycle, recovery, zero-water, and zero-energy concepts have been identified to address these challenges.

Multiple African countries have embarked on a rapid economic growth and development path, focusing on transforming their economies into that of a middle-income status and very often targeting the energy and agricultural sectors.

Agricultural transformation

Agricultural transformation and intensification is one of the key means by which African governments are hoping to achieve their economic development goals, as well as to achieve food security. Countries like Tanzania and Ethiopia have gone through various land and water

Economic development and rapid population growth in Africa demands a greater need for resources such as energy, water and food.

reforms, which have underpinned their economic development drive. This has resulted in investment reforms paving the way for international investors to lay claim to large tracts of Africa's land, as well as water resources. In Tanzania for example, the government adopted the Investment Promotion Policy, which was in essence an extension of the Agricultural Policy; also emphasising the modernisation of agriculture through adopting large-scale agricultural development practices and allocating land to commercial farmers.

Concomitant to this, irrigation policies have been put in place to support the intensification of agricultural developments which require an immense amount of already scarce water resources. The various development policies of a country, therefore, often have conflicting objectives. For example: the national irrigation plan of Tanzania (2002) was aimed at increasing the area of land under irrigation by 9% by 2017 to transform and modernise traditional agriculture. The national energy policy (1992), on the other hand, gives priority to the development of large-scale hydropower plants to reduce the use of foreign currency to import fossil fuel for the production of power. This directly competes with the use of water resources for irrigation development.

The intensification and modernisation of agriculture not only requires large amounts of water for irrigation purposes, but also energy which will - for the foreseeable future - still be supported by biomass from croplands, using large amounts of water. African countries are, however, also advocating for the diversification and transformation of their national energy mixes.

Energy diversification

Countries are implementing national energy plans that aim to improve access to energy, predominantly through the means of more 'modern' energy sources such as hydropower, wind and solar. Primary energy usage in Africa, is still largely obtained via traditional biomass - predominantly from croplands and forests - while the future African energy mix will shift towards the use of large scale hydropower plants and gas power, particularly that of the East African Region.

Close to 60% of sub-Saharan Africa's primary energy demand is still largely supported by biomass, and is a position which is not sustainable given the high (GDP) economic growth rates. The need for stable and reliable sources of energy arises as countries move towards an industrialised state. As a rule, African countries have traditionally been subject to state owned utilities, with very low levels of private sector involvement - if any. Also, energy generation capacity was not evenly spread across countries, with countries like South Africa accounting for 50% of Africa's power generation capacity. This position is set to rapidly change.

On average, the energy mix of most African countries is not diversified. South Africa's generation capacity is 90% served by fossil fuel (coal), Mozambique is 95% served by hydroelectric plants, with Tanzania (63% hydroelectric) and Kenya (46,2% hydroelectric) also proving a lack of diversification. The situation is set to rapidly change

over the next 15 years, given the need for countries to have a reliable energy mix, less affected by climate change and more in line with sustainability practices. For example, the East African energy mix in 2012 consisted of hydro (50%) and oil (50%). In 2030, it is expected to be comprised of: coal (12%), oil (18%), gas (9%), hydro (40%), bioenergy (3%), solar PV (6%), and other renewable energies (12%). For Southern Africa, the 2012 power capacity mix is coal (69%), oil (10%), gas (2%), nuclear (3%) and hydro (16%). This mix is expected to change to coal (45%), oil (7%), gas (10%), nuclear (3%), hydro (16%), bioenergy (3%), solar PV (9%) and other renewable energies (7%).

These numbers are subject to individual countries' energy masterplans and policy documents, and with recent gas finds in Mozambique (125 tcf), the gas numbers are expected to rise substantially, impacting the other technology types. It is important to note that the energy mix will be changing within the next decade. With a change in energy mix, comes a change in water requirements since power plants require water – and other activities in the power value chain, such as the coal that is being mined for the power station, also requires water.

This will potentially bring countries to a position where water resources allocated to the energy industry can compete with the water resources needed within the overall water sector (water supply and access), but also the agricultural and specifically agri-processing sector. For countries taking longer to wean themselves off of biomass, this will especially be the case. Biomass (being an agricultural product) requires large amounts of water – potentially creating a competitive scenario where the agricultural transformation might be hampered by the expansion of the energy sector or the water sector.

Importantly, renewable energy technology types employed in the African market (wind, solar PV and solar CSP) use minimal amounts of water compared to other technology types like coal. However, there is a need for a stable base load power supply. Although there is a requirement for renewable energy in a country's energy mix, it can also be noted that a country should first and foremost secure a stable power source in order to attract investors and fast-track economic expansion. The move towards an "optimal" energy mix is a challenge most countries face.

It is therefore vital that integrated planning is catered for by governments. This is essential to ensure that the potential competing nature of the Energy-Water-Food nexus is optimally planned for, not just on a country level, but also at a regional level, since water systems (rivers and dams) are often not bound by country boundaries.

Conclusion

The Water-Energy-Food nexus in Africa needs to be understood and addressed in a highly regionally-integrated manner, especially in regions sensitive to climate change, where a marginal increase in temperature can reduce water levels, causing a major knock-on effect in the water supply system.

The implications of the Water-Energy-Food nexus have necessitated not only the convergence of various technologies to address the challenges pertaining to competing resources, but also the need for an institutional structure that embraces a cross-sector approach to resource governance.

It is evident that agricultural transformation and energy transition are interdependent and could be partly competitive. A stakeholder-driven nexus approach is proposed, underpinned by quantitative and spatially explicit scenario and planning tools, which should assist in resolving these types of challenges. It will also result in more consistent policy and decision making, improve resource productivities, lower environmental pressures and enhance human securities.

- The Water-Energy-Food nexus is a concept that recognises the inter-linkages between these three resources.
- The National Development Plan calls for large-scale agricultural development to combat the food crisis which will require large amounts of water.
- The intensification and modernisation of agriculture requires large amounts of water... and energy.



take note



Aurelia van Eeden is the Business Unit Leader Energy and Environment at Frost & Sullivan Africa. She has business consulting and industry expertise, covering various applications in the Energy and Environmental sectors in sub-Saharan Africa, and has completed research on water rights and access in Tanzania. Aurelia holds an International Environmental Master's degree from the Norwegian University of Life Science and has a passion and interest in the Water-Energy nexus.



Johan Muller is the Programme Manager for the Energy & Environment (E&E) team at Frost & Sullivan Africa. He has over 8 years advisory expertise, including legal and business consulting. His industry knowledge spans various sectors within the public and private sector space; including: Energy, transport, and business optimisation and implementation activities. Johan holds a LLM (Commercial and Competition Law) degree and Economics (for Non-Degree Purposes) from the University of South Africa, as well as a LLB from the University of Stellenbosch.

Enquiries: Email Samantha.James@Frost.com

Wind Energy Pioneer Award

Ayanda Nakedi, Eskom's Senior General Manager for Renewables, was one of the leaders recognised at this year's Windaba for their contribution to the industry.

Windaba is the South African Wind Energy Association's (SAWEA) annual conference and at its gala evening a special accolade of 'Wind Energy Pioneer Award' was bestowed upon Ayanda for outstanding service to the industry.

Ayanda has given a pioneering and sustained contribution to wind power in South Africa, she has shown leadership in the growth of the wind industry and her contribution has had positive impact on the country.

Eskom's Group Chief Executive, Brian Molefe, said: "She has indeed been a pioneer, having overseen the commercial operation of Eskom's 100 MW Sere Wind Farm, our first utility-scale renewable energy project. The project was completed on time and within budget, with a safety record in line with our Zero Harm policy, and without any environmental legal contraventions or incidents of industrial action!"

Enquiries: Tel. 011 800 3304 or email mediadesk@eskom.co.za



Ayanda Nakedi, Eskom's 'Wind Energy Pioneer'.



Meteorology for Wind Energy Professionals

Dr Lars Landberg, a meteorologist at DNV GL, has written a book that will help non-meteorologists understand the critical concepts that underpin wind energy technology and project success. The fundamentals of meteorology dictate the success or failure of wind projects. The 224-page book starts with an explanation of how wind forms and how it is measured. Wind properties such as flow at all atmospheric scales, turbulence and wakes are examined, followed by a discussion on modelling, its resolution and accuracy. The reader is led through very simple concepts to more advanced theories with the use of examples.

Enquiries: Email Per.Wiggo.Richardsen@dnvgl.com

Two countries score triple 'A' trilemma score

In its fifth edition, the World Energy Council's annual ranking of energy and climate policies - the 2015 Energy Trilemma Index - registers overall improvements across the three dimensions of the energy trilemma. However, this year's report shows that the challenges faced by countries to develop a balanced approach to their energy policy mean that only two countries out of 130 are achieving 'AAA' balance score. Switzerland and Sweden, who top the list, achieve triple 'A' score, and while the UK remains in the top ten, it loses its 'A' grading for energy equity, moving it from a 'AAA' to 'AAB' status. It is a downgrade that reflects the challenges that countries across the world are facing in balancing the trade-offs of the trilemma goals and dealing with financing the transformation of their energy systems. Two new countries have been added to the negative watch list which in 2014 included German, Italy, Japan and the UK. The countries are South Africa, due to its electricity crisis, and the US where lack of investment in ageing infrastructure and exposure to extreme weather events pose threats to the country's currently strong energy security performance in the Trilemma Index. The report's findings show that the best-performing nations tend to be developed countries with higher shares of energy coming from low- or zero-carbon energy sources supported by well-established energy efficiency programmes. Every year, the Energy Trilemma Index report ranks the energy systems of countries across the world by giving them a score based on how they are balancing the three dimensions of the energy trilemma between energy security (a country's ability to meet its current and predicted energy demand), energy equity (the accessibility and affordability of energy across the population) and environmental sustainability (achievement of supply of renewable or low carbon forms of energy).

Enquiries: Vivien Rees. Email rees@worldenergy.org

Eco Tank

Recent and ongoing technical developments have made it possible to harness the sun's energy and make it easily available for all to use. Simple plug-and-play products are shaping the way in which consumers approach the use of solar as an alternative and viable option. The recently launched **Ecoboxx 1500** (EcoTank), is capable of up to 350 hours of power. In addition to providing enough power to support a small to medium sized business during times interrupted power supply, the EcoTank is used in residential and private homes, particularly in housing estates as an alternative to diesel generators.

Enquiries: Talana Cole. Tel. 021 447 6849. Visit www.ecoboxx.co.za

Energy Neighbour

Transmission losses and fluctuations in electric power grids can be reduced when renewable energy is stored locally. Researchers at the **Technical University of Munich (TUM)** have developed a stationary intermediate storage system - the Energy Neighbour. Energy Neighbour increases the local consumption of generated power, reduces the load on the grid and facilitates the expansion of renewable energy production capacity. Among its greatest strengths is its long lifecycle.

Enquiries: Marcus Müller. Email marcus.mueller@tum.de



Download the 2015 World Energy Trilemma report and the Energy Trilemma Index along with country profiles





New CESA CEO

Consulting Engineering South Africa (CESA) has appointed Christopher (Chris) Campbell as its new Chief Executive Officer. Chris, assumes office effectively from 1 December 2015. The position was left vacant earlier this year when the incumbent Lefadi Makibinyane resigned to pursue other career opportunities.



CESA President, Abe Thela, says that it gives him great pleasure to welcome Chris to lead the organisation. "Chris understands the industry, having worked for several consulting engineering companies in various capacities, is the immediate Past President of the Engineering Council of South Africa (ECSA), has several years of experience in the Transnet Group and most recently held an Executive position in the Precast Concrete business unit of the Aveng Group, Aveng Infracret," adds Thela.

Campbell, is a registered Professional Engineer, having started his career as a Draughtsman in 1981 from his humble roots in Newclare, Johannesburg, having matriculated as a bursary student from St. Barnabas College then located next to Sophiatown, Johannesburg, in 1980. He progressed to the level of Senior Technician, with a Higher National Diploma in Civil Engineering in 1986 and eventually obtained a BSc Civil Engineering degree (Summa Cum Laude) in 1995 at the Florida A & M University in the USA. In addition, he holds various certificates and diplomas in management and leadership.

Enquiries: Wally Mayne. Email wally@cesa.co.za

IEC Regional Centre for Africa opens in Nairobi

A major step has been taken towards greater access to electric power, safer electric and electronic products and overall better conditions for economic development, with the official opening of the **IEC (International Electrotechnical Commission) Africa Regional Centre (IEC-AFRC)**. The official opening ceremony took place in Nairobi, Kenya on Monday 2 November 2015, in the presence of highest level government officials of Kenya, the IEC Vice President, IEC General Secretary, industry experts, IEC Members and Affiliate Countries.

The link between energy and poverty reduction is well established. Electricity permits study after sunset, foods and medicines to be refrigerated and drives

millions of devices, electric motors and pumps in hospitals, manufacturing and agriculture. A reliable electricity supply improves basic services such as healthcare and increases access to clean drinking water, safer food, computing or mobile charging. With it companies are able to produce better products and individuals have greater income potential.

In September, the United Nations adopted an expansive set of Sustainable Development Goals (SDGs) that aim to 'end poverty in all its forms' by 2030. The United Nations has recognised Energy as the cornerstone: "No other SDG is more important for Africa" said Akinwumi Adesina, President of the African Development Bank.

As the regional focal point for Africa, the IEC Africa Regional Centre (IEC-AFRC) will provide training and mentoring to assist countries in the region in the adoption and use of IEC International Standards and Conformity Assessment Systems.

Through the IEC global platform thousands of experts from around the world contribute to the broad roll-out of new electric, electronic and Renewable Energy technologies, including mini- and Micro-grids in developing countries. Examples of IEC work include Renewable Energy generation from wind, ocean and solar power both for off-grid and on-grid use. This work enables the large-scale adoption and use of related technologies.

Enquiries: Gabriela Ehrlich. Email geh@iec.org

Building a secure future with Securex 2016

The recession has clearly taken its toll, not only directly by impacting finances, but indirectly by influencing unemployment and current salaries. Many people are living below the breadline and this is one of the main contributors to the rising crime levels in South Africa. The problem is not an absence of methods and modes to detect, decrease and deter crime, but rather what is the best combination for a chosen application. Consumers are often in the dark and many have had their fingers burned by unscrupulous suppliers or installers. The answer is quite simple – a visit to Securex 2016, Africa's leading security and fire exhibition. Held between 24 and 26 May 2016 at Gallagher Convention Centre in Midrand, Johannesburg, Securex 2016 will provide visitors with the unrivalled opportunity to interact with leading local and international manufacturers and suppliers of

the best brands in security and fire technology and services. "We had an amazing turnout at the 2015 exhibition and with the inclusion of a CyberAfrica conference and workshop we are confident that we will see an even bigger increase in visitor numbers in 2016," says Joshua Low, Securex Event Director at Specialised Exhibitions. Low explains that Specialised Exhibitions has aligned itself with CSCSS (Centre for Strategic Cyberspace + Security Science) to offer South African businesses the opportunity to hear international cyber security specialists share their knowledge and research in a targeted one-day conference. Proposed topics include insider threats and 'hackenomics'.

Enquiries: Email svenr@specialised.com or zeldaj@specialised.com or visit www.securex.co.za

Nereda Wastewater Treatment Technology in South Africa

International engineering and project management consultancy **Royal HaskoningDHV** and WEC Projects) have signed an Agreement for Nereda wastewater treatment technology in South Africa. The agreement was signed in Johannesburg in the presence of the Prime Minister of the Netherlands, Mark Rutte, as well as a number of South African Government Ministers and dignitaries including the Minister of Public Enterprises, Lynne Brown and the

Minister of Water and Sanitation, Nomvula Mokonyane. Nereda is an innovative wastewater treatment technology that has proved to be more efficient, sustainable, kinder to the environment and with lower operating costs than conventional methods of waste water treatment. The plant requires a four times smaller footprint and the process consumes half the energy compared to conventional installations. It is entirely based on natural processes, requiring no chemicals and features aerobic granular biomass with faster settling times than conventional aerobic systems.

Royal HaskoningDHV and WEC are currently cooperating in the implementation of Nereda technology at the Hartebeestfontein Wastewater Treatment Works aimed at improving the capacity of the plant by 5MI/day using existing infrastructure.

Enquiries: Kizito Lundu. Tel. 011 798 6000 or email Kizito.Lundu@rhdhv.com



The Cooperation Agreement was signed on 17 November 2015 by Karl Juncker, Managing Director WEC, and René Noppene, Global Director Water Products & Innovation Royal HaskoningDHV in the presence of the Prime Minister of the Netherlands, Mark Rutte and the South African Minister of Small Business Development, Lindiwe Zulu.

Official logistics distributor for automation specialists

BMG has been appointed as an official logistics distributor for automation technology specialists, **Festo South Africa**. "Festo's extensive product range - which encompasses electromechanical and pneumatic drives, valves, motors and controllers, as well as handling systems, sensors and process automation - is now available from BMG," says Wayne Holton, BMG's fluid technology manager. "The addition of the Festo product range to BMG's sales network, forms part of the company's expansion strategy, geared to enhance the steady growth of the South African operation over the last 40 years. "Festo's market share will be significantly expanded through this distribution agreement, which improves accessibility to Festo products throughout the country."

Enquiries: Tel. 011 620 1500 or email wayneh@bmgworld.net



Zest donates equipment to Tshwane TVET College

Zest WEG Group believes that it has a fundamental responsibility to assist in improving the lives of disadvantaged individuals in South Africa and that higher education and training is a priority towards building a sustainable economy. This philosophy is evident in the recent donation of a substantial quantity of electrical equipment to the Tshwane North Technical and Vocational Education and Training (TVET) College. Tshwane North Technical and Vocational Education and Training College is one of the 50 public TVET colleges in South Africa. The equipment donated by Zest WEG Group, includes motors, contactors, relays, starters, circuit breakers, fuses and other accessories. Technical support for the products will be provided by the group when necessary.

The equipment will aid lecturers at the facilities in demonstrating actual scenarios and will provide electrical engineering learners with a more enriched understanding of the electrical aspects of running electric motors and electrical accessories. The learners will become well versed in the correct selection and application of cutting edge international technology and new product lines.

In addition to the TVET donations, Zest WEG Group's CSI education programme also includes a number of learnership pro-

grammes that entail developing select unemployed youth by qualifying them in electrical engineering, with a subsequent Trade Test.

Enquiries: Kirsten Larkan. Tel. 011 723 6000 or email kirstenl@zest.co.za

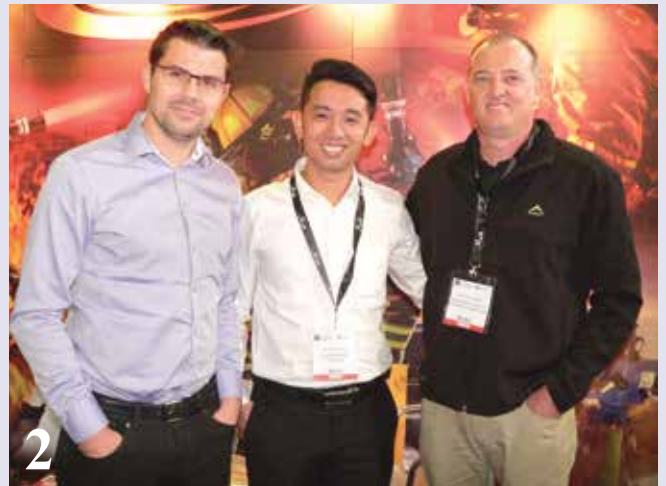


Veronica Ramashala, Level 3 electrical infrastructure learner at Tshwane North TVET College during a practical lecture demonstrating the WG MDWH miniature circuit breaker.



SAESI Conference and Exhibition

MSA Africa hosted a media launch of their products the G1 SCBA and AlphaBELT at the 30th South African Emergency Services Institute (SAESI) Conference and Exhibition held at Nasrec in early November. The event covers a range of risk and disaster management technology and equipment, for domestic and industrial purposes – such as breathing apparatus, protective clothing, detection and monitoring equipment, emergency vehicles and vehicle accessories.



1: (All from MSA Africa unless otherwise stated): Duduzile Mphahlele (NGAGE Public Relations) , Samantha Munawar (Office Administrator), Suraksha Mohun (Respiratory and Fire Helmets Product Manager), Simo Moerane (Area Sales Associate), Etienne Jacobz (Key Customer Sales Manager) and Jana Klut (NGAGE Public Relations).

2: Thomaž Štibelj (Sava), Cheong Si Swan (Bullard), Quinton Canning (Vanguard Fire Safety).

3: Anthony Heaney and Lesley Gamble (K9 Search and Rescue Association) with rescue dogs, Kuvut (Malinois, Belgian Shepherd) and Sammy (Border Collie).

4: From Lucas Rescue: Daniel Engelhardt, Jim Hamilton, Thabo Pilane and Domenia Pauwels.

5: What would a disaster management conference be without the Firemen? Happy to pose for the camera are Emile Conrad, Branville Abrahams, Deon Stoffels and (front) Edwin Lottery.



IPC and Applications Seminar

Beckhoff Automation recently held an IPC and Applications Seminar for their customers in Johannesburg and Cape Town. It was presented by Roland van Mark and Rob Rawlyk from Beckhoff Automation (Germany). Van Mark gave an overview of Beckhoff's comprehensive range of Industrial PCs, highlighting many innovations such as the latest many-core Industrial server PC containing two 18-core Intel Xeon processors (totalling 36 cores) with 2 TB of RAM. Rawlyk discussed Beckhoff's interesting and challenging applications which Beckhoff has developed over the years.

Enquiries: Michelle Murphy. Email michellem@beckhoff.co.za



Rob Rawlyk (Senior Application Engineer), Kenneth McPherson (Managing Director), Roland van Mark (Product & Marketing Management Industrial PC).



Brendan van der Westhuizen (Student Trainee), Rodney Grobler (Sales Technician), Adam Carless (Technical Service Engineer), Roland van Mark (Product- & Marketing Management Industrial PC).



Aimee Schumacher (Admin Assistant), Roland van Mark (Product- & Marketing Management Industrial PC), Michelle Murphy (Internal Sales Administrator).

Renewables... just not enough!

On Friday, 30 October 2015, American Tom Blees (President of the Science Council for Global Initiatives), was the main speaker at a Nuclear Industry Association of South Africa (NIASA) Round Table discussion held at the Johannesburg Country Club in Woodmead, Johannesburg. He believes that in order to mitigate against climate change and make environmental preservation a priority globally, there must be a move to eliminate the burning of fossil fuels. "The full range of electricity-generation sources – including nuclear power – must be deployed to replace coal and realistically meet the base-load power needs of an increasingly energy hungry world."

Enquiries: Email niasaservices@vdw.co.za



Round Table on Nuclear Energy in South Africa panel: Chris Yelland, (Panel facilitator); Des Muller (Nuclear Construction Services - Group 5); Jason VanderPoel (Allen & Overy); Knox Msebenzi (NIASA); Tom Blees (Science Council for Global Initiatives); Anthonie Cilliers (School of Mechanical & Nuclear Engineering - North West University).

Instrotech



Gerrit Steyn (NH Dip Electrical Eng, MBA) recently joined Instrotech as sales manager for the company's product portfolio.

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2016 Africa Energy Indaba

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

Enquiries: Visit www.siyenza.za.com

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Power & Electricity World Africa

15 – 16 March 2016,
Sandton Convention Centre
This conference is in its 19th year. It welcomes over 6 000 attendees and hosts a mecca of solution providers spanning three halls and thousands of square metres. This is the place where buyers find solutions to their challenges.

Enquiries: Email tamsyn.briscoe@terrapinn.com

African Utility Week & Clean Power Africa

17 – 19 May 2016,
Cape Town International Convention Centre
Running for 16 years, this event is the largest power and water utilities exhibition and conference on the African continent.

Enquiries: Email info@spintelligent.com

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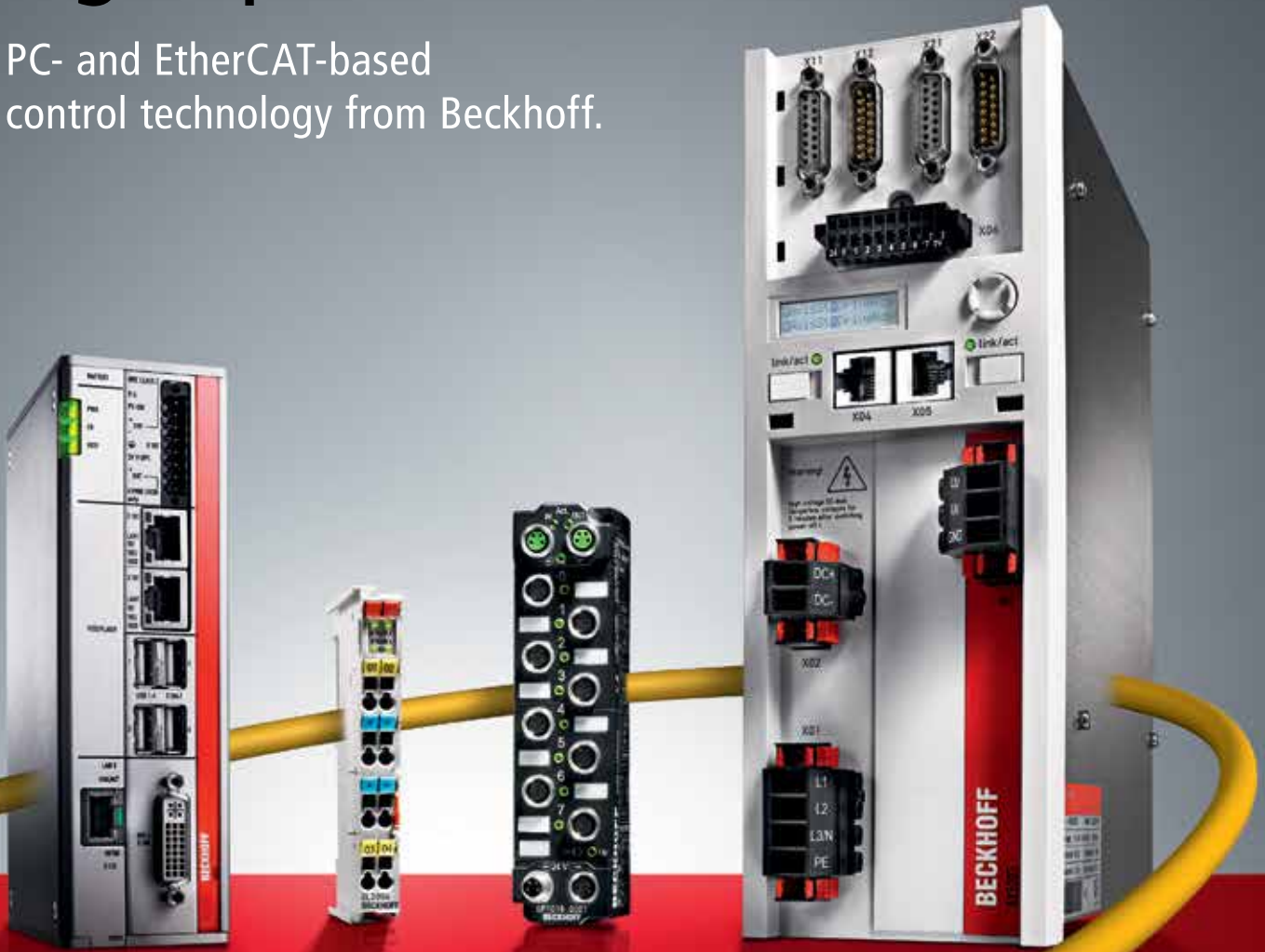
POWER-GEN Africa 2016 & DistribuTECH Africa

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

Enquiries: Email registration@pennwell.com

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I/O
Motion
Automation

New Automation Technology

BECKHOFF

The Only Power Factor Correction Equipment that can switch between Utility Power and Standby Generator Plant

The Equalizer with specified Generator Option

- Increases Useable power
- Allows separate target power factor Programming, dependent on generation Operational mode
- Potentially increases financial savings when multiple Standby Generator Systems are used in tandem
- Enables downsizing of new generator installations

Improves Productivity
Improves Profitability
Improves Power Quality
Saves Energy

Full Reactive Compensation in 20ms
Harmonic Filtration
Power Factor Correction
Transient Free Compensation
Reduces Volt Drops and Flickering
Increases Life Expectancy
Extends Generation Capacity



Energy Efficiency Through Power Quality



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Innovative Power Quality Solutions

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Design: Den Bromfield PIG



Wishing our clients a Joyous Christmas and a Prosperous New Year