

## FEATURES:

- Control systems + automation
- Hazardous areas + safety
- Plant maintenance, test + measurement
- Temperature measurement
- Energy + enviroFiciency: Focus on Drives, motors + switchgear



Let **TeSys**<sup>®</sup>  
be your drive



Life Is On

**Schneider**  
Electric

03/2016

ELECTRICITY + CONTROL

[www.electricsandcontrolmagazine.co.za](http://www.electricsandcontrolmagazine.co.za)



**PROeco**

*Let's connect.*



Johannesburg:  
011 452 1930  
Cape Town:  
021 551 8813  
Durban:  
031 914 4712



PROeco offers a series of switched-mode power supply units that deliver an excellent degree of efficiency and system sustainability.

- ▶ **Reliable power supply**
- ▶ **Basic functionality**
- ▶ **Compact design**
- ▶ **Easy to service**
- ▶ **Universal to all applications**

[www.weidmuller.co.za](http://www.weidmuller.co.za)  
[alockyer@weidmuller.co.za](mailto:alockyer@weidmuller.co.za)



**Editor:**  
Wendy Izgorsek

**Design & Layout:**  
Adel JvR Bothma

**Advertising Managers:**  
Helen Couvaras and  
Heidi Jandrell

**Circulation:**  
Karen Smith

**Publisher:**  
Karen Grant

**Editorial Technical  
Director:**  
Ian Jandrell

Quarter 4 (October - December 2015)  
Total print circulation: 4 734



Published monthly by:

**Crown Publications cc**

Cnr Theunis and Sovereign Sts

Bedford Gardens

PO Box 140, Bedfordview 2008

Tel: (011) 622-4770; Fax: (011) 615-6108

e-mail: [ec@crownc.co.za](mailto:ec@crownc.co.za)

[admin@crownc.co.za](mailto:admin@crownc.co.za)

Website: [www.crownc.co.za](http://www.crownc.co.za)

Printed by: Tandym Print

Electricity+Control is supported by:



We have now been through the State of the Nation address as well as the budget speech. I suspect neither was easy for the respective presenters. One tends to assess these things on not only what is said, but also on what is unsaid.

There can be no doubt that many of the policies governing the way we do business in South Africa need a thorough review. This is not for one moment to suggest that each policy, initially, was not well thought out with very clear objectives. Many, however, tend to clog up the very systems that we need to be unplugging in order to begin to grow the economy. And dare we flirt with the reality that it may imply accepting policies that would, for instance, not be considered acceptable in Europe.

Let's be honest... imagining that we can grow the economy by attracting more tourists, or digging more stuff out of the ground and putting it onto trains... is missing the point. We need to actively address a number of key issues. These include:

- Reducing the number of unemployable citizens
- Recognising that the vast majority of our population is young (very young)
- Coming to terms with the fact that, in general, our basic education standards are atrocious
- Understanding that our higher education sector is unaffordable to most South Africans
- Dealing with the fact that huge sums of money are squandered by the very people who should be custodians of that wealth

None of these deals with thorny policy issues. They deal instead with systemic issues that can be managed and controlled. What is required is the will to do that.

It is easy to find fault and point fingers, but my reading of the two speeches is that there is a growing realisation that it is a shared responsibility to sort all of this out. That it is not the State alone, but the citizens and the State.

I sense a growing acceptance that the State sets the tone for how we engage in solving these wicked problems and it is beginning to take responsibility for growing the economy as well as creating the environment in which this can take place.

I find it interesting that we face drought, crisis in the Department of Finance, troubles in some State owned entities, the threat of a downgrading by rat-

ings agencies – to focus our attention on the fact that we need to turn the ship around. It takes the threat of a wreck for us to pay attention.

Unfortunately, there no quick fix. There is no way to continue to make short-term gains at the expense of long-term sustainable solutions.

In as much as social grants are a critical reality, we need to begin to figure out how to make our population less reliant on the system; how to engage the population in creating wealth and making a difference.

These are wicked problems indeed. But they are problems we need to be finding solutions to... yesterday.



Ian Jandrell

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

*Ian*



The logo for H3I Squared is centered within a circular, gradient background. The letters 'H3I' are in a blue, serif font, with the number '3' in orange and yellow. Below 'H3I', the word 'Squared' is written in a blue, cursive font.

H3I  
Squared

**Official distributors of  
Siemens RUGGEDCOM  
products in Southern Africa**

**SIEMENS**

[www.h3isquared.com](http://www.h3isquared.com)  
[info@h3isquared.com](mailto:info@h3isquared.com)  
Tel: +27 (0)11 454 6025





10



25



30



42

**Control systems + automation**

- 4 Smart cities: Real-time infrastructure control systems *Tim Sowell and Johanne Greenwood, Schneider Electric*
- 10 Smart Identity System connects ERP and shop floor *Shane Novacek, Beckhoff Automation*
- 12 Round UP

**Hazardous areas + safety**

- 20 Utilising hazard studies in plant safety *Willie Coetzee, Actus Holdings, and Chris Potgieter, BFluor Chemicals*
- 25 Understanding Lock Out/ Tag Out procedures *Hayley Arnesen, North Safety Products*
- 27 Round UP

**Plant maintenance, test + measurement**

- 28 Tips for mitigating harmful harmonics *John Mitchell, CP Automation*
- 30 Industry must maintain transformers *Andre Man, WEG Transformers Africa (division of Zest WEG Manufacturing)*
- 32 Round UP

**Temperature measurement**

- 36 Water vapour in factory air... costly maintenance *Brian Abbott, SMC Pneumatics*
- 38 Evolution of temperature measurement *Steve Edwards, R&C Instrumentation*
- 39 Round UP

**Energy + enviroFiciency: Focus on Drives + motors**

- 42 Computer control of a small lathe: A mechatronics case study *Glyn Craig, Techlyn*
- 46 Round UP

www.electricityandcontrolmagazine.co.za



**Cover**

With safety at the heart, **Schneider Electric** has continued to innovate with not only the introduction of finger safe terminals, but influencing the safety standards for contactors too. *Read more on page 17.*

**Regulars**

- 1 Comment by Ian Jandrell
- 17 Cover story
- 50 A sense of Africa
- 51 Light + Current
- 51 Bizz Buzz
- 54 Social Engineers
- 56 Clipboard



Visit our innovative online technical resource for the engineering industry. [www.eandcspoton.co.za](http://www.eandcspoton.co.za)

# Smart Cities: Real-time infrastructure control systems

Tim Sowell and Johanne Greenwood, Schneider Electric



*Citizen expectations are satisfied when responsive and highly available city services are accessible to them in an easily consumable format.*

**F**or most growing cities, service continuity and citizen safety are two ongoing challenges. Although city managers may passionately want to improve the quality of life of their citizens, a city is only as good as its underlying physical infrastructure (i.e. power and water systems, safety systems, traffic management, etc).

Achieving such a level of responsiveness requires operational real-time control over the city and its systems. Crafting this type of solution would incorporate the city's physical assets, the service workforce, the changing landscape of the environment, and the movement and behaviour of citizens. To achieve real time actionable decisions, visibility of the city situation in the NOW is required. This visibility must be coupled with the ability to enable the workforce to act upon systems in order to control fluid situations. The value of the physical infrastructure relies on real-time control in order to maximise pay-back from the initial capital investments. A real-time control system is a computer system combined with instrumentation (sensors) that operators rely on to keep services running. Real-time control systems

feed data to dashboards and to enterprise resource planning, asset management, and reporting systems in order to enable better and faster operational decisions. Traditional city government spending patterns demonstrate that attention is often paid to IT-centric actions while operational technology (OT, the core physical infrastructure technology) is overlooked. In fact, both IT and OT need to integrate in order for city-wide strategies to spread benefit across multiple departments. Most cities already own many control systems that are dedicated to specific tasks (like power monitoring, traffic control, and water purification). For example, a city may have multiple water treatment plants performing similar functions. However those separate plants often deploy systems from different vendors that do not communicate to each other. A city may also own a portfolio of buildings each with its own proprietary building management system. These on-premise systems often lack sufficient networking capabilities, making it impossible to access them remotely, and to consolidate important data.

Thanks to advancements in technology, these legacy systems now represent a potential source of advantage for cities capable of analysing and relating data from these individual 'silos' of systems. A real-time platform is what enables the systems operators within city infrastructure departments to gather that important data and

|      |                             |
|------|-----------------------------|
| BOT  | – Build, Operate, Transfer  |
| IOT  | – Internet Of Things        |
| IT   | – Infrastructure Technology |
| OT   | – Operational Technology    |
| SaaS | – Software as a Service     |
| TCO  | – Total Cost of Ownership   |

## Abbreviations/Acronyms



”

*Service levels in a city  
are paramount – the city  
cannot stop running.*

convert it into information that helps to avoid crisis situations that disrupt services. As cities work towards achieving a higher degree of operational excellence, there is no 'one size fits all' formula. The transition must be managed as a journey, not a project. A real-time control platform serves as a framework for enabling advanced operations. A number of issues have been identified that need to be addressed in order to facilitate improvement of city services.

### Examining the challenges

#### Issue: Manual collection of data

**Cause: Infrastructure lacking instrumentation, automation and control:** Existing automation and control systems may be geographically distributed and require significant travel time for operators to manually access them. Examples may include water wells, treatment plants, municipal buildings, traffic control cabinets, and power substation equipment. Investments in these areas can become obsolete quickly. As a result, a trend is emerging to outsource the data reporting infrastructure to service providers.

#### Issue: Overall situational awareness

**Cause: Standalone procurement mindset:** Many cities lack a common operational platform purchasing strategy. Over time each department or utility runs purchasing operations independently of all the others. Individual projects are often managed as standalone procurements, even within the same department. Buying policies are often designed to minimise initial purchase price and avoid vendor lock-in. The result can be that a single department has multiple diverse systems controlling similar infrastructure. Cities find themselves unable to obtain an overall view from many providers and legacy systems. Where infrastructure has been outsourced or procured via Build-Operate-Transfer (BOT) type business models, there can be issues of continuity once the initial service contract has expired. This leads to sub-optimal prioritisation of actions, increased training costs, and extended ramp-up times for new operational staff.

#### Issue: Inability to unify and coordinate teams with shared data

**Cause: Siloed systems without a shareable data model:** To meet expectations for resilience and energy efficiency, teams increasingly need to share long-term planning data and short-term forecast data to make effective strategies and execute response plans.

**Issue: Stakeholders lack information or distrust it**

**Cause: Systems designed without relevant reporting and with inadequate focus on trustworthiness:** It is well accepted that 'one cannot manage what one does not measure' but too much data can rapidly overwhelm city decision makers and interested citizens. If data points are suspected of inaccuracy, are in conflict, or appear to tell an ambiguous story, they will be distrusted and ignored.

**Issue: Lack of synergy with citizens' and visitors' behaviour**

**Cause: Lack of real-time data optimised for different classes of user:** The population of the city is an integral part of how the city functions, and culture and behaviour directly impact the performance of the city systems and the results achieved. A new, growing class of citizens is beginning to take matters into their own hands, and they rely on connectivity to accomplish their goals. For example, more and more citizens are active participants using mobile applications to update the city on issues such as public services (failed street lights, overflowing rubbish bins etc.). Also a new class of energy consumer called 'prosumer' is beginning to emerge. A prosumer is someone who blurs the distinction between a 'consumer' and a 'producer'. In the context of a city, prosumers are consumers of city services who can (if appropriately supported) adapt their consumption patterns to achieve a better balance of outcomes (like taking a train instead of a car to get to work if the roads are overloaded).

**Issue: Lack of operational innovation**

**Cause: Inability to simulate, model and anticipate the effects of change:** City operational teams tend to be risk averse as they usually lack a safe area for experimenting with new ideas without the risk of citizen complaints. This leads to a 'if it's not broken, don't fix it' mentality that preserves the status quo and does not drive continuous improvement.

**Issue: Transitioning workforce**

**Cause: Baby boomer retirement, incoming 'digital natives':** The number of highly experienced operations, maintenance, process workers who will retire in the next five to 10 years is significant. Some managers estimate that 80% of their current team will be retired in five years. This challenge is particularly acute in some economies where there is a significant lack of qualified people to replace the existing 'baby boomer' generation.

The 'time to experience' has to be shorter than ever for the new workers coming on board to replace retirees. Increased geographic mobility and changing employment prospects mean that new hires move on to their next jobs within relatively short periods – sometimes less than a year. The implication is that cities can't afford to spend months on training and coaching before new employees become effective. The new generation of 'digital natives' expects instant access to the required knowledge; they expect 'touch experience';

they expect collaboration from anywhere; and they expect to learn on the fly. Traditional operational interfaces used for city systems will not satisfy the expectations of this new workforce. Addressing these issues requires a multifaceted approach. Technology, process and people have to converge in a way that allows operational teams to perform in a more flexible manner. In fast moving cities, decisions must be made quickly, and cannot wait to be passed up the management hierarchy. Workers need to be empowered to make more decisions, and this is enabled through access to more information, more knowledge and access to experience. Thus 'workers' need to be transformed into 'knowledge workers.' Urbanisation is driving the rapid growth of technology within city operational systems. The new operational agility requires collaborative operational teams. Increasingly cities need to leverage their operational staff across a broader range of competencies and functions than in the past. Especially in smaller cities, operational staff members will have responsibilities that span a variety of sites and domains, and will require regular collaboration with planners and subject matter experts. The challenge of these operational teams is to allow consistent information access across the total team, so that work items can be shared and managed across the team. Within the context of flexible operational teams, success today is largely dependent upon this type of situational management. Teams require enabling systems and processes to make and implement decisions – without those enablers they cannot be sufficiently responsive to the real-time situation. Flexible operational teams proactively receive and review trends and succeed in moving to a predictive rather than reactive model. They migrate beyond monitoring the present state (which implies notification via an alarm, which only indicates that the trouble has already occurred). Predictive models allow flexible operational teams to look ahead and to influence a potentially problematic situation before it begins to disrupt citizens. To achieve these outcomes the knowledge of 'best practices' must move from the workers' heads into the systems, so the dynamic workforce can act in a consistent manner no matter their experience or location. This requires operations innovation and systems that enable operational practices to be embedded. *Figure 1* shows a situation where a city has gone through a performance improvement programme. It shows the advantage retained when the practices are embedded in operational systems, and a culture and environment is fostered to empower continuous evolution of these operational processes.

*'Cities should not start with technology but instead start from their citizens and workforce and work back to produce a plan to satisfy the future desired state with a service-oriented technological solutions deployment.'*



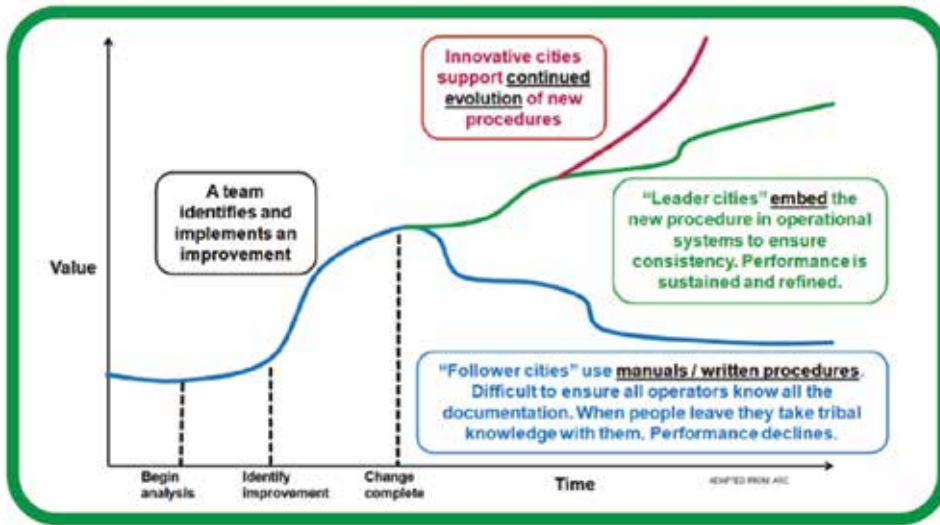


Figure 1: Effect of embedded knowledge management.

**Solution: Enabling flexible operational teams**

Advanced operational systems provide operators with the ability to capture data, validate its reliability, and make it available to the system for processing into information. As data is developed into information it is placed into its relevant context, and it is determined which assets or processes are affected. Further contextual processing based on machine learning and pattern recognition transforms items of information into knowledge.

The operator is provided with overall situational awareness (see Figure 2). Examples of how this knowledge management would work include information about an emerging traffic incident and how it will affect multiple districts of the city; or a developing condition in the comfort systems of a building and the effect it is having on 'x' amount of people. An operator also requires the wisdom to decide

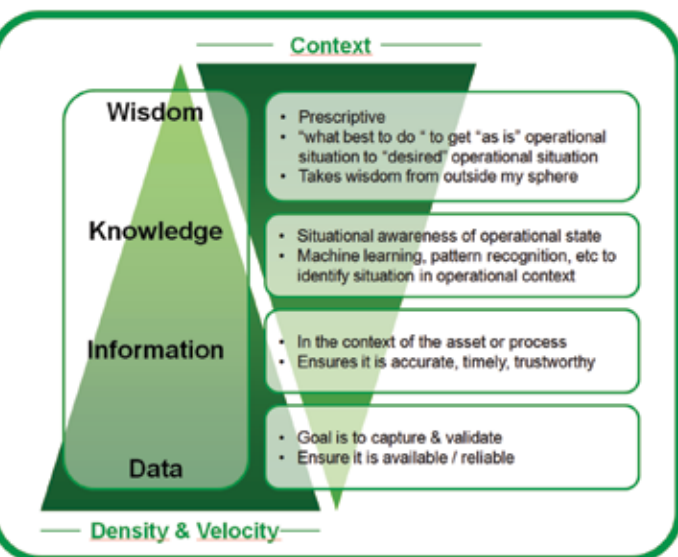


Figure 2: The transformation of data through knowledge management.

what to do and the judgment to make the best decision based on the circumstances. Today, most operators have to rely on their personal operational experience to inform them of the best course of action. Operators have to wait for direction from senior staff. This impedes agile actions. This problem gets worse in environments with worker retention challenges. An advanced operational platform that incorporates workflow and knowledge management alleviates this issue. It provides every

operator with instant access to the combined experience of the city's staff, offers them a set of scenarios that can be enacted along with the pros and cons of each, and enables them to act in a prompt and effective manner. Individual data points provide little or no context, while a knowledge management system makes maximum use of the context to provide guidance and support.

Flexible operational team environments incorporate the following three characteristics:

- **Roaming teams** – These are teams that work in a transient fashion across multiple assets/ sites. Support staff should be transient. This allows for more flexibility in work assignments and better utilisation of the city workforce.
- **Central operational centres** – These centres have an operational lead controller who is directing the overall activity, and who is supported by a transient team of different skill sets. The operational centres are supported by a virtual team of experts who can be internal or external to the city. This approach recognises that some specialists may not be city employees and increases the scope for collaboration to sister cities, academic institutions, and specialist advisors regardless of where in the world they are located.
- **Virtual expert teams** – These teams are enabled through appropriate decision support systems, harnessing the community of expertise across the city and its ecosystem of public and private partners. The tools utilised by these teams supply decision support and connect expertise in a timely manner based on trusted, consistent information. Both roaming teams and the operational centre participate as collaborators.

These integrated teams may be collaborating on one plant or several plant locations, one area of the city or several, with the whole team executing activities (work items) relative to the role and location in the most efficient manner. Teams equipped with overall situational awareness capabilities can coordinate both planned and emergency responses in a more effective manner. An example of planned response is repair and maintenance staging – if streets are dug up to address a water issue and then have to be dug up again three months

later for a gas-line repair this is disruptive and costly. Teams can also prioritise fixing costly problems ahead of fixing ones that have lower impacts, and the system can provide estimates of the 'cost of not fixing' each problem on the list. In an emergency situation sharing camera images, traffic status, coordinating utility repairs, along with first responders and security staff helps the city get back to a normal operational state far more quickly. Sharing information with citizens over social media, website, hotline or digital signage allows them to adapt their behaviour to be part of the solution and not worsen the problem. The integration of a real-time control platform provides an anchor for contributing reliable summary data to reports and dashboards used by the mayor, city council and city department heads.

The flexible operational team is dependent on a connected and technologically-enabled ecosystem of equipment and people that allows for flexible human interaction. Simple control systems fall short of addressing the agility needs of city operations.

### Strategic planning for real-time platforms

Cities should specify a real-time platform strategy that incorporates predictive models and knowledge management. The platform should also readily interface to other systems such as asset management and geographical information systems. The platform should enable roaming operators to access the systems from mobile devices. Cities should seek opportunities to consolidate classes of similar infrastructure onto a common platform. In many cases, it will not be necessary to replace existing control systems such as building management systems. Legacy systems can be progressively incorporated into a new platform while still leveraging the new automation and control systems that are installed.

Many cities already focus on procurement practices that evaluate TCO rather than purely the initial cost of purchase. However, total cost of ownership is often evaluated for the single system under procurement, and is not evaluated strategically across the multitude of systems owned by the city. Recommendations for cost justifying a move to real-time controls

- Control system price is typically composed of a base cost and incremental cost that depends on complexity and size of the system. Buying multiple systems incurs the base cost for each one. Buying a scalable platform and building multiple systems on top of it avoids incurring a significant number of multiple base costs. Investments are optimised and short term costs are balanced with total lifetime cost
- Modern control platforms contain various templates and data models of real-world objects. When a system is extended, that work may be reusable to reduce the cost of the extension. If a system is purchased from a different vendor then work may have to be duplicated
- It may be possible to take advantage of cloud hosting or software-

as-a-service<sup>1</sup> type business models. This can avoid costly upfront capex investments in IT hardware, since the control system is hosted in the cloud and the utilisation is paid from the opex budget.

*The 'Internet of Things' (IOT) enables smart devices, connected city assets and the humans who are accessing those devices, to gain real-time visibility to situations. Devices may have embedded automated practices which, in turn, allow for coordinated actions between operators and machines to resolve a problem - in some cases, before the problem occurs.*

### Technical sustainability

Most cities that are purchasing systems want to avoid being locked in to a proprietary solution from a single vendor. However, buying multiple systems from different vendors may not be the most cost-effective approach and may also introduce additional layers of operator complexity. The risk of locking-in to one vendor can be avoided by choosing a proven platform solution that embraces open standards and that is widely used by different independent system integrators. Such an open platform will interface to other systems and devices as required. If, at some future point, the decision is made to adopt another control platform as the master, the existing open system platform can integrate into the new solution without too much effort. Under such a scenario, the cost of core platform maintenance is therefore spread among the entire customer base for the platform, and no particular city department has to pay this cost alone. Scaling the system to incorporate more devices or new areas should be possible through a configuration interface, similar to the settings menu on your smartphone, which avoids the need for maintenance of scripts or code.

Another tactic that cities adopt is to build their systems largely from open-source software, supported by custom programming to integrate the components. Open-source denotes software for which the source code is freely available. It can be modified or enhanced by anyone. This can be appealing as new features may be added for free by programmers from a community of enthusiasts. In contrast, proprietary software is owned by an individual or company. There are restrictions on its use, particularly licence fees, and its source code is usually kept secret.

Software-as-a-service (SaaS) business models licence software to users through subscriptions. The software is typically centrally hosted and accessed through the user's web browser. This can relieve the city of various maintenance responsibilities related to the software and shift the costs of purchasing the system from up-front costs to a monthly subscription fee.

- To achieve real time actionable decisions, visibility of the city situation in the NOW is required.
- A real time control system is a computer system combined with instrumentation (sensors) that operators rely on to keep services running.
- A real-time platform enables the systems operators within city infrastructure departments to gather information to avoid service disruption.



take note

The flexibility of open-source software can tempt buyers to specify a solution based on very idiosyncratic requirements. In theory, the access to the source code means that cities will always be able to hire programmers to modify the system - and to avoid the situation where a proprietary system 'moulds like putty' around the initial needs but then 'sets like concrete' and can't be changed later on. In practice, the city will end up with a system which is unique and which becomes more complex with each modification. Eventually the costs of keeping a support team in place becomes prohibitive, as do the risks of changing a system that has grown too complex.

- **Scalability:** Each component of the architecture should be capable of expansion as the city adds new or extends existing operational systems, and adds decision support information and business process automation to the architecture
- **Trustworthiness:** Trustworthiness is a composite of system availability and event accuracy. Experience has proven that users will quickly abandon an operational or decision support solution which can't be highly trusted.
- **Efficiency:** An appropriate system architecture ensures network traffic is minimised, and functions are processed only where they are needed

### Appointment of a CTO/CIO

City managers or mayors will likely benefit from appointing a chief technology officer to coordinate operational technology strategy across multiple departments. This could also be part of the role of a chief information officer (CIO) as long as that responsibility extends to operational technology as well as traditional IT. The CTO/CIO should work across city departments, functions and utilities to identify short and long term opportunities and to design an overall strategy. Projects should be identified to provide a starting point for the journey to operational excellence.

### Funding models

Existing funding models may be an impediment to investment in shared platforms. For example if one department is funded by rate-payers (e.g. collected as part of a water or energy tariff) and another is funded by taxpayers (e.g. collected as part of a property tax) there may be challenges to manage if one department owns the system and

extends use of it to the other. Cost sharing may not be well identified and return on investment may be confusing. It may be necessary to create a shared services model, with a clear cost contribution from each user department. A real-time platform strategy can work with both capex and opex-centred approaches. Some public organisations such as municipal departments, hospitals and schools, have been seeking to shift expenditures from overstretched capex budgets to opex budgets. This gives stakeholders the flexibility of providing access to products or services via monthly payments.

### Conclusion

A strategic approach to real-time platforms eliminates the wasted effort and increased cost of siloed control systems. Such an approach enables unification across assets, applications and systems. Each of the existing systems continues to run, but now they become aligned with information and visualisation models. Predictive analysis and communication are supported in order to facilitate rapid decision-making. Investments are optimised for the long term. This can bring reduction in total cost of ownership, cost savings from energy efficiency, reduction in staff costs, and improvements in resilience and sustainability. Such a system, since it is based on an open, standardised platform has longevity to evolve. New and disruptive technologies will continue to emerge. However a system based on open standards and with a flexible architecture design will allow cities to quickly adapt to changes.

Tim Sowell has 30+ years of international experience in industrial software applications and software development, living in Australia, Europe, Middle East, Africa, and North America. Tim's passion is to drive operational effectiveness through step changes in how technology is applied and address the agile operational strategies in the industrial/manufacturing sector. Tim's current role is leading Software Strategy and Architecture at Schneider Electric for Industry Solutions.

Johanne Greenwood has 20+ years of international experience as a software developer, educator, advisor and change agent. She led the creation of Energy University, a free online elearning resource which took first prize in Learning Category in the European Commission Sustainable Energy Europe Award. She contributed to ranking Schneider Electric at 9<sup>th</sup> in the Global 100 Most Sustainable Corporations in the World. Today, Johanne focuses on Smart Cities and supports cross-functional teams around the world to collaborate with cities and partners to build and achieve their vision of cities that are efficient, liveable and sustainable.

Enquiries: Isabel Mwale. +27 (0)11 254 6400 or email [isabel.mwale@schneider-electric.com](mailto:isabel.mwale@schneider-electric.com)



# Smart Identity System connects ERP and shop floor

Shane Novacek, Beckhoff Automation

*This Smart Identity System provides comprehensive remote connectivity, enabling users to access applications via web-capable devices like smartphones and tablets.*

This tells of turnkey labelling and marking solutions that raise efficiency and save money. The development of innovative labelling and marking solutions is one of the main undertakings of C3 Corporation (referred to in this article as the Company). Based in Appleton, Wisconsin, the company recognised at an early stage that intelligent track-and-trace is the key to intelligent manufacturing. Equipped with PC-based control technology, the Smart Identity System developed provides comprehensive remote connectivity, enabling users to access applications via web-capable devices like smartphones and tablets.

The company's track-and-trace systems are used in many industries like foam and urethane production, the paper and packaging industry, the food and beverage industry, as well as in the finished metal products industry. Working closely with customers, the company has a need to understand the entire operation from the shop floor to the top management level and everything in-between. This enables the elimination of bottlenecks, making the whole operation more efficient.

With the company's Smart Identity System for marking products with data-intensive labels, it has managed to introduce a new development in the field of integration services. This system gives customers an accurate overview of their operation's throughput rates and effectiveness. Via remote access they can use any web-capable device to issue commands, change templates and labels, run diagnostics and access data. The openness of the PC Control

platform also allows us to adapt our labelling and marking solution to the customer's specific requirements.

## **PC-based control: Integrated, highly-connected control platform**

The control platform of the Smart Identity System consists of a Beckhoff CX2020 Embedded PC with a 1,4 GHz Intel® Celeron® CPU, TwinCAT 3 automation software, and EtherCAT as the real-time communication system. The Embedded PC, with its directly connected EtherCAT I/O terminals, allows us to design the system with great flexibility. This is a huge benefit, because all our applications and installations are customer-specific. The PC-based control solution also enables optimal vertical and horizontal integration. For example, linking to an ERP system is just as easy to implement as it is cost-effective. The controller's connectivity allows you to link it to the Worldwide Cloud and access it via mobile devices from anywhere as long as the customer's network is VPN-capable. The company has also begun to

- The company's track-and-trace systems are used in many industries.
- It is imperative to understand every company's entire operation – from shop floor to top management.
- The Smart Identity System has introduced a new development for marking products with data-intensive labels.



take note

CPU – Central Processing Unit  
 ERP – Enterprise Resource Planning  
 I/O – Input/Output  
 OPC UA – Open Platform Communications Unified Architecture  
 PC – Personal Computer  
 PLC – Programmable Logic Controller

## Abbreviations/Acronyms



implement OPC UA so that users of Smart Identity Systems can see the same data at the same time with built-in security and data encryption. Based on PC-based control technology we implemented a web server, a comprehensive database and a controller in a single device.

Conventional systems cannot compete with this solution because they require multiple hardware layers or separate devices. With PC Control we simply add more software layers, combine everything in a single hardware device, and sell the solution as an all-in-one, turnkey package.

### Automation technology and IT convergence via TwinCAT 3

TwinCAT 3 plays an important role in the labeling and marking solutions from C3. In addition to the standard programming languages for automation applications, TwinCAT 3 offers a wide range of IT engineering tools. The development software, the easy installation of web servers and a series of new software tools give us many options to further advance the functionality of our Smart Identity Systems. As a result, we can embed many functions at no additional cost into the PC-based software platform, which makes the work of our developers considerably easier. The TwinCAT 3 software libraries make it possible to implement one or more TCP/IP servers and/or TCP/IP clients within the TwinCAT 3 controller. The controller variables and/or the direct values from the EtherCAT I/O system can be recorded and saved in databases cyclically or in an event-driven manner. With the TwinCAT 3 Database Server, the company was able to significantly expand the history tracking and trend analysis functionalities. We can see all the labels and the markings throughout a line, and it is rather easy to view what a facility has produced by the day, month or year. The company uses a variety of digital EtherCAT I/O terminals to connect sensors, scales, scanners and other field devices. EP6652-0010 EtherNet/IP slave terminals handle the communication with other industrial Ethernet systems. They provide

a direct link to EtherNet/IP devices in the company's applications and return their data via EtherCAT.

### Power through intellectual property

The company recently installed the new PC-based Smart Identity System for a highly automated national dairy processor client. This company can now gather data about its recipes and improve their traceability. In the previous system, the main PLC sent requests to a computer, which then sent the print commands to the label printer. The issue was time. Since a single computer controlled all the labellers, a boxed product would frequently be missing a label because it was not printed on time. Consequently, the product had to be sent back through the system to be properly labelled. EtherCAT allowed us to increase the labelling speed significantly. The real-time communication system makes sure that all labels are correctly printed by the time each package arrives for final processing. It also gives the company access to its entire production history. Another advantage of the PC-based solution is the system's source code protection. This solution allows the customer to protect valuable intellectual property. The hot-connect capability of EtherCAT also made it much easier to switch out print engines and consumables. These processes could take four hours or more on the plant floor if you include the IT department's involvement with the ERP systems. With PC-based control and EtherCAT, it now takes one person just about half an hour.

“  
 Open Platform Communications  
 Unified Architecture (OPC UA) is  
 an industrial M2M communication  
 protocol for interoperability  
 developed by the OPC  
 Foundation.”



Shane Novacek is the Marketing Communications Manager, North America, at Beckhoff Automation  
 Enquiries: Kenneth McPherson.  
 Email [kennethm@beckhoff.co.za](mailto:kennethm@beckhoff.co.za)

## Oscilloscope... 6-in-1 versatility, high performance

**TEKTRONIX** has introduced the new MDO4000C oscilloscope that includes up to six built-in instruments, (spectrum analyser, arbitrary/function generator, logic analyser, protocol analyser and digital volt meter/frequency counter). The MDO4000C Series, when configured with an integrated spectrum analyser, is the only instrument that provides simultaneous and synchronised acquisition of analogue,



digital and RF signal analysis ideal for wireless communications in IoT and EMI troubleshooting.

**Embedded design:** Discovers and solves issues by performing system level debug on mixed signal embedded systems including today's most common serial bus and wireless technologies.

**Power design:** Makes reliable and repeatable voltage, current and power measurements using automated power quality, switching loss, harmonics, ripple, modulation and safe operating area measurements with the widest selection of power probes in an affordable solution.

**EMI troubleshooting:** Tracks the source of EMI in an embedded system by determining which time domain signals may be causing unwanted EMI. Observations in real-time of the effects time domain signals have on system EMI emissions.

**Wireless troubleshooting:** Whether using Bluetooth, 802.11 Wi-Fi, ZigBee, or some other wireless technology, the MDO4000C enables viewing an entire system - analogue, digital and RF, time-synchronised to understand its true behaviour.

**Manufacturing Test and Troubleshooting:** Size and space constraints can play havoc on a manufacturing floor. The unique 6-in-1 MDO4000C minimises rack or bench space by integrating multiple instruments into one small package.

*Enquiries: The Comtest Group. Tel: 010 595 182 or email sales@comtest.co.za*



### Gas Monitoring

- H B Systems Pty Ltd is the appointed Representative for Kimessa AG of Switzerland for the Supply and support of Kimessa Gas Sensors and Monitoring Systems.
- Specializing in Gas Leak Monitoring of refrigerant gases (Ammonia, Freons etc.) for land- or marine based Refrigeration Systems.
- The range extends to a multitude of gases, e.g. CO<sub>2</sub>, CO, NO<sub>x</sub>

#### Gas Sensors

IP65



Ex



#### Monitoring

2, 4, 10, 32 Channels.



H B Systems Pty Ltd  
T: +27 21 852 1189  
M: +27 82 920 4979  
www.hbsystems-electrical.com  
info@hbsystems-electrical.com



Integrated in weatherproof stainless steel enclosure with 24VDC UPS

**KIMESSA AG**  
Gas Monitoring Systems

## Modular data centre for telecoms operator in Congo

**Master Power Technologies (MPT)** is delivering a turnkey modular data centre solution to a telecoms company in Brazzaville, in the Republic of Congo. The solution is to be delivered as a set of modular, pre-tested containers that comprise a self-contained data centre. The telecoms giant wanted to expand an existing site in Brazzaville and earmarked an old building for the new data centre. The solution devised by MPT was a two-storey, modular data centre. The solution is self-sufficient and able to run indefinitely without access to external power sources. The energy component takes up the ground floor of the building to ensure the data centre is self-sufficient, and consisted of generators, a bulk fuel supply and security controls. Rory Reid, sales and marketing manager at Master Power says the data centre has been divided into two levels of 340 m<sup>2</sup> each. The first level contains five Emerson 80 kW HVAC units and the second level contains three units. All in all, the equipment MPT supplied and built into the containers for the project includes:

- 3 200 A low-voltage panels
- Two 500 kW UPS systems
- Two 2 400 A rectifiers
- Three 1 000 kVA FG Wilson generators
- One 28 000 litre diesel fuel tank

MPT will also install 122 cold aisle racks for IT equipment, although this can be expanded as required by the client. The full solution of eight modular containers was assembled and tested in South Africa by MPT before being shipped to Brazzaville.

*Enquiries: Rory Reid. Tel. +27 (0)11 792 7230 or email rory@kva.co.za*

# Servo, stepper and DC motors: directly integrated into the I/O system.



## [www.beckhoff.co.za/compact-drive-technology](http://www.beckhoff.co.za/compact-drive-technology)

In combination with a wide range of motors and gear units, the Beckhoff I/O systems enable a compact and cost-effective drive solution. The modular and extendable motion terminals support servo, stepper and DC motors with different performance ranges. For machine mounting outside of a control cabinet, EtherCAT Box modules for stepper and DC motors are available. All drive solutions are integrated into the Beckhoff automation software TwinCAT which enables easy parameterization.



**Beckhoff Automation (Pty) Ltd**  
Randburg 2194, South Africa  
Phone: + 27 (0)11 795 2898  
[info@beckhoff.co.za](mailto:info@beckhoff.co.za)

|            |               |                | EtherCAT Terminals<br>(IP 20) | Bus Terminals<br>(IP 20) | EtherCAT Box<br>(IP 67) |
|------------|---------------|----------------|-------------------------------|--------------------------|-------------------------|
| IPC        | Servomotor    | 50 V, 4 A      | ■                             |                          |                         |
|            |               | 50 V, 4 A, OCT | ■                             |                          |                         |
| I/O        | Stepper motor | 24 V, 1.5 A    | ■                             | ■                        |                         |
|            |               | 50 V, 5 A      | ■                             | ■                        | ■                       |
| Motion     | DC motor      | 24 V, 1 A      | ■                             | ■                        |                         |
|            |               | 50 V, 3.5 A    | ■                             |                          | ■                       |
| Automation |               | 50 V, 5 A      | ■                             | ■                        |                         |

New Automation Technology

**BECKHOFF**

## New Visual IR Thermometer detects instantly

The Comtest Group, Fluke's authorised Test and Measurement distributor for South and southern Africa, has introduced the Fluke VT04 Visual IR Thermometer – the latest in troubleshooting tools with a built-in digital camera and thermal heat map overlay. The device bridges the gap between traditional IR thermometers and infrared cameras.

Building on the extremely popular Fluke VT02, the VT04 adds PyroBlend Plus with a four-times sharper resolution than the VT02 and automatic alarm features. It is an ideal frontline troubleshooting tool for electrical, industrial maintenance, HVAC/R, and automotive applications. The ultra-compact Fluke VT04 is fully automatic with built-in intelligence, so issues can be detected instantly with no training required.

The VT04 includes advanced alarm features for troubleshooting stubborn intermittent issues, including a hi-lo temperature alarm that flashes on the screen if the user-selected temperature goes out of the selected range; a time-lapse image capture that can be set to capture images in 30-second to one-hour intervals; and an auto-monitor alarm that initiates image capture automatically after a temperature alarm has been triggered, allowing users to automatically capture images even while the VT04 is unattended using the universal tripod mount.

It displays and saves images as full digital, full infrared, or in three blended modes (25, 50, and 75%) with 40% wider field of view than the VT02.

Enquiries: Tel: 010 595 1821 or email [sales@comtest.co.za](mailto:sales@comtest.co.za)



## Nobody manufactures 6 mm safety relays.

Until now...

### Relay Technology

Designed by PHOENIX CONTACT



### Maximum performance – minimum size

With the PSRmini product range, Phoenix Contact is bringing to the market the most narrow safety relays in the world. At widths of just 6 mm and 12 mm, they provide maximum functional safety through force-guided contacts according to the standard EN 50205. The highly-compact design means space savings of up to 70 %. This is possible thanks to the newly developed relay technology from Phoenix Contact with switching loads up to 6 A.

### For More Information Please Contact Us On:

JHB: 011 801 8200

CT: 021 930 9666

DBN: 031 701 2701

PE: 041 364 0451

[www.phoenixcontact.co.za](http://www.phoenixcontact.co.za)



## Wireless Controller for IIoT applications

**RET Automation Controls** has introduced the Sure Cross DXM100 industrial wireless controller, designed to facilitate communications for Ethernet connectivity or Industrial Internet of Things (IIoT) applications. Available with an internal Sure Cross DX80 Wireless Gateway or a MultiHop Data Radio, this powerful Modbus communications device reliably connects local wireless networks with the Internet and/or host systems.

To satisfy multiple application requirements, the DXM100 controller offers several wired and wireless connectivity options to easily share data between local and remote equipment. The cellular modem option eliminates the need for IT infrastructures to connect remote equipment, while the integrated Sure Cross wireless radio option enables Modbus connectivity to equipment.

“By integrating Banner’s wireless radio, cellular connectivity and local I/O, our new DXM100 wireless controller provides a proven platform for IIoT applications,” said Tim Hazelton, Product Manager, Banner Wireless. “With unique Internet messaging tools and easy programming capabilities, the DXM100 ensures complete connectivity and communication.”

Banner’s DXM100 wireless controller includes a logic controller with easy programming options for simple operation and guaranteed control. It can be programmed using action rules and ScriptBasic, allowing freedom when creating custom sensing and control sequences. The DXM100 also allows for secure email and text messaging for alarms, alerts and data log files. The DXM100 incorporates several automation protocols into its system, including Modbus RTU, ModbusTCP and EtherNet/IP. The controller also features on-board universal and programmable I/O ports for simple connection to local sensors, indicators and control equipment.



**Enquiries: Brandon Topham.**  
Email [brandon.topham@retautomation.com](mailto:brandon.topham@retautomation.com)

## Ongoing innovations in automation



The launch of the LOGO!8 in 2014 brought about great change to the world of the Logo. Features such as built in Ethernet meant that the Logos could now communicate to other Logo’s as well as to higher level SIMATIC PLCs and HMIs. Additionally, this meant no more pricey programming cables as well as a built in web-server. Just a simple

Ethernet cable is needed for programming. The higher resolution screen of the Base Module (BM) as well as the Text Display (TDE) has three backlight colours (white, yellow and red) which aids in bringing attention to the device in emergency situations. A new add-on module, namely CMR2020, allowed the logo to send and receive SMSs as well as track GPS positioning. The face-lifted design of the LOGO!8 has brought the 20 year heritage of what started as a smart relay into the modern era of Basic Automation.



It has been seven years since the launch of the S7-1200 and TIA Portal back in 2009 and a relatively short road of fantastic innovation it has been. With V1 of the range being the shining replacement of the S7-200, the S7-1200 has grown into a PLC capable of replacing many lower-end S7-300 systems.

With the latest version sitting at V4.1, the S7-1200 has features such as a built-in web-server, on-board ProfiNet, Motion Control functionality, revised PID Control blocks, up to 1MHz High Speed Counters (HSC) and Pulse Train Outputs (PTO/PWM), the list goes on. The most important feature of the range, however, is the communication capabilities. Protocols such as ProfiNet, ProfiBus, ModBus TCP, ModBus RTU on RS485, PtP on RS232, GPRS (up to LTE for PtP or TeleControl Server applications), GSM (SMS), DNP3, IEC, ASI Bus and Radio Frequency available throughout the S7-1200 range, **Siemens** can offer customers flexibility not only in the high-end market, but in the smaller applications as well.

**Enquiries: Hayden Bielby. Tel. 0 11 652 3752**  
or email [jennifer.naidoo@siemens.com](mailto:jennifer.naidoo@siemens.com)

## Energy efficiency so your machines can do more



**Save up to 11% on your electricity consumption by switching to Engen Hydrokin ESF hydraulic fluid.**

With excellent anti-wear properties, it’s specially designed and formulated to have superior lubricating ability and lower frictional coefficient to reduce energy consumption and so save you money.

Contact one of our technical advisors today on +27 21 403 5090, email us at [1call@engenoil.com](mailto:1call@engenoil.com) or visit [www.engenoil.com](http://www.engenoil.com) for more information.



## Control systems' orders for combined cycle power plants, Thailand

Yokogawa's subsidiary, Yokogawa (Thailand), has received letters of intent for the purchase of control systems for 12 combined cycle cogeneration plants that are to be built for Small Power Producers (SPPs) in Thailand. The 12 SPPs responsible for these projects are all special purpose companies that are jointly owned by Gulf Energy Development Company Limited and Mitsui & Co. The 12 power plants will all be natural gas fired combined cycle cogeneration facilities, and will be located in the Bangkok suburbs. Nine of these will have a 120 MW capacity, and the remaining three will have a 130 MW capacity, for a total generation capacity of 1,470 MW. The construction of these 12 plants is slated for completion between May 2017 and July 2019. The letters of intent received by Yokogawa (Thailand) were submitted by Toyo Engineering Corporation, which will hold overall responsibility for the engineering, procurement of equip-

ment and materials in Thailand, construction, and commissioning for the 12 projects.

For each of these projects, Yokogawa (Thailand) will deliver the CENTUM VP integrated production control system for the monitoring and control of the gas turbines, heat recovery steam generators, and a steam turbine. Yokogawa will also handle engineering for its products and will provide support with the installation and commissioning of these products and the training of operators. Yokogawa believes that it will win these orders due to its solid track record in Thailand with the delivery of control systems to SPPs, other types of power plant operators, and companies that have in-house power facilities. A contributing factor is the company's strong support organisation in Thailand.

**Enquiries: Christie Cronje. Tel. +27(0)11 831 6300 or email [Christie.cronje@za.yokogawa.com](mailto:Christie.cronje@za.yokogawa.com)**

## Super bright industrial grade tower lights

Schneider Electric, a global specialist in energy management and automation, has announced that its latest range of industrial grade tower lights, Harmony XVU, is now available to the local market.

The line offers a clean and innovative design that enhances installation safety. The colour-coded display and sound signalling increase visibility of machine alarms, making Harmony XVU the perfect fit for applications in the automotive, food and beverage, and semiconductor industries.

The Harmony XVU tower lights offer high quality, true colour, bright LED light modules that enable users to create

a configuration, which is best suited to their requirements:

- One to five illuminated units (available in five colours: red, amber, green, blue and clear), or
- One to four illuminated units plus a sound unit (buzzer or voice)

Additionally, the range includes a special multi-colour LED module with a choice of six colours and four light patterns: Steady, blinking, flashing, or rotating, which are easily configurable by two dip switches inside the unit.

**Enquiries: Isabel Mwale. Tel. +27(0)11 254 6400 or email [isabel.mwale@schneider-electric.com](mailto:isabel.mwale@schneider-electric.com)**



# OMRON

## KP100L Photovoltaic Inverter



### The right inverter every time

As a world leader in industrial automation, Omron has a reputation for high quality and reliability, which also extends to our range of PV solutions. Our commitment to this is reflected in the latest addition to our solar range - the KP100L. This new inverter offers smart control and advanced performance. It can also be used with any kind of solar panel or monocrystal and polycrystal module. This simplifies the selection task, making the KP100L Solar Inverter the right choice every time.

*Pick up the phone or email for a quote!*

+27 (0)11 579 2600

[info.sa@eu.omron.com](mailto:info.sa@eu.omron.com)

[www.industrial.omron.co.za](http://www.industrial.omron.co.za)

# Schneider Electric

## *Automation and Control*

### Invention of the first contactor

### When the switch became automated



It's hard to believe but before the contactor was invented, switching on an electrical load was not automatic. Imagine having to manually switch on motors in applications such as heating, foundry and industry?

The invention of the contactor in 1924 by Telemecanique, now Schneider Electric, meant for the first time this could now be automated and with it came improved safety for workers.

After André Blanchet filed a patent for the first bar contactor, the company began producing 40 A contactors, timers, distribution

boxes, pushbuttons, stop contacts and relays. They quickly expanded the business to become a leading specialist in industrial control and automation.

#### ***The last 90 years has seen continuous innovation***

With safety at the heart, Schneider Electric has continued to innovate with not only the introduction of finger safe terminals but influencing the safety standards for contactors too. Over the years the contactor has evolved to the present day, the unique TeSys U offering multiple functions in one device. Everlink, unique to us, is enhanced with many safety features such as well shrouded terminals and the elimination of 'copper creep' that can lead to terminals loosening and dangerous over-heating.

Ninety years of evolution and innovation has resulted in a wide choice of products. Nowadays TeSys is the market leading motor starting and power switching range providing customers with a perfect solution for any application.

The new LR9D and LR97D electronic overload relays complement the existing line of products, known as some of the most energy efficient, comprehensive and reliable products in the market. The new TeSys LR9D Electronic Overload Relay offers a unique selectable trip class and allows customers to select between Class 5, Class 10, Class 20 and Class 30. This enables the customer to set a desired level protection for added flexibility. The 5:1 current adjustment range makes these new relays a natural choice for a wide range of applications, from 0,1 to 110 A.

#### ***Enquiries: Customer Care:***

☎ **Tel. 086 1300 222 (RSA)**

@ **+27(0)11 230 5880 (Intl.) or**

@ **email [za-ccc@schneider-electric.com](mailto:za-ccc@schneider-electric.com)**



Scan the code to go to our website to see other latest products.

## Self-contained photoelectric sensors for harsh environments

**RET Automation Controls** has introduced new M18-4 self-contained photoelectric sensors from Banner Engineering. Featuring robust IP69K-rated 316 stainless steel housing, the heavy-duty 18 mm metal barrel sensor is ideal for harsh industrial environments where abrasive chemicals and ingress fluid are present. Built with Advanced ASIC (Application Specific Integrated Circuit) technology, the dc-operated M18-4 sensors are also resistant to fluorescent light and offer a high level of crosstalk avoidance.

Featuring a powerful and bright visible red emitter beam, the M18-4 allows for easy alignment and set-up. For added ease of use, the M18-4 sensor also offers a highly visible output, and dual-function power and stability

indicators. The indicators are comprised of one green and two yellow LED lights. Solid green indicates power is applied and the sensor is ready, while green flashing specifies a marginal sensing signal. The two bright yellow LEDs, visible from both sides of the sensor, indicate the output is conducting.

"Some production environments damage low cost plastic sensors leading to machine down time," said Dennis Smith, Senior Technical Marketing Manager, Banner Engineering. "Banner's M18-4 photoelectric sensors are designed to provide long term and reliable sensing performance in harsh industrial applications with enhanced chemical and washdown resistance."

To accommodate diverse applications, the

M18-4 is available in opposed, polarised and non-polarised retroreflective, diffuse and fixed-field sensing modes. For increased flexibility, diffuse models offer a robust 250 degree sensitivity potentiometer. A wide operating temperature range of -40 to +70 ensures optimal performance for diverse applications.

**Enquiries: Brandon Topham.**  
Email [brandon.topham@retautomation.com](mailto:brandon.topham@retautomation.com)



## Intuitive data management for Process Analytical Technology

**Siemens** is innovating its data management software for Process Analytical Technology (PAT) with Simatic Sipat version 5.0, which allows users to monitor and control the quality of their products in real-time during manufacturing. The latest version features a new configuration concept that further increases user friendliness and shortens



implementation time. Moreover, the new Dynamic Data Alignment (DDA) optimises data management for continuous manufacturing. The main applications of Simatic Sipat 5.0 are in the pharmaceutical, food & beverage and fine chemicals industries.

The new configuration concept offers an immediate graphical insight into the functionality of a Simatic Sipat method. On the instrument level, preconfigured PAT IDs can be applied. These can simply be selected during method creation, allowing fast and easy method setup. Configuring new methods is straightforward and can be done in just a few minutes. All linking processes (e.g. between collected data and calculations) can easily be performed using what are known as 'wizards'. These new features allow the end users to work more quickly, reduce the training input required and speed up implementation within the organisation.

For continuous manufacturing processes, the ability to combine the right pieces of information when making quality decisions is vital. This means that data collected from different locations along the production line at different time intervals must be combined with each other to arrive at the correct product quality.

**Enquiries: Jennifer Naidoo.** Email [jennifer.naidoo@siemens.com](mailto:jennifer.naidoo@siemens.com)

## New range light curtains – easy to install, use, maintain

**Omron Electronics South Africa** recently introduced the new F3SG-R range of safety light curtains which combine torsion-resistant construction to guarantee easy alignment with a troubleshooting function based on QR codes. The new light curtains are available in two versions, the easy F3SG-RE for simple on/off detection applications and the advanced F3SG-RA for more versatile safety solutions.

Both versions can be supplied as finger detection types, with a detection capability of 14 mm, or as hand detection types, with a detection capability of 30 mm. Protective heights up to 2 080 mm are offered for finger detection types, which have

a maximum range of 10 m, and up to 2 510 mm for hand detection types, which have a maximum range of 20 m.

F3SG-R light curtains have an IP67 ingress protection rating and are built to withstand wash-down and dusty environments. They feature exceptionally rigid construction that eliminates problems of top-to-bottom twisting and makes setting up fast and straightforward. As a further aid to setting up, they incorporate optical synchronisation, which makes it unnecessary to use wiring between the emitter and detector.

**Enquiries: Tel: 0860 OMRON1 (667661)**  
or email [mitchel.boyd@eu.omron.com](mailto:mitchel.boyd@eu.omron.com)



## Plug and play solution makes flow monitoring easy

The compact plug and play EGE SNS 450 thermodynamic flow sensor provides ease of flow monitoring with low maintenance benefits.

According to Gerry Bryant, Managing Director of **Countapulse Controls**, sole southern African agent for EGE's full range of flow sensors and controllers, the innovative screw-in adapter on the EGE thermodynamic flow sensor allows for universal use in a variety of applications.

The adapter is screwed into a T-piece or a welding sleeve and the probe is then secured in this adapter using a union nut. Users are reassured of the integrity of the connection, which is sealed up to 100 bar.

The EGE sensor, which includes an LED display for ease of use, can function in temperatures from between minus 20 to plus 80°C and is suitable for controlling the flow of fluids such as water, glycol mixtures and chemicals. Ingress protected to IP67 standards the design of the sensor, which features no moving parts, is focused on elimination of failure that would typically be caused by oxidised bearings, torn impellers or deflector deformation.

With a robust construction the EGE flow sensor is resistant to corrosion and is ideal for use in both liquids and air, as well as in hazardous environments. "This is a welcome addition to the Countapulse Controls product line-up and complements the company's existing range of sensing solutions; all geared around reliability and longevity combined with uncompromising accuracy," says Bryant.

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



## White paper previews future CC-Link IE and PROFINET interoperability

A white paper announcing new possibilities for interoperability between **CC-Link IE** and **PROFINET** predicts simpler control network infrastructures that should be of interest to machine builders and end users operating on a global basis. The paper, entitled Transparent Network Infrastructure between CC-Link IE and PROFINET, can be downloaded from <https://www.cc-link.org/eng/news/151201.html>, the website of the CC-Link Partners Association (CLPA). It has been produced jointly by the CLPA and Profibus and PROFINET International (PI). Open networks make it easier for industrial equipment from different manufacturers to communicate over the same control systems, so will be vital for achieving the high speed, high volume data transfer rates required for productive and efficient I4.0 and IIoT manufacturing. Presently there are many different communications protocols and standards, many of which are incompatible with one another.



Through their cooperation, the CLPA and PI aim to enable transparent and easy bi-directional communication between CC-Link IE and PROFINET equipped machines, systems and devices through standardised interfaces. The cooperation was announced in November 2015 and the white paper lays out a development timeline that predicts product implementation in 2017. A working group has been formed to create the specifications that will define how this interoperability will be implemented and the target is to complete this by November 2016.

Download the paper: <https://www.cc-link.org/eng/news/151201.html>

**Enquiries: Email [anne-marie@dmaeuropa.com](mailto:anne-marie@dmaeuropa.com)**

*Professor Dr. Fumihiko Kimura, CLPA Chairman and Karsten Schneider, Chairman, PROFIBUS.*

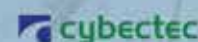
## SUBSTATION AUTOMATION, METERING AND SCADA



WoodBeam substation communication solutions simplify substation integration and automation, providing the utility with :

- NERC CIP compliant security
- System wide device automation and integration
- Automatic event file retrieval
- Remote control and engineering management passthru
- Protocol translation
- Data concentration and distribution
- Industrial Ethernet LAN
- Substation SCADA
- Metering and energy management

The solution allows you to build a comprehensive communications infrastructure that is fully integrated, delivers maximum reliability and improves service quality.



## WoodBeam

P O Box 526 Modderfontein 1645  
 Tel: +27 (11) 457-1600 (0861 966 323)  
 Fax: +27 (11) 608-1016  
 email : [info@woodbeam.co.za](mailto:info@woodbeam.co.za)

# Utilising hazard studies in plant safety

Willie Coetzee, Auctus Holdings and Chris Potgieter, BFluor Chemicals



Hydrofluoric acid plant (major hazardous installation) in Runcorn, United Kingdom.

*The benefits of hazard studies can be realised in existing plants when process modifications are contemplated.*

**H**azard studies are useful tools in the design of safe and operable processing plants. More often than not the information from a Hazard study never reaches operational and maintenance personnel and subsequently understanding of design rationale is typically not transferred to these colleagues.

Apart from using the hazard studies to identify and mitigate risks, the information originating from the hazard studies can therefore be used as the basis of further and new training requirements for operator skills development and plant safety training.

These inputs should also be incorporated into all of the engineering information, including PFDs, P&IDs,

”

*The HAZOP is an iterative process that relies on the accuracy of the information presented to the HAZOP team during the process.*

operating instructions, etc. to ensure that the end user of the facility has all the information required to operate the facility safely in a structured and understandable format.

In order to fully utilise the information and know-how originating from hazard studies, this information should be readily accessible and easy to understand.

Advanced HAZOP tools can be used to create simple, structured and easily transferable reports and information summaries that ultimately empowers facility operations and maintenance personnel to maintain a safe working environment. By implementing HAZOP software reports can be optimised to keep record of

- AHF – Anhydrous Hydrogen Fluoride (AHF)
- HAZOP – Hazard and Operability Study
- HF – Hydrogen Fluoride
- IBC – Intermediate Bulk Container
- PFD – Process Flow Diagram
- P ID – Piping & Instrumentation Diagram
- SIS – Safety Instrumented System

## Abbreviations/Acronyms

'non-issue' items raised during the review, but not include these items in the information incorporated into operator training and plant operational manuals.

### Case Study - Metal fluoride salts plant

A pilot scale facility was designed for the production of a transition metal fluoride salt within the boundaries of a larger production complex. When designed, the plant consisted of a raw material storage area, a solution make-up area, the salt production area, product handling area and final product storage. However the required market for the metal fluoride salt product that the plant was designed for was never secured, and the facility was subsequently mothballed. Subsequent to the mothballing, some of the equipment installed on this plant has been removed for utilisation in other processes in the larger production complex.

This mothballed facility has been earmarked to be utilised for metal fluoride salts production by BFluor (a different metal fluoride salt than it was originally designed for). In order to utilise this pilot plant for this product, the plant must be de-mothballed and refurbished, as well as a redesign with relation to some portions of the facility. Due to the deviation from the original design intent of the process, several constraints are imposed by the current design with relation to the new process. Significant retrofitting and process modifications are therefore required to ensure that the facility is able to meet the BFluor process' intent.

### Brief process description

Raw materials for the production of the metal fluoride salt include: metal oxide, Anhydrous Hydrogen Fluoride (AHF), water and a base solution. The metal oxide powder is stored in a storage hopper in the raw materials storage area. The AHF is stored in a 100 m<sup>3</sup> tank with 20% freeboard. The demineralised ('demin') water is supplied from the water supply pipeline. The base is a powder (used to make up the base solution) stored in a storage hopper.

The first stage of the process is the make-up of the solutions required in the process, a 70% HF solution and a 20% base solution. The HF dilution occurs in the HF dilution tank (a polypropylene tank) while the base solution make-up is done in two separate make-up tanks (polypropylene tanks).

The metal fluoride salt reaction occurs in two vessels. In the first, the metal oxide powder is dissolved into the 70% HF to produce a metal fluoride acid. This in turn is reacted with the base solution in the next reaction vessel to form the metal fluoride salt. Subsequent

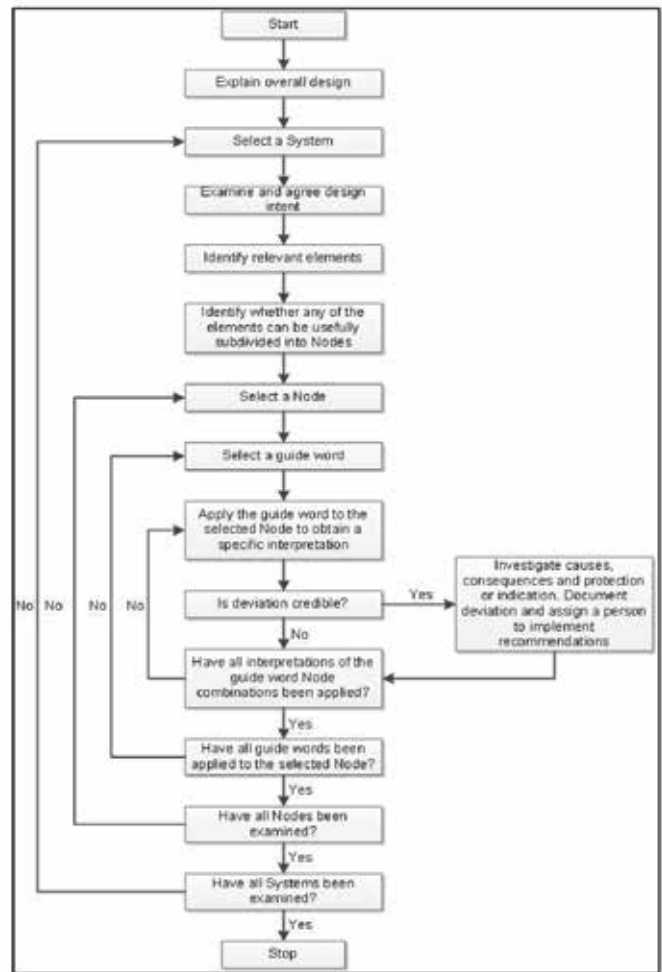


Figure 1: Typical HAZOP Methodology as adapted from IEC-61882.

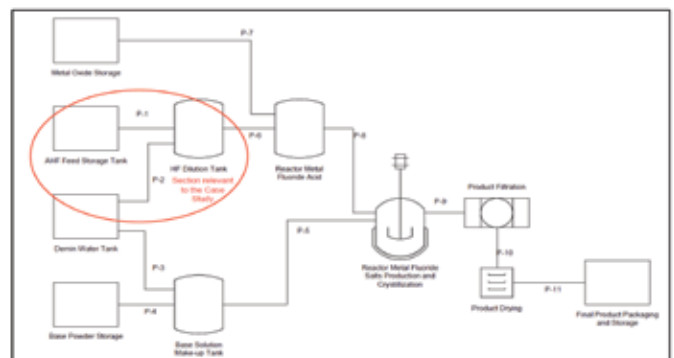


Figure 2: High level block flow diagram.

to the synthesis of the metal fluoride salt solution, the same vessel is used to crystallise this solution to obtain the final solid metal fluoride salt product. The last stage of the process is the product handling. The solid metal fluoride salt is filtered and then washed and dried before being stored in the final product silo, from where it is packaged and warehoused before being distribution.

### Process design analyses and safety optimisation

In the production of a metal fluoride salt, anhydrous hydrogen fluoride (AHF) is used as a raw material. HF is required as a 70% HF solution to digest the metal oxide powder, and thus dilution of the AHF is required. In the process described, the AHF is transferred via the AHF transfer pipeline (MFS-0102-PL-001), from the AHF storage tank (MFS-0102-TK-001) to the HF dilution tank (MFS-0102-TK-002) for dilution to a 70% HF solution.

AHF is a volatile substance and is extremely toxic. It has a flash point of around 16°C at ambient conditions in the Highveld of South Africa. The aforementioned necessitates that the AHF be stored either under pressure (old method) or at low temperature (modern method). In the instance of an AHF release to the environment, at conditions where the temperature is higher than 16°C, the AHF will flash off and form a toxic vapour cloud (based on Highveld ambient atmospheric pressure).

### Basic control philosophy

For the dilution of AHF to 70% HF, the most important thing to control is the temperature of the dilution tank. This is done in this plant by means of feed ratio control of the two feed streams into the HF dilution tank, the AHF feed stream and the demin water feed stream. The temperature of the AHF feed stream from the chiller's product side controls the flow rate of the chilled water through the chiller. In the case of a rise in temperature in the HF dilution tank, there is a Temperature Alarm HIGH followed by a Temperature HIGH HIGH trip on the tank, which immediately shuts off the AHF feed stream into the reactor.

Similarly in the case of over filling in the HF dilution tank, there is a Level HIGH HIGH Trip on the tank, which first shuts off both the AHF feed stream and then the demin water feed stream into the reactor.

### Hazard Studies

During the decommissioning process, a design review of the Metal Fluoride Salts pilot production plant was done. This included the compilation of engineering design diagrams and process descriptions. As well as the review of the plant safety and operability in the form of a HAZOP study. During the HAZOP study the following recommenda-

tions were made in order to guarantee a safer plant design for the production of the metal fluoride salts:

- Include a high level alarm on the AHF feed storage tank
- Include a low level trip on the AHF transfer pump
- Install a plant trip on chilled water failure
- Include a vent line from the HF dilution tank to the vent gas scrubber system
- Cool the demin water feed to 10-15°C
- Include bunds in all areas that handle HF (separate bunds for each area)
- Include containment of all HF containing equipment/tanks (and investigate the best method of containment)
- Include a HF vapour knock-down system in all HF containing areas (either a water or a foam spray system)
- The high temperature trip on the HF dilution tank should trip at a temperature above 15°C
- Investigate the inclusion of a dilute HF analyser on the 70% HF feed from the HF dilution tank (with an alarm)
- Install HF detection in all areas with HF (with a high level system trip) {AHF storage, transfer pipelines, AHF chiller, HF dilution and vent gas scrubber system}
- Install automated block valves in the AHF feed line and include a high flow trip on the block valves
- Determine the optimum position for the control valve FV-001 in the AHF transfer line
- Include an empty emergency tank
- Include a trip on the AHF transfer pump in the event of pipeline rupture
- Include a high temperature alarm on the temperature indicator in line MFS-0102-PL-004 and investigate the addition of HF detection in this line
- Include HF monitoring on the vent gas stack
- Investigate the addition of an interlock system on the isolation valves

Using the method as described where the HAZOP study and SIL review is done in conjunction with each other, a SIL review was conducted after the HAZOP was completed and included the members of the HAZOP team. This SIL review considered HAZOP items where consequences were identified and trips were either already included or recommended during the HAZOP study.

Safety Instrumented Systems (SIS) were evaluated based on the design and recommendation originating from the HAZOP and mostly produced SIL ratings of 2 and below, with the exception of one system (on the high concentration of HF in the plant area trip) where a SIL rating of 4 was identified, which is deemed to be unacceptable and



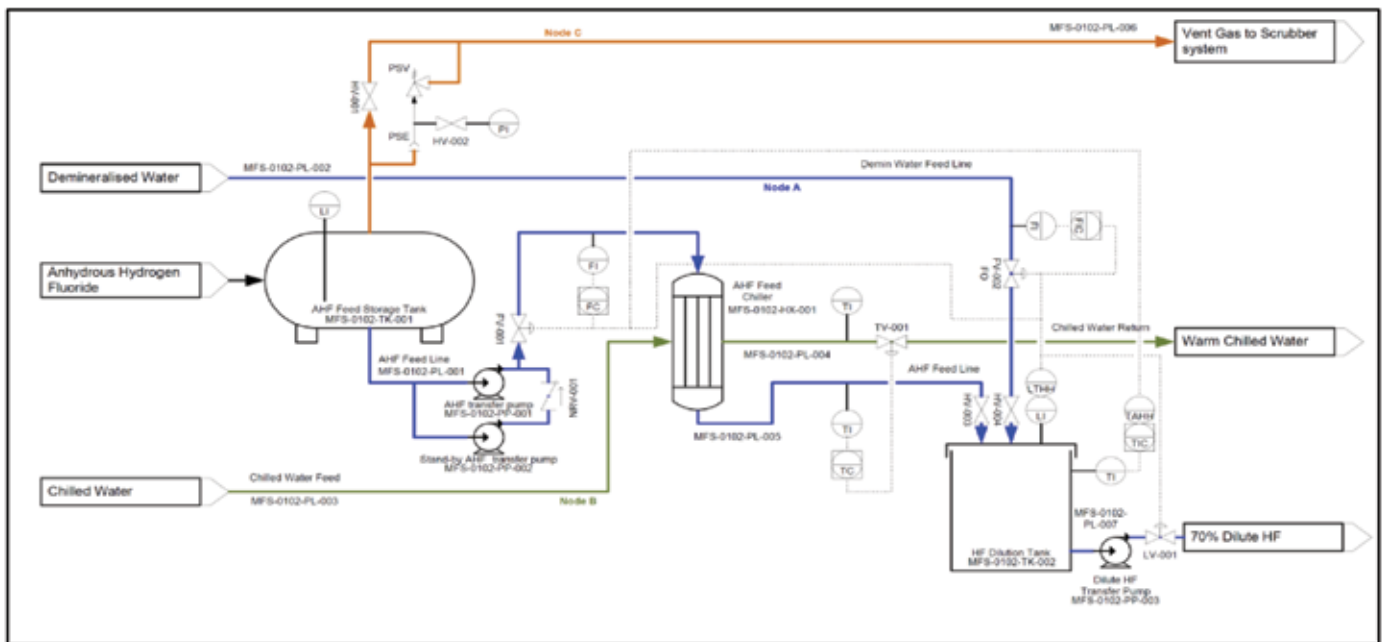


Figure 3: Basic P&ID for the HF transfer and dilution system.

subsequently triggered a review of the process design. A subsequent Inherently Safer Design (ISD) review was conducted to re-evaluate the possibilities of improving the process design to increase the amount of Independent Protection Layers (IPLs).

### Inherently safer design review

The principles of Inherently Safer Design are:

- Minimise
- Substitute
- Moderate
- Simplify

These principles were applied in the critical review of the Metal Fluoride Salts plant. The review was completed on the P&ID diagrams that had been updated with the recommendations from the HAZOP study and the SIL review. This diagram for system 2, the HF dilution area can be seen in *Figure 4*.

The AHF feed storage tank is the only point in the system where minimisation could be effective. This is also the point of greatest risk as the major process incident that can occur on this section of the plant is that of loss of containment of AHF, which would be catastrophic in no uncertain terms. AHF containment loss could occur either through tank rupture or full bore pipeline rupture. This tank has been sized for five days' worth of feed material.

The main questions:

- Can this volume be reduced (minimised) without having a negative consequence on the production capacity of the plant?
- Would such a reduction in the tank volume have a noticeably positive effect on the facilities inherent risk?

Several options were considered, however by implementing a structured approach it was determined that the most practical and feasible solution in terms of process and plant safety would be to utilise the AHF IBC (Intermediate Bulk Container) as the AHF feed storage tanks. By doing this it is ensured that there is a loading bay designed with all the relevant safety systems (bundled and contained with a spray system to knock down vapours) and this loading bay is connected to the process via a loading arm that could be coupled to the AHF IBC. A second IBC of AHF would be onsite and ready to be connected at all times to ensure process continuity. The empty IBCs would be returned to the AHF supplier for refilling.

As was recommended in the HAZOP study, an empty emergency tank would also form part of the AHF feed system and would be large enough to contain the entire volume of a full IBC while maintaining sufficient free board space, as defined in the original design.

The collective effect of these changes is that the SIL rating required for the specific SIS was lowered to within an acceptable limit, thereby reducing the dependency of the facility on a SIS and empowering the operation personnel to operate their facility safely.

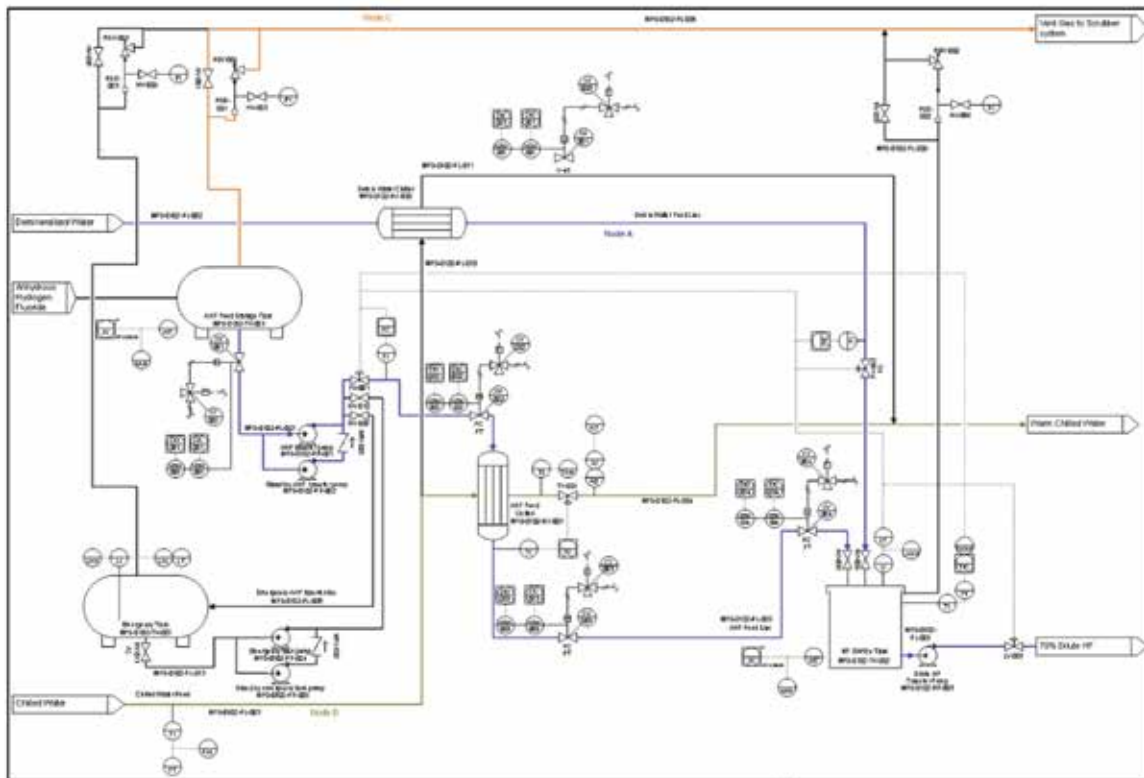


Figure 4: Basic P&ID for the HF transfer and dilution system including first round HAZOP and SIL recommendations.

## Conclusion

Hazard studies are not immune to human failure due to their nature and the nature of the humans doing the studies. This opens up the possibility for critical design flaws to be overlooked in the Hazard study process resulting in a design which is either critically flawed or is not inherently safe. This said, HAZOP and SIL studies remain an effective means of identifying and mitigating process design flaws and inherent safety risks. Advanced Hazard study tools/systems can be used by a skilled facilitator to further enhance the value of such studies and streamline the process to mitigate the possibility of human failure occurring due to the inherent failures of the HAZOP and SIL process.

The two questions that we are still faced with are:

- How do we keep human discretion in the HAZOP process, whilst eliminating the human factor (the impact of human failure)?
- How do we ensure intact transfer of the complete details of the safe design and design intent over to the operating personnel, especially in the long run?

## Acknowledgement

This topic was presented at the Safety Control Systems & Hazardous Areas Conference 2015 held in Midrand, Johannesburg (organised by IDC Technologies). The authors thank Pamela Prinsloo (BFluor Chemicals) and Neels Welgemoed (Quadro Chemicals Engineering) for their contribution to the paper and presentation.

- Hazard studies are useful tools in the design of safe and operable processing plants.
- Information from hazard studies can be used to identify and mitigate risks and to further requirements for plant safety training.
- Hazard studies are not immune to human failure owing to human error.

take note



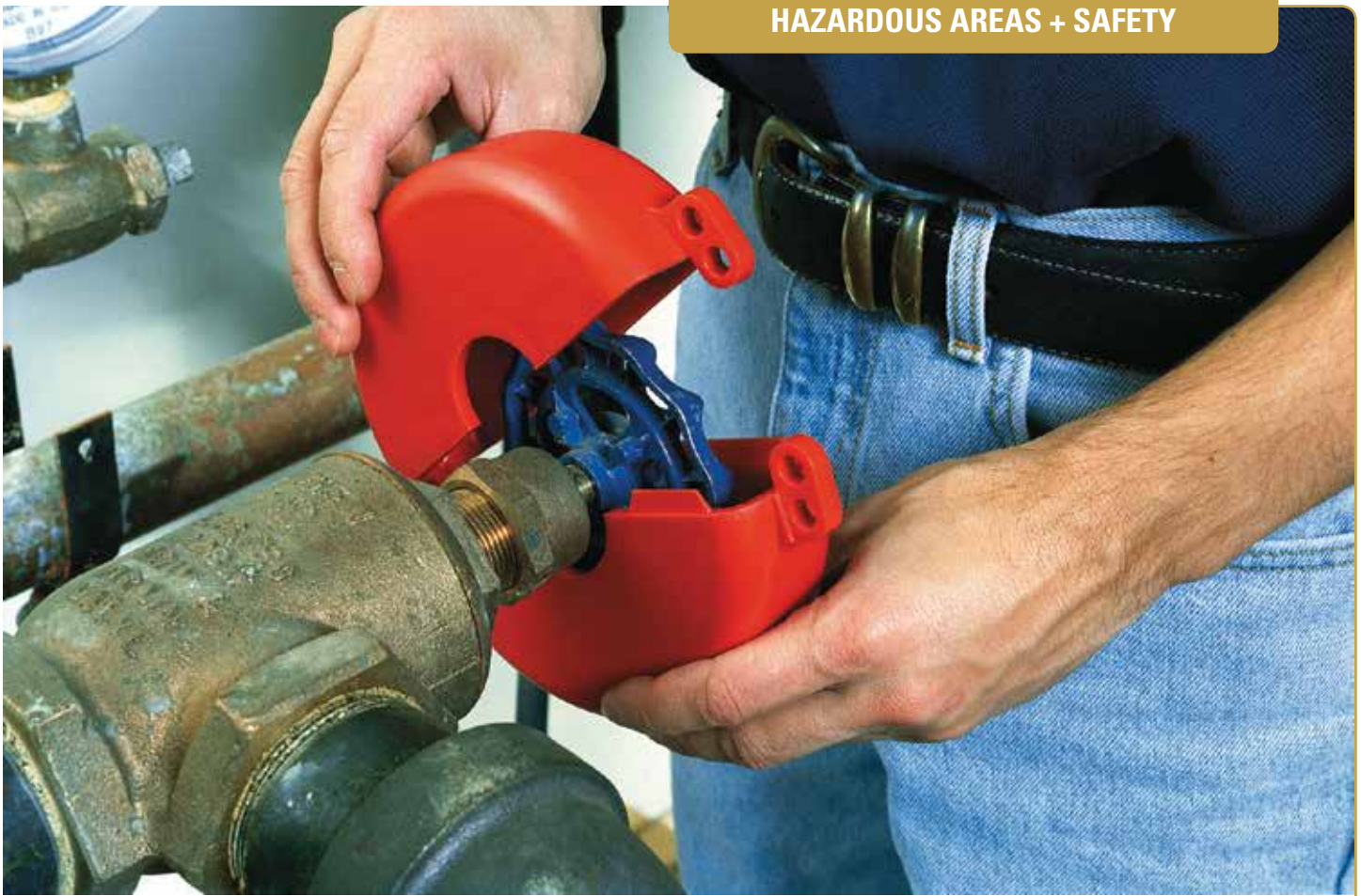
Willie Coetzee started his career at Sasol Technology and soon headed a major technology development project in the Sasol Secunda Clean Fuels environment. In 2013 he joined CDE Process where he assumed the lead engineering role on an R2 billion, UCG to Energy project. Currently Willie is the founder and managing director of

Auctus Holdings and has recently established TerraServ, a company wholly dedicated to turning waste to useful products.



Chris Potgieter started his chemical engineering career in the SA nuclear and fluorochemical industry in the '80s. His experience as member of the Applied Fluorine Engineering Group and success as project leader in hazardous chemical process development and the associated market development of hydrofluoric acid utilisation plants triggered

his interest in hazardous chemical process technology commercialisation. Over the past 20 years Chris has honed his skills in building sound revenue streams for upstart businesses and growing strong relationships with key stakeholders like the environmental authorities. Chris established BFluor Chemicals in 2007. Enquiries: Email [chris@bfluor.co.za](mailto:chris@bfluor.co.za)



# Understanding Lock Out/ Tag Out procedures

Hayley Arnesen, North Safety Products

*At any given time in South Africa, three million workers are exposed to the hazards posed by volatile energies such as electricity, gas, fluids or steam, which are contained in various types of machinery undergoing routine servicing and maintenance.*

**C**raft workers, electricians, machine operators, and labourers are injured and even killed on the job from exposure to hazardous energy. The most effective means of minimising these risks is by securing and controlling the energy sources with an effective Lock-Out/Tag-Out (LOTO) system.

A LOTO system prevents the unexpected start-up or release of stored energy by securing a padlock to a clamp in order to lock the machine being serviced or maintained. After being locked, a tag is placed on the machine to indicate that it should not be turned on.

LOTO systems are used in industry and research settings to ensure that dangerous machines are properly shut off and not started up again prior to the completion of maintenance or servicing work, in order to avoid danger.

An industrial machine may contain hazards such as hot fluids, moving presses, blades, propellers, electrical heaters, conveyor belts with pinch points, moving chains and ultraviolet light, to name a few. The lack of a LOTO system, or improper handling of the system, may result in injuries that include electrocution, burns, crushing, cutting,

laceration, amputation, or fracturing of body parts. The unexpected start-ups can also cause extensive damage to the machinery itself, adding to the expense of equipment repairs and replacement to the total cost involved. Disconnecting or making the equipment safe involves the removal of all energy sources and is known as isolation. The isolation procedure generally includes the following tasks:

- Announcing the shut-off
- Identification of the energy source/ sources
- Isolation of the energy source/ sources
- Locking and tagging of the energy source/ sources
- Proving that the equipment isolation is effective

After informing employees of the LOTO procedure, the equipment due to be repaired or serviced must be at a zero-energy state before any work can be undertaken. This procedure starts by locating the energy source. It is vitally important to identify the true source of energy and to locate backups such as generators. A flow diagram or schematic often assists in tracing energy to the source.

- Unexpected machine start-ups can cause severe injury to operators and extensive damage to equipment.
- LOTO systems ensure that dangerous machines are properly shut off and not restarted before completion of maintenance and servicing.
- A good LOTO system consists of clearly labelled energy sources, easy-to-follow procedures, and lock-out tools that ensure quick service and maintenance activities.



The equipment should be turned off at its main source, which is either a circuit breaker, mains connection, air or hydraulic line, for example. It is important to bear in mind that there may be more than one shutdown point, and all of these should be turned off. The next step is to place a special lockout device on each source of energy, and to attach a tag to each lockout device so that employees are aware of the situation.

Equipment may contain stored or potential energy that could cause harm – this should be released or blocked. After following these procedures, test for zero energy by trying to start the equipment. LOTO doesn't end when repair work is complete, and inspections must be done before starting the equipment up again. The site should be inspected for tools and parts that may be lying around on the floor or machinery, and equipment controls must be in the off or neutral positions, before the locks and tags are removed by authorised personnel only. Locks and tags should be returned to designated areas and employees should be notified that the equipment is being powered up again.

## Group Lockout

When two or more workers are working on different parts of a larger overall system, the locked-out device is first secured with a folding scissors clamp that has many padlock holes capable of holding it closed. Each worker applies their own padlock to the clamp. The locked-out device cannot be activated until all workers have signed off on their portion of the project and removed their padlock from the clamp.

A lock selected by colour, shape or size is used to designate a standard safety device, locking and securing hazardous energy. No two keys or locks should ever be the same. A person's lock and tag must not be removed by anyone other than the individual who installed the lock and tag unless removal is accomplished under the direction of the employer.

Trained personnel should always manage the LOTO system. For instance, if a steam valve automatically gets turned on, it might burn the workers who are repairing a downstream connection in the piping. Another scenario is the sudden release of a jammed conveyor system, which can result in the crushing of workers, if not properly managed.

It is the responsibility of the employer to develop and implement an energy control procedure that provides authorised and affected employees with the same level of protection as a personal lock-out or tag-out device. A good LOTO system consists not only of clearly labelled energy sources and easy-to-follow procedures, but also quality and accessible lock-out tools to ensure smooth and quick maintenance and servicing activities.



*A LOTO system prevents the unexpected start-up or release of stored energy by securing a padlock to a clamp in order to lock the machine being serviced or maintained.*

## Types of padlocks

Lock-out padlocks are available in nylon, aluminium, steel and brass body options. Nylon body padlocks are best-suited to electrical applications, due to the non-conductive properties of the material. Temperature and corrosion-resistant aluminium body padlocks are ideal for high-temperature outdoor applications up to 580°C.

Owing to their strong physical resistance characteristics, steel body padlocks are designed for severe physical environments, while spark-resistant brass body padlocks are ideal for use in flammable applications. The range of padlocks described feature shackle diameters ranging from 4,7 mm to 7 mm, and have shackle heights ranging from 20 mm to 75 mm.



*Hayley Arnesen has had over 16 years of experience in the safety industry. Her experience has been diverse spanning many industries and functions. She currently works for North Safety Products Africa as Exports Manager. Enquiries: Tel. +27(0)11 974 7062 or email harnesen@northsafety.co.za*

## Pilot electronic signalling contract for Transnet Freight Rail completed

**ACTOM** Signalling recently completed a pilot electronic interlocking contract for Transnet Freight Rail (TFR) that encompassed provision of a system for a single existing station. The validation process also required a simulated 'validation station' containing the full scope of permutations for electronic signalling systems.

ACTOM Signalling has developed and installed an electronic system designed specifically for Crescent station, situated near Potchefstroom station in North-West Province on the line to Klerksdorp, while the validation station simulation it has developed as part of the pilot contract serves as a master model for all other stations TFR may assign to the business unit to design and provide electronic interlocking systems for in future.

The multi-million rand contract was awarded in mid-2014 and the system at Crescent was completed and commissioned in September 2015. "The Crescent system

will be monitored by TFR prior to granting full and final approval of the interlocking system," said Peter Colborne, ACTOM Signalling's General Manager.

The core of the electronic interlocking system is Alstom's integrated Vital Processor Interlocking (iVPI), a product that was initially developed for the North American market but has been applied in more than 16 countries. ACTOM developed the hardware and software interfaces to all the trackside equipment and the CS90 remote control system.

"Our engineering configuration program, called Engineering Configuration Tool (ECT), has the capability to automatically generate interlocking equations for individual stations according to their specific layout and signalling requirements," Colborne explained.

This custom-designed engineering configuration tool, developed in-house by ACTOM Signalling, is an extra layer of software that utilises the programming tools

developed by Alstom. It is programmed to apply TFR's HR97 interlocking rules to the required station layout.

**Enquiries: Peter Colborne. Tel. 011 871 6600 or email peter.colborne@actom.co.za**



ACTOM Signalling's Frans Badenhorst (left), Application Engineer, and Leon Pienaar, Senior Development Engineer, with the newly-installed electronic interlocking system in Crescent station's relay room.

## Analytical measuring points – 100% signal integrity

The new Liquiline To Go CYM290/CYM291 multi-parameter handhelds for pH, conductivity and oxygen measurement, bring reliability and safety directly to the sample point. The portable instruments guarantee stable measuring values and easy control of measuring points in all environmental conditions.



Whenever and wherever a pH, conductivity and oxygen value needs to be controlled **Endress+Hauser's** Liquiline To Go meters provide correct values with 100% signal integrity. They are equipped with Memosens technology that converts the sensor values into a digital signal and transmits it interference-free. The result are reliable measuring values with which the user can take correct and appropriate actions fast to keep the process running under optimal conditions.

Grab sample analysis with different technologies as installed in the process, often leads to inconsistencies and measurement discrepancies. Liquiline To Go handhelds allow the use of the same robust Memosens

sensors as in the process. This guarantees a full data consistency between lab and process measurements and maximises the reliability of the grab-sample results. Both Liquiline To Go versions can be used in the most challenging environments. The robust housing with ingress protection to IP66/67 brings a large improvement for the safety in many process industries. A fast control of measurement values directly at the sample point is now possible, with a minimised risk of sample contamination. In addition to the CYM290 version, the CYM291 with ATEX/IECEX certification allows process control also in hazardous areas.

**Enquiries: Jan Swart. Tel: 27 (0)11 262 8000 or email Jan.Swart@za.endress.com**

## Safer energy distribution

**Prolec-GE** today announced the expansion of its eco-friendly offering with the launch of the new VG-100 Natural Ester Fluid (VG-100). Derived from vegetable sources, VG-100 is a 100% biodegradable dielectric coolant with a high flash point that represents a safer alternative to the conventional mineral oil that is used in transformers.

Mineral oil is commonly used in transformers to keep the core and coil cool, but unexpected power surges can cause overheating, creating a fire hazard, leaving houses and businesses vulnerable to power outages. VG-100 has a higher flash point than mineral oil, which reduces fire risks, making electricity distribution safer and more reliable. Completely natural and non-toxic, VG-100 helps customers prevent potential damage to the environment in the

event of leaks or spills. This fluid also has the ability to draw out moisture from paper, increasing the lifetime of the transformer's cellulose insulation. In addition, its self-extinguishing and high flash point (>300°C) feature help improve fire safety. Formulated using a proprietary process, this 100% biodegradable dielectric fluid does not contain any synthetic antioxidant, sulphur or petroleum-based compounds. VG-100 complies with international standards such as IEEE, Factory Mutual and Underwriters Laboratories. It is patent-granted for use in new electrical transformers or to replace mineral oil in existing transformers.

**Enquiries: Patric Rayburn and Julie Khoo. Email Grid.MediaRelations@ge.com**

# Tips for mitigating harmful harmonics

John Mitchell, CP Automation

*Facing a lack of awareness, the industry has struggled to implement effective mitigation techniques for harmful harmonics.*

*These are a few useful tips.*

**T**he rise of non-linear loads in industrial environments over the last two decades has resulted in the growing problem of harmonic currents and utility-level voltage distortion.

Voltage distortion, caused by current harmonics, can wreak havoc in a plant, its equipment and the mains power supply. Damage can be serious and varied with the most common symptoms including voltage notching, motor vibration, arcing on bearings, nuisance tripping, Electromagnetic Interference / Radio Frequency Interference (EMI/RFI) and overheating.

The very first place to start is to ensure you comply with regulations. International harmonic control requirement, IEEE-519 [1], limits *'the maximum frequency voltage harmonic to 3% of the fundamental and the voltage Total Harmonic Distortion (THD) to 5% for systems with a major parallel resonance at one of the injected frequencies'*. Some form of filtering is subsequently recommended.

We are fortunate, in the United Kingdom, to have a stiff power grid, but this is not true everywhere. Developing countries often are not as lucky. Weak grids with an unreliable supply and inadequate infrastructure are common in other parts of the world. The power ratings on products are often based on calculations performed in ideal conditions. Buyers would be wise to note that these products may perform adversely in weak grids and may not perform to IEEE-519 [1] standards in these conditions.

Remember to always stay on your toes. The last few decades have seen a rise in the use of non-linear loads such as transistor based Variable Speed Drives (VSDs) and line commutated dc drive systems. The processes of high frequency switching and Pulse Width Modulation (PWM), introduce unwanted multiples of the fundamental 50 Hz frequency in the form of harmonics. Knowing what options are available to you can help the overall efficiency of the harmonic mitigation process.

Passive and active harmonic solutions can be installed in both series and parallel (shunt) configurations within a system. Series solutions operate in line with the load, meaning that units must be sized for the full current load. Shunt units can be sized only for the harmonic

disturbance. There is a clear decision to be made between series-passive, shunt-passive, series-active and shunt-active solutions.

## Series-passive

The most straight forward series-passive solution can be achieved using a line reactor. This is a low cost way to reduce current harmonics, whilst adding a level of protection to the rectifier.

## Shunt-passive

Shunt passive is power factor correction, often using fixed capacitor banks, tuned and detuned contactor based units, thyristor capacitor banks and fine tuned passive filters. These methods were principally developed to resolve reactive power and not specifically for harmonic mitigation. Today, I would hope no one is installing capacitor banks by themselves and, at the very least, using de-tuned ones – with an inductor for example.

## Series-active

Series-active takes the form of an AFE VSD. It replaces the rectifier diodes in a regular VSD with an IGBT controlled rectifier to eliminate switching based signal noise.

AFEs are great at significantly lowering THD and maintaining good power factor. However AFEs have some serious drawbacks. In order to maintain a small form factor, lower switching frequencies are used, which result in high switch ripples on the voltage waveform. This can cause other sensitive equipment like Programmable Logic

”

*Voltage distortion, caused by current harmonics, can wreak havoc in a plant, its equipment and the mains power supply.*

- Harmonics remains a problem in modern electrical networks.
- Filtering is a viable solution - but you need to know exactly what harmonics problem you are dealing with.
- Active filtering provides the most efficient harmonic compensation.



take note

|      |                                     |
|------|-------------------------------------|
| AFE  | – Active Front End                  |
| EMI  | – Electromagnetic Interference      |
| IGBT | – Insulated Gate Bipolar Transistor |
| PLC  | – Programmable Logic Controller     |
| PWM  | – Pulse Width Modulation            |
| RFI  | – Radio Frequency Interference      |
| THD  | – Total Harmonic Distortion         |
| VSD  | – Variable Speed Drive              |

## Abbreviations/Acronyms

Controllers (PLCs) and telemetry and communications networks to nuisance trip and malfunction. In addition, although this unit may at first seem to eliminate harmonics, it must be noted that with the AFE in addition to the VSD, there are now two drives in the circuit producing twice the heat. This means twice the heat and, with a 200 kW AFE, it soon adds up. For the panel builder/ system integrator, bigger cooling systems are needed to cope with the excessive heat.

### Shunt-active

Active filters provide the most efficient harmonic compensation in a compact unit that has little loss, is insensitive to grid conditions, cannot be overloaded and is easy to retrofit. All of this comes at a slightly higher cost, which is offset by the better return on investment over the longer term.

### Conclusion

Understanding the often subtle differences between various harmonic filtering technologies can yield better cost savings, reduce complexity and prolong equipment life. Getting your head around what options are available really is worth it in the long run.

### Reference

- [1] IEEE-591. 1992. Recommended practices and requirements for harmonic control in electrical power systems.



John Mitchell, is global business development manager at CP Automation. He has experience in engineering, marketing and sales across major industry sectors.  
Enquiries: Email [john.mitchell@cpaltd.net](mailto:john.mitchell@cpaltd.net)



**Contact us:**

**Telephone**  
+27 11 621 0000

**E-mail**  
[sales.za@wika.com](mailto:sales.za@wika.com)



**PATENTED  
PRECISION**

INDUSTRIAL   PROCESS   HYGIENIC   **CALIBRATION TECHNOLOGY AND SERVICE**

### THE MEASURE OF ALL THINGS

We set standards in calibration technology.

Whether the on-site service of your equipment for a safe audit or a fully automatic calibration system: We offer a comprehensive spectrum of products and services - and thus also the right solution for your requirements. In our portfolio you will find established brands and high-quality instruments, with tried and tested functionality, in all accuracy classes and with different levels of automation. [www.wika.co.za](http://www.wika.co.za)

# Industry **must** maintain transformers

Andre Man, WEG Transformers Africa (division of Zest WEG Manufacturing)

*Transformers have often been referred to as the most efficient pieces of equipment developed by mankind and, as this apparatus has limited moving parts, most individuals believe it to be maintenance free.*

**T**here could be nothing further from the truth. Achieving optimum performance and a long functional life from this essential asset is contingent on having a comprehensive preventative maintenance and service strategy in place.

Preventative maintenance of transformers is critical not only from an operational reliability perspective but also because a well-structured maintenance programme will significantly extend the life of the transformer. In most cases it is not inconceivable for a well-maintained transformer installation to have a lifetime that outstrips that of an average human – and this could be between 40 to 50 years.

## Custom support programmes

WEG Transformers Africa (WTA) (referred to in this article as the Company) offers a suite of support services for its transformers customer base and these include preventative maintenance programmes that can be structured to accommodate customer needs and budgets. It is most important for customers to do an initial assessment of the transformer installation as this will allow a base line to be verified; and following any corrective action a customised support programme can be implemented to ensure the optimum reliability of the transformer.

”

*The company has a fully-fledged oil sampling laboratory at its facility in Heidelberg.*

During a preventative maintenance assessment, the Company's team of skilled technicians will rate the transformer according to the application in which it is being used. Following this, a needs-based maintenance strategy is implemented with the objective of reducing the probability of transformer failure. The Company is able to provide verifiable reporting on the condition of the transformer using oil sampling, analysis and thermal graphics surveys, all of which meet international quality standards reporting requirements and are accepted by most insurance. The maintenance strategies are customised for each installation to track the asset condition and enable verifiable reporting on performance degradation. Preventative maintenance can provide an early warning mechanism as it provides crucial information that could facilitate an early intervention with major servicing or even component replacement.

## On-site preventative maintenance

Transformer oil sampling is carried out by skilled individuals to ensure accuracy and reliability. The manner the sample is taken is critical to the result and sampling tins are only used once to avoid cross contamination. When drawing the oil sample, the sampling technician will also do a visual external inspection of the transformer against a checklist as this will pick up any physical issues with the transformer. Evidence of leaks or a change in colour of the silica gel will be a clear indication that there is moisture ingress. The general condition will also give an indication of corrosion. In addition to the visual assessment and oil sampling and analysis, the





|     |                                   |
|-----|-----------------------------------|
| DGA | – Dissolved Gas Analysis          |
| OEM | – Original Equipment Manufacturer |
| PCB | – Polychlorinated Biphenyl        |
| PPM | – Parts Per Million               |

## Abbreviations/Acronyms

team undertakes thermal graphic surveys to determine areas where excessive heat may be present in the transformer and other electrical equipment. All information is accurately documented to ensure it can be compared against new information from subsequent follow-up on-site condition monitoring inspections.

### WTA oil sampling laboratory

One of most important differentiators for the Company's customer base is that the operation has a fully-fledged oil sampling laboratory at its facility in Heidelberg. Samples are brought back to this laboratory where state-of-the-art equipment and international best practice is used to analyse the oil. The oil sample is compared to a base line and this enables the technicians in the laboratory to identify potential problems which cause transformer failure. The Karl Fischer titration procedure (moisture Parts Per Million (PPM)) is used to determine the moisture content of the oil. High moisture will result in dielectric breakdown. The oil is analysed to determine where Polychlorinated Biphenyl (PCB) is present because of the high risk factor associated with exposure to this substance and the potential risk should it catch fire. The PCB test is done to identify whether the oil contains PCB, and if so the amount. Furanic analysis is also carried out; this determines the cellulous breakdown products in the oil and gives an indication of the life expectancy of the insulation in the transformer.

Other tests include kV or dielectric strength testing to determine the insulating properties and Dissolved Gas Analysis (DGA) which

- A preventative maintenance and service strategy is essential to ensure the long functional life and optimum performance of a transformer.
- Preventative maintenance programmes can be structured to accommodate customer needs and budgets.
- The maintenance of an historical database allows the accurate tracking of the condition of individual transformers.



provides a clear indication of internal failure conditions. Acid levels are checked against acceptable standards.

### Follow up interventions

Following the comprehensive oil analysis, the Company's mobile field service teams are able to implement interventions to address identified issues. These interventions could include anything as basic as re-torquing the transformer to replacing gaskets and cone rubbers right up to major on-site repairs including replacing offload tap changers. Significantly, the WTA field service teams operate from fully equipped vehicles with all the necessary tooling as well as 4 500 litre per hour high vacuum purification unit. These skilled technicians are able to do the most basic physical inspection to full on-site repair work. Other on site maintenance activities deal primarily with the condition of the transformer and could entail purification and regeneration as well as vacuum treatment to eliminate entrapped air. Oil samples are taken after all inventions to gauge the success of the intervention.

### Conclusion

All work done by the laboratory is documented and customers receive a before and an after report. The maintenance of an historical database is essential as it allows the accurate tracking of the condition of an individual transformer as well as the identification and investigation of trends that may develop in individual transformers. Experienced OEM technicians do regular surveys on transformers to assess their operational health, it is possible to mitigate against any potential risk in terms of asset failure.



Andre Mans is the Chief Operations Officer of WEG Transformers Africa.  
Enquiries: Kirsten Larkan. Tel. +27 (0)11 723 6000 or email [kirstenl@zest.co.za](mailto:kirstenl@zest.co.za)

## Efficient flow measurement using heating jackets

An **Endress+Hauser** client in the Power industry has presented a challenge, measuring the flow of sulphur into the SO<sub>2</sub> plant, the sulphur has to remain in a liquid form at 135°C to prevent it from cooling, hardening, blocking the tubes and ultimately obstructing the process. Coal has been the mainstay of electricity generation and plays an important role. The coal is finely ground before being mixed with warm air and burned in huge boilers. The generated steam passes through a turbine making it rotate to generate electricity,

which is then fed into the national grid. Waste produced in the form of pulverised fuel ash is removed from the boiler gases by electrostatic precipitators before the gases pass up the chimneys.

In the order to reduce harmful emissions, sulphur trioxide SO<sub>3</sub> is injected into the precipitation inlet flow to change the resistivity of the existing particles and enhance the performance of the electrostatic precipitators.

Too much SO<sub>3</sub> will create a higher acid dewpoint and increased probability of cold-end corrosion and acid emission. If there is too little, the electrostatic precipitator's performance will suffer and release increased particulate emissions to the atmosphere. Measuring the flow of sulphur into the SO<sub>2</sub> plant is therefore integral to the process, as is retaining the optimum temperature. The sulphur flows at extremely high temperatures and the pipelines need to be trace-heated to maintain the fluid properties of the sulphur.

Promass 83F is more than up to the challenge with a process temperature capability of 350°C, performing at pressures up to 350 bar. In order for the application to work effectively, the sulphur has to remain in a liquid form at 135°C to prevent it from cooling, hardening, blocking the tubes and ultimately obstructing the process. However, if the temperature exceeds 150°C, the viscosity raises and the sulphur does not flow easily. Maintaining the optimum temperature is therefore vital to achieving maximum effectiveness of the process. Heating jackets were recommended as they can be placed over the Promass meter in order to maintain the optimum temperature for sulphur flow.

**Enquiries: Frans van den Berg.**  
Tel: +27(0)11 262 8000 or email  
info@za.endress.com



## Electrical equipment protection during outages

Legrand's power solutions ensure protection of electrical equipment and continuity of service during planned and unexpected power outages.

"These modular systems include certified low emission (CLE) cast resin transformers, busbar trunkings, enclosures for power

switchgear and controlgear assemblies, as well as uninterruptible power supply (UPS) units," states Marc Naidoo, projects and technical coordinator, **Legrand SA**. "An important advantage of selecting Legrand components for efficient, safe and flexible power distribution, is the immediate integration between the company's busbar trunking systems, cast resin transformers and XL<sup>3</sup> cabinets."

"All Legrand power solutions systems encompass the latest technology for energy efficiency, quality power supply, optimum safety and enhanced aesthetics."

Legrand's environmentally friendly, dry type cast resin transformers, transfer electrical power between two different voltage systems at the same frequency, with low environmental impact. These HV/LV transformers offer significant savings on

electricity costs and can reduce electricity consumption by up to 20% during off-peak activity.

The absence of flammable insulation liquids, the use of self-extinguishing materials exempt of toxic gas emissions, reduced noise levels and low electromagnetic emissions, ensure enhanced environmental protection in all installations. Legrand's standard distribution transformers have rated power between 100 and 3 150 kVA, primary rated voltage up to 36 kV and secondary rated voltage up to 433 V. Special transformers have rated power up to 20 000 kVA, primary rated voltage up to 36 kVA and secondary rated voltage on request. For climate conditions these transformers can withstand severe conditions - E2 - environmental class, C2 - climatic class, F1-fire-behaviour class.

**Enquiries:**  
Tel. +27(0)11 444 7971 or  
email [legrand.south-africa@legrand.co.za](mailto:legrand.south-africa@legrand.co.za)



# Extended Guarantees

## on WEG Products



Extending product guarantees is aligned with Zest WEG Group's strategy of forming long term partnerships with customers, and allows you absolute peace of mind.

Tel: +27 11 723 6000

[www.zestweg.com](http://www.zestweg.com)



# ZEST

**WEG Group**

Please contact your nearest sales office for further details.

## First radar level sensor for liquids with 80 GHz

**VEGA** Grieshaber KG has introduced VEGAPULS 64, the first radar level sensor on the market for liquids that measures at a frequency of 80 GHz. This feature allows considerably better focusing of the radar beam. With this new instrument, measuring is much easier and more reliable, even under difficult conditions, such as tanks fitted with heating coils, baffles or agitators.

Until now, a radar sensor with a transmission frequency of 26 GHz and an 80 mm-diameter antenna had a beam angle of approximately 10°. With the same size of antenna, the VEGAPULS 64 has a beam angle of only 3°. This allows the sensor to be used even in vessels with internal installations or heavy build up on the walls, as its focused microwave beam simply avoids these obstacles.

The larger the dynamic range of a radar sensor, the higher the measurement certainty and the wider the range of applica-

tions that the sensor can be used for. Until now there was no radar sensor for liquid applications on the market with a dynamic range like that of the VEGAPULS 64. This means that media with very poor reflective properties, i.e. a low dielectric constant, can now be measured with more certainty than previous radar sensors. Even foam, turbulent product surfaces, condensation or build up on the antenna are no problem – VEGAPULS 64 measures more reliably due to its greater measurement certainty. It has an accuracy of approximately 2 mm, even with a measuring range of 30 m.

The new radar level sensor VEGAPULS 64 is not only ideal for wide use in the chemical industry, but also in the pharmaceutical and food industries, because of its hygienic materials and design. The relevant approvals for this sector, such as 3A and EHDEG, are available. Thanks to its small antenna – the diameter of the smallest version is no

larger than a 1-euro coin – it results in very compact process fittings, which means the sensor can offer an interesting alternative for confined spaces in small vessels.

**Enquiries: Chantal Groom.**  
VEGA Controls SA. Tel. 011 795 3249 or  
email [chantal.groom@vega.com](mailto:chantal.groom@vega.com)



## Innovative main distribution switchboard solution

The arrival of ABB's innovative main distribution switchboard solution, System pro E Power, in the South African market provides a modular switchboard solution rated up to 6 300 A with short-circuit current up to 120 kA. The modular system provides an industry-leading level of flexibility, combined with simplicity and speed of assembly, to local switchboard manufacturers.

The **ABB** product development team carefully considered the views and experiences of modular switchboard users world-wide for the design and manufacture of a new, ABB low-voltage equipment focused, switchboard solution. This solution meets all electrical installation requirement with respect to degree of protection, segregation and all electrical characteristics in accordance with the latest international standards (IEC).

System pro E Power concentrates on three key pillars to make the system a key-resource for panel builders; flexibility, speed and simplicity.

**Flexibility:** Ultra-high technological standards can be achieved thanks to System pro E Power, since the vast array of accessories and configurations available allow tailor-made solutions to be created. The key features include an innovative method of supplying uprights and cross-pieces in kits, with depth and width measurements able to create up to 120 configurations of varying sizes, using common modular components. This flexibility enables the assembler to provide a wide range of functional dimensions; height options of 1 800 or 2 000 mm, width range from 300 to 1 250 mm and depth from 200 to 900 mm. Furthermore, protection classes are provided for all types of applications; ranging from a basic IP30 to an industry-first IP65 ingress rating.

**Speed:** System pro E Power reduces the time required for assembly prior to switchboard commis-

sioning. Whatever the configuration may be, each component has been designed for ultra-fast assembly and wiring due to quick and effective techniques for mounting the kits and distribution systems.

**Simplicity:** System pro E Power simplifies assembly operations due to pioneering solutions, both for the circuit-breaker and main distribution busbar installation. To illustrate the simplicity; a common busbar system is employed in all applications up to, with linear and scaled solutions for busbar holders. As a result the busbars may be installed in any position; at the rear or at the side, vertically and under the roof, on the floor and on any horizontal level. In an ever-increasingly competitive environment, the features of ABB's System pro E Power distribution boards make a compelling argument to consider the switchboard for any power distribution application.

**Enquiries: Rod Lezar.** Tel. +27(0)10 202 5880 or  
email [roderick.lesar@za.abb.com](mailto:roderick.lesar@za.abb.com)



## Compatible multicode reader with text recognition

ifm electronics' multicode reader is used in a wide range of industrial applications. It provides product tracking, production control or product identification. With its protection rating of IP 67, integrated lighting, different interfaces and a large variety of operating distances and field view sizes, the ifm multicode reader is suited for a large number of industrial applications.

Independent of orientation and number of codes the multicode reader automatically decodes 1D and 2D codes. The new version also solves OCR tasks, e.g. for product identification by means of type designations or series numbers. The professional software of the



new multicode reader takes the high reading reliability of the Data Matrix code to a new dimension. The standardised process interfaces RS-232, Ethernet, TCP/IP and Ethernet/IP ensures fast and easy integration in industrial control technology.

In addition to an automatic exposure setting, manual adjustment is possible as well. Four lighting segments can be deactivated manually. Therefore optimum results are achieved even with highly reflective metal surfaces.

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

## Pedestrian Detection Systems... high end technology

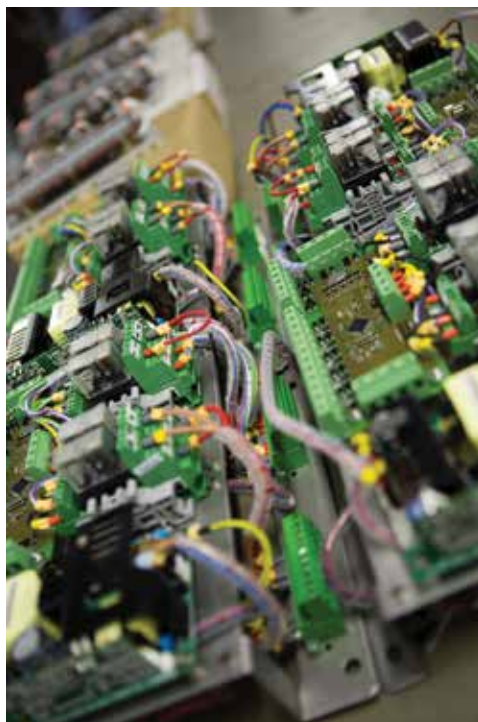
Booyco Electronics has been at the forefront of the Pedestrian Detection Systems (PDS) technology development since the company was established in 2006. From the first basic collision warning system to the Booyco Electronics PDS solution of today, the product has gone through three technology improvements. "It is this embracing of newly available technology that has allowed Booyco Electronics to remain best-in-class," says Anton Lourens, managing director.

Industry demands have also changed over this period and it is through the application of the available appropriate technologies that the Booyco Electronics PDS system complies with current South African legislation.

The legislation mandating the use of PDS systems came into being in South Africa in 2015, and Lourens says there are varying levels of involvement in the South African mining market when it comes to the deployment of high-end technology for PDS. He explains that where the development of PDS does not form part of a TMM organisation's global strategy, that company is less likely to develop systems that will comply specifically and only with South African legislation.

Booyco Electronics' fully integrated PDS represents the latest generation of this technology and offers a supply of information, which allows the safety intervention capability with a data hub that enables integration with TMM OEM's underground vehicles and equipment. Each PDS is deployed based on application specific risk assessments ensuring that it is fit-for-purpose.

**Enquiries: Anton Lourens. Email anton@booyco-electronics.co.za**



HELUKABEL® is a leading International manufacturer and supplier of cables and wires. The specially designed cables produced have stood the test of time in installations all over the world



Our range boasts over 33 000 products



Cable solutions are offered for every aspect of the installation, This includes, all related cable as well as cable protection, connectors, conduits, glands and tools. All products are manufactured to the highest standards and are RoHS compliant and we are certified according to DIN ISO 9001



Helukabel offer cables and wires but also offer a vast array of cable accessories:

These include:

- Cable Glands Protective tubes
- Drag & Guidance chains
- Insulation, shrunk, braided, and high temp.
- Termination and connection sleeves
- Bundling, binding and fixing Identification & marking, Terminals & lugs
- Tools Connectors



Based in Johannesburg, Cape Town and Durban

Tel: +27 (0)11 462 8752  
sales@helukabel.co.za  
www.helukabel.co.za

# Water vapour in factory air ... costly maintenance

Brian Abbott, SMC Pneumatics

*Failure to remove water vapour from factory air can quickly become a costly maintenance headache. Water vapour and the resulting water condensate are the foremost causes of costly downtime and increased maintenance. The blame is often laid on the more visible culprit – oil or contaminants, both of which are easily removed with proper filtration.*



IDH Thermo Dryer from SMC Pneumatics

**M**oisture in facility airlines can cause corrosion and rust which can break loose to the air passageways causing blockages in narrow restrictions and filter elements. This can lead to increased pressure drops and loss in machine performance, not to mention energy loss and costs of the compressed air.

Aftercoolers, drip legs and water separators are used to remove water condensate from factory compressed air. However, this air is still at 100% relative humidity and is still at risk of condensing into water should the surrounding temperatures drop to its dew point.

In order to increase protection of expensive automation equipment, factory compressed air must remove as much water vapour as possible to avoid any condensation further downstream. This is done by lowering its dew point.

## How is dew point lowered in factory-compressed air?

Drying compressed air at the highest pressure consistent with the facility's demands will result in the most economical dryer operation. For most industrial applications, the rule is to first set the pressure dew point to meet general requirements, then adjust it between -6°C to -10°C lower than the facility's lowest ambient temperature. Hence, factory air dryness or dew point is relative to the application's specific requirements.

Refrigerated dryers are the most common measure to lower dew point. A refrigerated dryer will further cool the compressed air by removing heat at its inlet side and lowering its temperature dew point down to 3°C, then expelling the condensate through an automatic condensate drain. The dryer will then reheat the dried compressed air back to ambient temperature by recycling the previously removed heat using a heat exchange process. This reheating of the compressed air to ambient temperature will eliminate 'sweating' cold pipes when working in humid factory conditions.

It is recommended that a coalescing filter be installed upstream from the refrigerated dryer to remove any compressor oil and other

contaminants that may still be trapped in the compressed air to ensure the dryer's proper functioning. Oil coating the cooling surfaces decreases efficiency while coalescing filters saturated with liquid water will aid its drying capacity. In circumstances where factory piping is exposed to ambient temperatures lower than the dew point achievable by refrigerated drying, alternate methods of drying must be considered.

### Best practices

Membrane dryers use hollow fibres composed of a macro molecular membrane through which water vapour passes easily, but is difficult for air (oxygen and nitrogen) to pass through. When humid, compressed air is supplied to the inside of the hollow fibres, only the water vapour permeates the membrane and is drawn to the outside due to the pressure differential between the moisture inside and outside the hollow fibres. The compressed air becomes dry and continues to flow unimpeded out of the membrane dryer.

A portion of the dry air from the outlet side is passed through a very small opening to reduce the pressure and purge the outside of the hollow fibres. The moisture that permeated to the outside of the hollow fibres is discharged to atmosphere by the purge air which in turn creates a low partial pressure allowing the dehumidification process to continuously perform.

By altering the air flow rate and membrane configurations, pressure dew points from 15°C to -60°C can be achieved. Membrane air dryers are a cost effective solution for point-of-use applications in pharmaceutical manufacturing, packaging, laboratory environments and other applications.

Desiccant dryers, on the other hand, pass air through beds of desiccant, an absorbent material such as silica gel or activated alumina, which adsorb water vapour to its surface to effectively lower dew points to temperatures well below that which a refrigerated dryer can achieve. Heatless regenerative models use a pair of desiccant beds which alternate in service while the one bed is operational, the off-line bed is regenerated via a pressure swing adsorption process. Pressure dew points from a standard -30°C to an optional -50°C and

beyond can be achieved with a desiccant dryer. Both membrane and desiccant dryers are adversely affected by the presence of oils or liquid water and must be protected with a quality coalescing filter.

### Conclusion

Over specifying an application's or a facility's dew point can be very costly due to exorbitant energy bills just as the maintenance costs for water vapour damage to product lines can be for an under specified dew point.

Drying the entire factory's compressed air supply to -30°C dew point is unnecessary and extremely wasteful. It is sensible practice to dry the compressed air to a dew point which is -10°C lower than the factory's lowest ambient temperature then subdivide each compressed air supply by application using zone or point-of-use membrane or desiccant dryers to provide the appropriate level of dryness. The costs of energy, downtime, replacing production components, end product defects or even loss of brand value are just a few factors to consider when determining an appropriate dew point.

”  
Drying compressed air at the highest pressure consistent with the facility's demands will result in the most economical dryer operation.

- Moisture in facility airlines can cause corrosion and rust which in turn causes blockages.
- To increase protection of automation equipment, factory compressed air must remove as much water vapour as possible to avoid condensation downstream.
- This is achieved by lowering its dew point.

take note



Brian Abbott, SMC Pneumatics Product Manager, has over 16 years of experience in IA (Industrial Automation) and has focused most of this time in the pneumatics industry. His specialities include Industrial Automation (pneumatic), Process Automation, Technical support and Technical Training. He has extensive experience in circuit design, mechanical support for product applications, technical support, national technical and benefits training, system design and product selection support. He was also involved in the ongoing product and market launches of various products throughout his career. Enquiries. Tel. +27(0)11 568 2407 or email [babbott@smcpneumatics.co.za](mailto:babbott@smcpneumatics.co.za)

# Evolution of temperature measurement

Steve Edwards, R&C Instrumentation



Various techniques and devices have been used throughout time in an effort to accurately measure and compare temperature conditions. For example:

- Fire and ice, hot and cold – elemental extremes
- Boiling water is a fixed temperature as is melting ice

In the early days of ceramics manufacture the craftsman used malleable materials which indicated through deformation that certain higher temperatures were reached. A baker on the other hand, used a piece of paper – the quicker it became brown in the oven, the hotter the oven was.

It was known that specific materials changed state at set temperatures and this is what they based their temperature measurement on.

The disadvantage of all these techniques was that they were not reversible – cooling could not be determined. Also, the accuracy of the results was very dependent on the user and his or her experience.

It was not until the discovery of thermometers, a little over 400 years ago, that actual temperature conditions could be measured exactly. It was determined that a probe made of two different conductors forming a junction at one end had certain voltage producing abilities. The thermocouple produces a temperature dependent voltage known as the thermoelectric effect. This voltage is proportional to the difference between the hot and cold junction. Commercial thermocouples are inexpensive and can be used in a wide range of temperature applications. Their main limitation is accuracy, they have to be in contact with the high temperature and system errors of less than 1°C are difficult to obtain.



The discovery of infrared radiation by the physicist, Wilhelm Herschel, at the beginning of the 19<sup>th</sup> Century opened up new possibilities for measuring temperature – without contact and thus without affecting the object being measured and the measurement device itself. Compared to early infrared temperature measurement devices, which were heavy, awkward, and complicated to operate, the image of such devices today has completely changed. Modern infrared thermometers are small, ergonomic, easy to operate, and can even be installed into machinery. From versatile handheld devices to special sensors for integration into existing process systems, the spectrum of product

offerings is vast. A variety of accessories and software for the collection and analysis of measurement data are provided with the majority of infrared temperature sensors.

An IR thermometer can be compared to the human eye. The lens of the eye represents the optics through which the radiation (flow of photons) from the object reaches the photosensitive layer (retina) via the atmosphere. This is converted into a signal that is sent to the brain.

Simple single point Infrared temperature measurement has evolved into units that now display Thermal images, used in applications that monitor on-line real time molten steel temperature to deciding if a batsman is out or not when a catch is taken from the ball hitting his pads. The advantages of IR thermometers are:

- Very fast measurements (milliseconds)
- Can measure on moving objects
- Difficult to reach objects
- Hot objects (> 2 000°C)
- Feedback-free-measurement

## Conclusion

Advantages in single detectors and thermal imaging continue to grow and Fluke Process Instruments (formerly Raytek, Ircon and Datapaq) lead the field as the biggest supplier of IR temperature measurement devices.

”

*An Infrared thermometer can be compared to the human eye.*

- Infrared radiation was discovered by Wilhelm Herschel at the beginning of the 19<sup>th</sup> Century.
- Early IR thermometers were heavy, awkward and complicated to operate.
- Modern IR thermometers are small, ergonomic, easy to operate and can be installed in machinery.



take note

Born and educated in Yorkshire, England, Steve Edwards has been involved in rotating equipment monitoring for many years. He joined AECI (South Africa) in the consulting engineering department... and later started R&C Instrumentation, providing industries with industrial instrumentation and consulting services and applications design in Infrared temperature monitoring and scanning. Enquiries: Tel. 032 946 2805 or email [stevee@randci.co.za](mailto:stevee@randci.co.za)



## Infrared in high temperature applications

In the Iron and Steel industry and in many Foundry applications, temperature readings show whether processes are operating within their proper ranges, whether a reheater is too cold or too hot, whether a stand needs adjusting, or how much cooling should be applied. Each stage can be accurately monitored so the steel retains correct metallurgical properties as it travels through the process. Every section of the steel manufacturing process can benefit from infrared thermometers and the customised applications developed by **Fluke Process Instruments** (formerly Raytek and Ircon). These benefits include:

- Higher quality products
- Increased productivity
- Reduced energy costs
- Enhanced worker safety
- Reduced downtime
- Easy data recording

Infrared sensors take temperature measurement one step further. Fast and accurate analogue and digital output allows temperature data to be integrated into control system and simultaneously output for remote temperature monitoring and analysis. Smart sensors, with digital electronics and 2-way communications, can be configured remotely from the safety of the control room - especially important for metals with changing emissivities. The result is increased functionality and greater control.

A wide range of optics covers an enormous variety of applications. This is supported by integrated through-the-lens sighting, plus either laser or video sighting for correct target location. Infrared Thermometers are used world wide and in South Africa in many Iron and Steel applications. These applications include:

- Continuous casting
- Reheating
- Rolling mills
- Scale breaker, rolling stands, down coiler and coil box
- Cold mills
- Rod/wire mills

**Enquiries: R&C Instrumentation. Tel. 086 111 4217  
or email [info@randci.co.za](mailto:info@randci.co.za)**



## ► Sensitive but strong



**KROHNE**

► measure the facts

## ► Accurate flow measurement for partially filled pipes? The TIDALFLUX 2300 F from KROHNE has got you covered.

Backed by over 90 years of expertise in flow measurement, there's a KROHNE meter for every job. The TIDALFLUX 2300 F reliably measures flows in pipes filled to between 10 % and 100 % of their inner diameter.

Even fat and oil floating on the surface are not a problem for the TIDALFLUX 2300 F – its capacitive sensors are integrated into the liner and are never in direct contact with the liquid. Featuring a sturdy polyurethane lining, the TIDALFLUX 2300 F is also perfect for demanding wastewater environments. Ex approvals to ATEX and IECex Zone 1 are available as an option.

When a rugged job demands a high degree of precision, the TIDALFLUX 2300 F performs and never quits.

KROHNE – Water is our world.

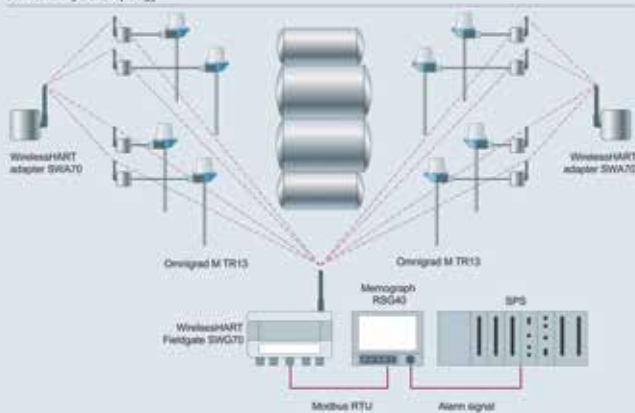
KROHNE South Africa  
8 Bushbuck Close  
Corporate Park South  
Randtjiespark, Midrand  
Tel.: +27 113141391  
Fax: +27 113141681  
Cell: +27 825563934  
John Alexander  
[j.alexander@krohne.com](mailto:j.alexander@krohne.com)  
[www.za.krohne.com](http://www.za.krohne.com)



## Retrofit that saves you money

Incidents which cause a system to shut down may not only lead to costly repairs but may result in considerable losses. An **Endress+Hauser** customer producing more than 880 000 tons of heavy plate annually, ranging from 5 mm to 125 mm in thickness, was able to retrofit the Endress+Hauser wireless solution at a lower cost than expected. They are confident that they now have an optimum overview of the status of the roll neck bearings and that they can maintain the system and replace bearings according to schedule, regardless of any faults. Every company has an interest in making sure that its processes are running at optimum levels. Incidents which cause a system to shut down may not only lead to costly repairs but may result in considerable losses. This heavy plate manufacturer optimises their plant availability through recoding temperatures at the roll neck bearings and a straightforward implementation using WirelessHART.

Schematic system topology



### Results

- Detection of any damage to the friction bearings
- Predictive maintenance intervention
- Protection of the extreme costly friction bearings

### The challenge

The four-high rolling stand at this heavy plate manufacturer comprises of two work rolls which reshape the steel slabs directly, and two back-up rolls, which transfer toll pressure to the work rolls. The four-high stand has a maximum rolling force of 80 000 kilo newton. This situation is very demanding, even for roll neck bearings. The roll neck bearings are located on the operating and drive side of the upper and lower back-up rolls. These are known as Morgoil friction bearings. A lubrication circuit ensures that the Morgoil bearings get the lubrication they need while the temperature of this circuit is monitored at the inlet and outlet. An increase in the temperature differential indicates a higher degree of friction inside the bearings which may result in damage. However, the ambient conditions which prevail at the rolling stand make it difficult to wire up the necessary temperature sensors securely.

### Solution

For temperature measurement, TR15 resistance thermometers with a weld-in thermowell and replaceable insert are used. These have already proven their worth a thousand times over in challenging industrial applications. Each temperature sensor is fitted with an adapter which enables wireless data transmission based on the WirelessHART standard. Due to space limitations and possibly restricted radio communication, installing the adapter directly on the temperature sensor is not advised. The adapter is therefore installed remotely and connector to the temperature sensor using a short cable. The adapter not only facilitates data transmission, it also powers the connected device via the battery integrated in the adapter. Each adapter works as a transmitter and receiver, ensuring the data can be transmitted to the WirelessHART gateway, even if direct radio communication is not possible. The WirelessHART gateway forms the central access point to the WirelessHART network and manages communications. The gateway automatically assigns the communication paths in the network as well as the times for the data packets. This means the new measuring points can be retrofitted easily. From the gateway via Modbus RTU, the measured values are displayed on a Memograph RSG40 graphic display recorder. From there, they can also be transferred to downstream control systems. The eight measured values are monitored permanently.

*Enquiries: Benjamin Mlangeni. Tel. 011 262 8012 or email info@za.endress.com*



# Some Like It Hot!

High Temperature  
Infrared Thermometers







*fast, accurate, safe  
1000 to 3000 Deg C  
Single or 2 Colour (Ratio)  
Point, shoot & read  
for quick hot spot detection*

## R&C

INSTRUMENTATION

e-mail info@randci.co.za

**086 111 4217**

www.randci.co.za

Premier Distributor of

Choose from a complete line of fixed sensors and handhelds









**VEGA** WE ♥ RADAR

## Introducing a new world class!

VEGA, the world market leader in radar level measurement will soon be presenting a new star in the galaxy of sensors. Get ready for the technology of the future. Look forward to a new generation full of innovative possibilities. We'll keep you updated!

[www.vega.com](http://www.vega.com)





Figure 1: General view of the machine.

# Computer Control of a small lathe

## *A mechatronics case study*

Glyn Craig, Techlyn

*This article shows how the mechanical parameters can be calculated and matched to appropriate drive motors and controls. Programming methods are also described.*

**B**uilding on the information contained in previous articles... this one describes practical, real-life implementation with the customer requiring the machining of a large number of cutting discs to form part of a production machine.

Each part required different curved properties. This ruled out conventional lathe practice due to the complex simultaneous axis movements (interpolation) needed to machine the workpiece. In addition, high repeatability was called for.

A good quality second hand lathe was procured, and the cross travel (X) and long travel (Z) axes were discarded and replaced by high accuracy linear slides and backlash-free ballscrews. *Figure 1 (main image)* shows the general view of the machine and *Figure 2* shows the drive end of the Z axis with the motor protective cover removed.



Figure 2: Drive end of the Z axis.

## Initial calculations

Initial assumptions:

Ballscrews: 16 mm diameter by 5 mm pitch

Z axis screw length: 800 mm

Required traverse rate: 1 800 mm/minute

Resolution: Around 1,0 micron

(Note: Resolution is not the same as accuracy)

Mass of the Z payload including the X axis: 15 kg.

The parameters then became:

Leadscrew RPM =  $1\ 800/5 = 360$  RPM

An unexpected result of high leadscrew rotational velocity is the tendency to develop destructive vibration at critical speeds. Reference to design charts revealed that the lowest critical speed for a screw of this length was in excess of 2 000 RPM. No problem here. 360 RPM was judged to be on the low side given motors capable of 10 times this speed. It was decided to fit low backlash planetary gearboxes. This would provide the following advantages:

- Motor torque increased by 3
- Motor resolution increased by 3
- Reflected inertia on the motor shaft decreased by  $3^2 = 9$

At this point we could select a suitable motor. Be aware that this portion of the selection process could require a number of iterations.

Available planetary single stage gearboxes were quoted as having a maximum backlash of 10 arc-minutes. From this we could determine that the lost angular motion would be  $10/60 = 1/6$  of a degree, or  $1/6 \times 1/360 = 1/2\ 160$  of a revolution. This then gives lost motion of  $5\ 000/2\ 160 = 2,3$  micron.

This is small compared to temperature effects which would lengthen or shorten the leadscrew by 11 micron per 1° Celsius change per metre length. At this point a motor could be selected and the following checked:

- Reflected inertia connected to the motor.
- Linear force generated.

## Inertia

Matching of load inertia to the motor rotor inertia is essential for a stable system. This is a large subject and will be dealt with fully in a future article. For now, it is sufficient to say that the ratio of coupled inertia to rotor inertia should not exceed 3:1.

The SI (System Internationale) unit for inertia is  $\text{kg.m}^2$  (kilogram metres squared). However, for small systems such as this the units  $\text{kg.cm}^2$  result in more easy to envisage numbers. (One  $\text{kg.m}^2$  is equal to  $100^2 = 10\ 000\text{kg.cm}^2$ ).

To calculate the inertia of the longest screw we use the empirical formula for a cylindrical steel shaft:

$$J = D^4L/1\ 300$$

where:

J = moment of inertia,  $\text{kg.cm}^2$   
 D = diameter, cm  
 L = length, cm

In our case:

D = 1.6  
 L = 80

Therefore

$$J = 1,6 \times 80/1300 = 0,4033\ \text{kg.cm}^2$$

To this must be added the equivalent inertia of the payload.

$$J = WLp^2/4000$$

where

WL = mass of payload, kg  
 p = leadscrew pitch, mm

$$\text{For our case, } p = 5 \text{ and } WL = 15 \\ = 0,0938\ \text{kg.cm}^2$$

$$\text{Therefore total coupled inertia} = 0,4033 + 0,0938 \\ = 0,4971\ \text{kg.cm}^2$$

A range of 23 frame (2,3 inch) brushless motors was available from the supplier, and we selected the largest, with a rotor inertia of  $0,2302\ \text{kg.cm}^2$ . The inertia mismatch was then:  $0,4971/0,2302 = 2.1592 : 1$

This matching would be acceptable without a gearbox, but we chose to stay with the 3 : 1 gearbox in the interests of rigidity. Reduction gearboxes reduce the coupled inertia by the square of the ratio, in the same way as a transformer reduces coupled impedance by the square of the turns ratio. The motor therefore sees a reflected inertia of  $4 \times 0,4971/3^2 = 0,0552\ \text{kg.cm}^2$

At this point we were able to estimate the available linear force which could be produced. We use another empirical formula:

$$F = T.644.e.g/P\ \text{N}$$

Where

T = torque in Newton metres (Nm)  
 e = efficiency with a range of 0 to 1

g = acceleration due to gravity (9,81 m/s<sup>2</sup>)  
 p = leadscrew pitch, mm

Although the motor could produce in excess of 1 Nm of torque, we decided to use a value of 0,4 Nm and efficiency of 0,8. This equates to  $0,4 \times 3 = 1,2$  Nm on the screw.

Therefore force  $F = 1,2 \times 644 \times 0,8 \times 9,81/5$  N  
 = 1212,98 N

This is far in excess of what is required on a small machine and should result in good axis rigidity. Leaving this calculation till the end is deliberate, as experience has shown that, provided inertia and speeds are sensibly chosen, it is rare to find insufficient force produced.

Note that no attempt was made to choose the smallest satisfactory drive motor. We regard this as false economy and a very bad idea on a new machine. *Here endeth the first lesson!*

**System description**

Details are shown in Figure 3.

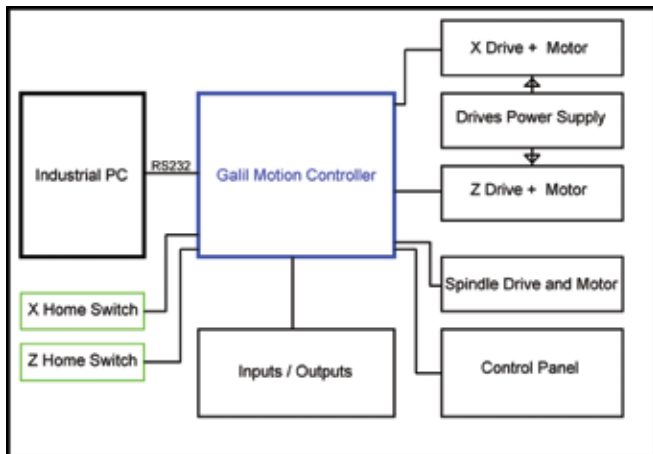


Figure 3: System description.

The Galil motion controller receives an ASCII (American Standard Code for information interchange) file from the industrial PC. Thereafter, the program executes from the Galil's onboard memory and the PC acts as an operator interface. This avoids the use of an HMI (human machine interface) and is by far the most efficient way to engineer a project of this type. Standard PC literacy is all that is required of the user.

The Galil controls the axis movement and, in addition, performs the Programmable Logic (PLC) functions such as checking safety circuits, and control panel pushbuttons as well as driving indicator lamps and switched loads such as the coolant pump. In addition, an analogue output supplies 0-10 V to control the spindle speed. Up

to eight tasks can execute simultaneously. Figure 4 is a picture of a typical Galil motion controller (www.galilmc.com).



Figure 4: Typical Galil motion controller.

**Programming**

Commands consist of simple two letter acronyms such as:

- SH X Servo Here (X axis)
- BG X Begin
- ST X Stop
- etc

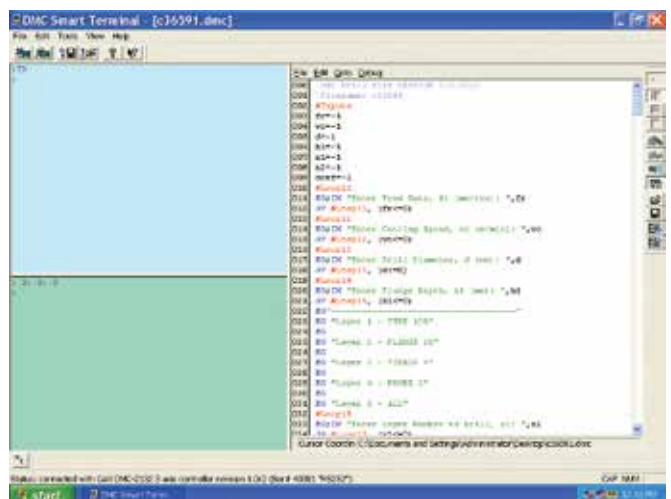
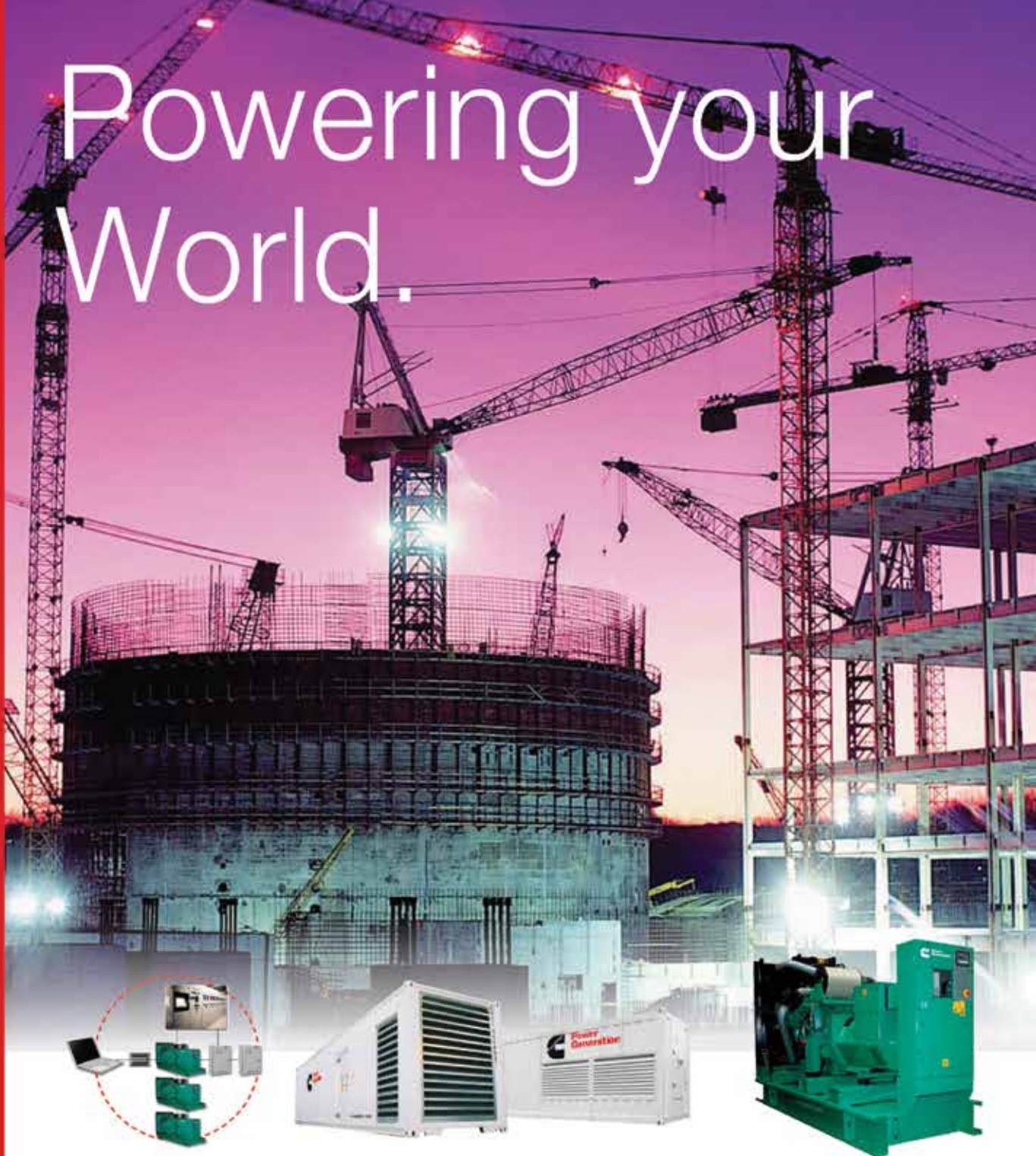


Figure 5: A Galil programming tool.

In Figure 5, the right hand screen is a text editor. The top left hand screen is used to execute the program and issue commands on the fly. The bottom left hand screen shows Galil messages and responses.

# Powering your World.



Cummins diesel generator sets designed to give you unequalled reliability, power quality, superior performance and efficient operation. Diesel genset range - 8 kVA to 3300 kVA (50Hz), with a wide range of control systems and switch-gear.

Cummins South Africa (Pty) Ltd. is a company-owned distributor providing power generation systems, components and services in standby, prime, as well as auxiliary power to meet the needs of a diversified customer base.

**Our energy working for you.™**

**Cummins South Africa**

Head Office: +27 11 321 8700

Fax: +27 11 444 1899

[www.cumminspower.com](http://www.cumminspower.com)

**Cummins** **Power  
Generation**



Previous articles by Glyn Craig describe a drive test rig [1] and the general design principles of a brushless motor drive [2].

**Acknowledgement**

We thank the directors of Frigotherm Engineering for permission to publish details of the machine.

**References**

- [1] Craig G. A bench top motor dynamometer for drives testing. Electricity and Control, May 2015.
- [2] Craig G. Brushless Servo operating principles. Electricity and Control, July 2015.

- To realise proper design you need to understand the parameters defining the system.
- Mechanical parameters can be calculated and matched to motor and drive systems.
- Matching load and motor rotor inertia is a key component in the design described.



take note



Glyn Craig is a director of Techlyn. He has been involved in the mechatronics field for many years. Techlyn has represented Galil Motion Control since 1994, and offers free training on their products. Enquiries: Tel. 011 835 1174 or email [glyn@techlyn.co.za](mailto:glyn@techlyn.co.za)

**South African solar power plant wins PFI solar deal of the year**

The government's Renewable Energy Independent Power Producer Procurement Programme (REIPPP) is rapidly contributing to South Africa's growth as one of the fastest growing renewable energy sectors in the world. The Minister of Energy has been determined that 3 725 megawatts (MW) of renewable energy sources is required to ensure the continued uninterrupted supply of electricity.

According to Hartmut Winkler, Professor of Physics at the University of Johannesburg, the REIPPPP contributed to over 6 000 MW to date. It is envisioned that this figure should reach 9 600 MW of solar power capacity by 2030. All completed solar power plants form part of South Africa's electricity supply and are fully linked to the Eskom power grid. Currently, solar power already contributes to more than 1 MW onto the grid on a sunny day.

The Ilanga 1 CSP Project recently won the 2015 Project Finance International (PFI) solar deal of the year. The award ceremony took place on 3 February 2016 in London. The plant is located about 30 kilometres east of Upington and forms part of the Karoshoek Solar Thermal Park. Ilanga 1 is a 100 MW parabolic trough plant with a thermal energy storage system.

Apart from the significant job-creating opportunities, the project promises to deliver over half a billion Rand annually to socio-economic development over a 20 year period. The surrounding areas will benefit from these socio-economic development initiatives.

Jen Stolp, partner in Baker & McKenzie's banking and finance department, acted as lender counsel. Lenders of the project included Development Bank of Southern Africa (DBSA), the Public Investment Company (PIC), the Industrial Development Corporation (IDC), Nedbank, Investec, Standard Bank and ABSA.

"The Ilanga 1 CSP Project aligns perfectly with ABSA's CSI initiatives aimed at enhancing business relevance, sustainability and

social upliftment. It is great to see projects geared at creating a better future recognized at the PFI awards", said Shaun Moodley, Vice President Banking-Resource and Project Finance at ABSA Capital, regarding ABSA's involvement in the project.

Emile Malan, Principal: Energy at Nedbank, said: "Nedbank is committed to green funding and supporting sustainability initiatives, and we're proud to be part of the Ilanga 1 project. It is projects like these that help us build on our long history of promoting environmental responsibility."

**Email: [louise.crouch@epicmslgroup.com](mailto:louise.crouch@epicmslgroup.com)**



The Ilanga 1 CSP Project recently won the 2015 Project Finance International solar deal of the year. The award ceremony took place in London. In the photo are members of the Development Bank of Southern Africa (DBSA) and Baker & McKenzie's Jen Stolp at the award ceremony. (Credit: Infrastructure Investment Awards 2015).





Contains 100% pure safety and reliability.



## Food and beverage

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

### Promag H 100

- Multivariable measurement for flow, temperature and conductivity
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology™

### TM411

- iTHERM QuickSens: fastest response times (t90s: 1.5s) for optimum process control
- iTHERM StrongSens: unsurpassed vibration resistance (> 60g) for ultimate plant safety
- iTHERM QuickNeck – cost and time savings thanks to simple, tool-free recalibration

[www.za.endress.com/food](http://www.za.endress.com/food)



## CESA committed to partnering with Government for infrastructure service delivery

Consulting Engineers South Africa (CESA) supports the clarion call to address institutional and regulatory barriers to business investment and growth, announced Finance Minister Pravin Gordhan during the Budget Speech.

"It means we must give greater impetus to sectors and industries where we have competitive advantages. And it means being bold where there is need for structural change, innovation and doing things differently. We need agility and urgency in implementation," stated Gordhan.

CESA has, for some time now, been aware that there are inefficiencies in the way public-sector infrastructure projects are implemented. These shortfalls include lack of planning, inappropriate procurement approaches, lack of project management capacity and capability and lack of other desired technical skills in the public sector. In addition these inefficiencies rob South Africa of multiple billions of Rands annually, which could be effectively used to fund the much-needed increase in infrastructure investment

Gordhan explained that international experience has demonstrated that growth is ignited by strong and stable political and economic institutions, sound infrastructure that reduces the cost of doing business and facilitates trade, competition between firms and openness to trade and an environment where firms invest and undertake research and development.

CESA welcomes the need for multi-year appropriations for major capital projects of which reform is under consideration for the following projects:

- Energy investment amounts to R70 billion this year and will be

- over R180 billion over the next three years, as construction of the Medupi, Kusile and Ingula power plants is completed
- Transport and logistics infrastructure accounts for nearly R292 billion over the next three years. Transnet is acquiring 232 diesel locomotives for its general freight business and 100 locomotives or its coal lines. There is R3,7 billion to upgrade the Moloto Road, R30 billion for provincial roads maintenance, R18 billion for bus rapid transit projects in cities and refurbishment of over 1 700 Metrorail and Shosholoza Meyl coaches
- R62 billion is allocated for the housing subsidy programmes and R34 billion for bulk infrastructure and residential services in metropolitan municipalities
- R28 billion will be spent over the MTEF on improving health facilities and R54 billion on
- The next phase of the Oliphant's River water scheme is in progress, completion of the supply to Lukhanji Municipality in the Eastern Cape, completion of the Wolmaranstad wastewater treatment works and construction of the Polihali Dam as part of the Lesotho Highlands project

These are some components of the R870 billion public sector infrastructure programme over the next three years.

CESA with the backing of its member firms recommits itself to partner with Government and other key role players in finding lasting and practical solutions, especially in relation to infrastructure development.

**Enquiries: Dennis Ndaba. Tel. 011 463 2022 or 0739812066 or email [dennis@cesa.co.za](mailto:dennis@cesa.co.za)**

## PV modules for Round 3 of REIPPP



ARTsolar has recently completed production of the final consignment of locally produced photovoltaic (PV) modules in the Government's Round 3 of the Renewable Energy Independent Power Producer Programme (REIPPP).

"These PV modules were manufactured at the ARTsolar plant in KwaZulu-Natal, for the Mulilo Sonneditz Prieska PV solar plant project. This plant, which supplies the electricity it produces to the Eskom Kromos Substation in the Northern Cape, is the first 75 MW ac size REIPPP project to have PV modules produced by a South African owned company," says Derek Lawrance, director, ARTsolar. "After winning this Q1 2015 bid, ARTsolar implemented an expansion programme to meet production requirements of this project.

was increased to a 24 hour/six day schedule and we expanded our team to 200 staff.

**Enquiries: Tel. 031 705 7162 or email [sales@artsolar.net](mailto:sales@artsolar.net)**

## Locally manufactured inverter solutions for 86 MWp RSA solar plant

ABB is delivering electric balance of plant for an 86 megawatt peak (MWp) project near Prieska in South Africa. This packaged inverter solution comprises locally manufactured inverter stations and medium voltage (MV) stations with related services. The project has been developed by Mulilo Sonnedix and is to be built by Juwi ZA. The site is located in the Northern Cape region of South Africa close to Prieska, and forms part of the Renewable Energy Independent Power Producers Procurement Program (REIPPP) round 3 projects.

The nominal rating of the project is 76 MW ac, The ABB plant is feeding the power to the national high voltage grid. The deliveries start in October 2015 supporting the rapid connection target to the distribution network in May 2016.

ABB's scope of delivery includes forty 2 MW PVS800-IS inverter stations, each containing two PVS800 central inverters, and respective MV stations with 2,4 MVA transformers and ring main units (RMU). ABB PVS800 central inverters and inverter stations are manufactured in ABB Johannesburg facilities as well as also the 22 kV Ring Main Units (RMUs). Together with locally manufactured medium voltage transformer the local content of ABB delivery exceeds 60 %. The hardware delivery is supplemented by a service offering that includes training and commissioning and local support for the years to come.

"The high efficiency, reliability and easy-to-maintain industrial design of our inverters, together with our local service and support

capabilities, are the key success factors for ABB PVS800 central inverters in South Africa," says Silviu Martinescu, Manager of ABB's business unit Power Conversion in South Africa. "We are developing further our service organisation in the region to meet the increasing installed base as I expect more deliveries to come."

**Enquiries: Silviu Martinescu. Tel: + 27(0)10 202 5000 or email [Silviu.martinescu@za.abb.com](mailto:Silviu.martinescu@za.abb.com)**



A motor controller to overcome typical in-plant communication barriers?

Definitely.



Industrial and chemical plants use numerous motors to provide the necessary motion. Any unplanned or sudden motor stops may result in costly process interruptions, making control and monitoring essential. Multiple in-plant communication protocols are used to control and monitor these motors. ABB's UMC100.3 accommodates a wide range of communication methods; simply plug-on the required fieldbus interface or connect to the ethernet network interface. Additional information: [www.abb.co.za/lowvoltage](http://www.abb.co.za/lowvoltage)

ABB South Africa (Pty) Ltd.  
Electrification Products  
Tel. +27 10 202 5880  
E-mail: [LP@za.abb.com](mailto:LP@za.abb.com)

Power and productivity  
for a better world™ **ABB**

## Energy efficiency in farming – Crucial

Farming in South Africa, as in many parts of the world, is faced with severe drought conditions and steadily increasing costs on all fronts. Labour, infrastructure, equipment, transport, energy, livestock and seed stock are becoming more and more expensive. Farmers' need to counterbalance these threats requires new business strategies to reduce operating costs, compete more effectively and comply with increasingly strict environmental standards whilst increasing productivity and improving quality.

As a result, Eskom has been doing extensive research on energy efficient farming and how to best support South Africa's farmers and all other types of agro-businesses with energy efficiency advice.

Agriculture – farming operations plus the processing, packaging and other support industries comprising the sector - consumes 6 000 GWh (gigawatt hours) of electricity per year, 4% of the national total. Although far less than the 148 000 GWh consumed by the industrial sector, powering the agricultural sector is of strategic importance to the long-term socio-economic wellbeing of our country. Apart from the fact that millions of people are directly or indirectly dependent on agriculture for their livelihoods, the sector is key to our nation's food security and foreign currency-generating food exports.

49M, the local movement that calls on all South Africans to switch to energy efficient business practices and lifestyles, encourages farmers to conduct energy use assessments as a starting point to improving the energy efficiency of their operations. Through this assessment process, data on a farm's energy consumption and associated costs can be collected

and analysed as a basis for change on four fronts:

- Changing energy use behaviour
- Streamlining operations
- Improving maintenance procedures
- Switching to energy efficient technologies, including renewable energy solutions

Energy use assessments typically analyse electricity bills, usage data and all electric equipment and processes specific to the operation of a particular farm. Likely recommendations for technology retrofits and equipment upgrades could include:

- Lighting – optimising inefficient lighting systems by fitting energy efficient component alternatives such as Compact Fluorescent Lamps (CFLs), Light Emitting Diodes (LEDs), T-5 systems, electronic control gear, lighting sensors and daylight harvesters
- Motors – replacing outdated, inefficient or over-sized motors with energy efficient alternatives and installing Variable Speed Drives (VSDs), where applicable
- Pumps – replacing inefficient pumps with energy efficient alternatives and operating them in an optimal configuration with correctly sized motors and VSDs, where applicable
- Renewable energy – utilising alternative energy sources such as solar water heating systems, micro-hydro schemes and photovoltaic installations

### Tariffs

Importantly, and as a starting point, farmers are advised to check which electricity tariff they are billed at; there could be an opportunity to reduce energy costs by moving to a more cost effective structure. Moreover, shifting energy intensive operations outside periods of peak demand for electricity could mean paying lower tariffs.

### Testimonial

An Eskom Energy Advisor conducted an energy use assessment on the farm of Kosie and his son Manie Eloff outside Soekme-kaar in Limpopo Province. The assessment

showed that irrigation accounts for 61% of their electricity bill. The Eloffs have 14 pumps of varying sizes, some of which could save electricity by using Variable Speed Drives. Costly, and a new technology in the eyes of many farmers, Kosie and Manie decided to invest in a VSD.

- The VSD was installed on a 45 kW motor
- The throttles that change the flow and pressure as the irrigation load changes were removed

The installation reduced energy demand from 18,9 kW to 13,2 kW, a saving of almost 30%. Owing to this improvement in energy efficiency, the Eloffs are now investigating the savings potential of the other 13 pumps on the farm as well. With agriculture – here and across the world - grappling with the need to produce more and more food for both human and animal consumption in the face of rising operating costs and increasingly unpredictable weather patterns, Eskom will always consider the sector as strategically important and keep on working hard to make a contribution towards turning it electricity smart - one farm and one agro-business at a time.

### Eskom Energy Advisors

Eskom's national Advisory Service can help locate technology suppliers. The team can also advise farms and any other business in the agricultural sector on:

- Reducing energy usage
- Doing walk-through energy assessments to identify energy usage
- Improving the energy efficiency of operations and electrical systems and processes
- Prioritising maintenance as an important contributor to reducing energy usage
- Finding SANAS approved energy savings Measurement & Verification Authorities
- Advisors also help identify funding opportunities for energy efficiency projects

**Enquires: Tel. 08600 37566 or email an enquiry to [AdvisoryService@eskom.co.za](mailto:AdvisoryService@eskom.co.za)  
Visit [www.eskom.co.za/idm](http://www.eskom.co.za/idm) for more information**

## New products for industrial standby

**Leroy-Somer** Electric Power Generation, a division of Emerson and global manufacturer of industrial alternators, has introduced Leroy-SomerTAL, a new series of products dedicated to the commercial and industrial standby market.

ControlReg is the first integrated generator set controller and automatic voltage regulator to hit the market. This new solution is the fruit of a partnership between Leroy-Somer and DEIF, a leading generator control manufacturer. ControlReg will be offered as a package with an alternator. ControlReg combines full-fledged generator set controls (such as start preparation, start/stop sequences, fuel level) with typical AVR (Automatic Voltage Regulator) features: voltage adjustment, U/f function, PID setting or motor soft start. The ControlReg package, which includes an industrial alternator, cables and the ControlReg generator set controller offers a complete solution for generator sets manufacturers to ease and speed up assembly time and configuration.

**Enquiries: Email [n.bazerbachi@mepax.com](mailto:n.bazerbachi@mepax.com)**



## Off-grid energy solution for primary school

With the attendance of the President's Office, Gauteng Province, Department of Energy, Department of Education and the IPP Office, the Government of South Africa will officially inaugurate the SolarTurtle at the off-grid school in the informal settlement of Palm Ridge in March 2016. In 2015 the Gauteng Department of Education (GDE) was approached with a new way of providing solar electricity to off-grid schools. Other solar projects previously attempted saw their solar panels stolen or vandalised within weeks. This next generation **SolarTurtle** - called the **PowerTurtle** - provides a secure solution for Pheasant Folly Primary and the children attending. With no grid connection, Pheasant Folly Primary School is powered by expensive generators which are not sustainable within the school's financial budgets, given that fuel alone costs more than R2 000 per week. This is clearly not an ideal situation for the school or the environment, so a solution was desperately needed to facilitate affordable energy access and continued learning. PowerTurtle is a unique, container-based design which allows for unparalleled security. Morning sunshine triggers the solar panels to roll out and a specially engineered rail system to unfold in minutes. In the evenings the solar panels slide back into the reinforced 6m shipping container for safe keeping. This pilot boasts an impressive sixteen 300W solar PV panels (4,8 kW), the latest Freedom Lite lithium batteries and top-of-the-range 8,5 kW Schneider solar technology. An estimated 2 500 off-grid schools in Gauteng require support - typically located in informal settlements across Gauteng. Crime and vandalism have played major roles in the disuse of solar PV power in South Africa.

**Enquiries: Lungelwa Tyali, 072 321 9070 or email [Lungelwa@solarturtle.co.za](mailto:Lungelwa@solarturtle.co.za)**



In October 2015 during its South Africa: Gas Options meeting, EnergyNet Ltd launched the 'Not Just Talking Fund for Energy Access' with its advisors Impact Brands Africa, Fieldstone and ERM. Its first investment was made in partnership with the IPP Office of South Africa - awarded by the Honourable Minister for Energy Tina Joemat-Pettersson MP - to provide secure electricity for the primary school and its community

## Bizz Buzz

### Gas engine for flour mill in Cameroon

U.K.-based **Clarke Energy**, GE's new authorised distributor of Jenbacher gas engines in Cameroon, is supplying a 1,4 MW J420 Jenbacher gas engine to Flour Mill SCTB to provide more reliable, cost-effective, on-site power for the company's mills in the city of Douala. The Jenbacher unit will permanently replace existing rented gas generators at the site, giving SCTB a more cost-effective, permanent, on-site power solution that will enable the company to save more than \$200 000 annually in fuel costs. The system is scheduled to enter commercial service in the second quarter of 2016.

**Enquiries:**

**Email [Alex.Marshall@clarke-energy.com](mailto:Alex.Marshall@clarke-energy.com)**

### New technology for optical data transfer

VTT Technical Research Centre of Finland and Aalto University, together with a group of contributing local companies, are starting a new Tekes-funded project on optical switching and transmission technologies to improve the scalability and energy-efficiency of data centres and 5G networks where the volumes of data transfer grow exponentially. With the current data centre networking technologies, addressing the exponential increase in data volume would lead to an enormous magnification of the cost. The new Tekes-funded project, Optical Information Processing for Energy-Efficient Data Centres (OPEC), focuses on the development of novel optical components and technologies on VTT's proprietary silicon photonics platform, as well as new silicon wafer production and precision assembly concepts.

**Enquiries: Email [sanna.arpiainen@vtt.fi](mailto:sanna.arpiainen@vtt.fi)**

### Sulzer promotes reduced downtime at P&AM show

At this year's Plant and Asset Management show, which will be held at the NEC, Birmingham from 12 - 14 April, **Sulzer** will be showcasing repair techniques for large rotating equipment that reduce downtime. In addition to offering the opportunity to meet Sulzer engineering experts at their stand, the company will be highlighting the repair services for mechanical plant, motors, generators and pumps that can improve reliability and reduce the Total Cost of Ownership (TCO).

**Enquiries: Email [chris@dmaeuropa.com](mailto:chris@dmaeuropa.com)**

## Fighting energy poverty

The European Policy Centre, with the support of the King Baudouin Foundation, and Schneider Electric has launched the Energy Poverty Task Force to consider energy poverty challenges in the European Union.

**Schneider Electric**, the global specialist in energy management and automation, and the European Policy Centre, an independent, not-for-profit think tank with the support of the King Baudouin Foundation, announce the launch of the Energy Poverty Task Force to consider energy poverty challenges in the European Union. The launch event of the task force took place on 26 January, 2016 in Brussels, in presence of Maroš Šef ovi , Vice-President of the European Commission in charge of energy.

Energy poverty affects people in mature economies who do not have normal and regular access to the energy necessary to cover their basic domestic needs, i.e. heating, power and cooking. This is caused by a combination of low incomes, higher electricity prices and poor building energy performance. According to the French National Energy Poverty Monitor (Observatoire National de la

Précarité Energétique, or ONPE), energy poverty affects nearly 20% of the French population. Fight against energy poverty in mature economies is today a major development issue, as access to energy in developing countries. It needs to improve people's day-to-day lives while offering concrete solutions to tackle climate change.

As a socially responsible company and a global specialist in energy management, Schneider Electric launched in 2013 its programme to fight energy poverty in mature economies. The Group wants to foster the emergence of a virtuous circle by focusing on three areas: education, investment and technology. Schneider Electric is now seeking how to be most effective in its actions. That's why the Group partnered with the European Policy Centre in the Energy Poverty Task Force, to consider energy poverty at European level. End of 2015, Schneider Electric had already published a White Paper Resolving Energy Poverty in Europe: Understanding the Initiatives and Solutions.

**Enquiries: Email**  
[veronique.roquet-montegon@schneider-electric.com](mailto:veronique.roquet-montegon@schneider-electric.com)

## Siemens celebrates SA's new engineers and technicians

**Siemens** commits to training South Africans as part of its contracts for work on SA power stations and other infrastructure. Special attention is given to local communities, women and people with economic and educational disadvantages. Under government's national Accelerated and Shared Growth Initiative (ASGI-SA) scheme, Siemens trains engineers, electrical technicians and artisans. The ASGI-SA Skills Development Programme is a partnership training programme between Siemens and Eskom. Skills development programmes are project specific and they are linked to Eskom power stations, including Kusile, Medupi, Duvha, Ingula and Hendrina.

On Friday, 12 February, more than sixty

newly-skilled men and women celebrated their graduation with engineering degrees, diplomas, trade certificates and national certificates. They will now enter the SA economy with confidence and skills to build careers in engineering.

One of the new Siemens graduates is Jaquolyn Mononyane, 26, who comes from Ekangala in Mpumalanga. She matriculated in 2008 and did electrical engineering at the Tshwane University of Technology (TUT). Now Jaquolyn is on a further two-year Siemens graduate training programme and studying for a BTech in electrical engineering. As part of her training, she has been to work on the Sere wind farm in the Western Cape. In 2015 Jaquolyn became the first

female supervisor at Siemens' North Riding facility. She is currently a supervisor in the facility's medium voltage division, a job which was previously done by a skilled German worker.

Lloyd Dlamini, 27, started as a trainee and is now a Siemens' training mentor. He comes from the Bushbuck Ridge area in Mpumalanga and matriculated in 2006. Lloyd was studying electrical and electronic engineering at TUT when he met visiting Siemens recruiters, and in July 2010 he joined a Siemens facility in Centurion to complete his practical training. By the time he finished studying he already had a job offer with Siemens, and he started as an engineering technician in the testing department in 2011. In July 2014 he was appointed manufacturing quality manager at Siemens' North Riding facility.

Siemens' new graduates include two engineers with a BSc in Electrical Engineering, two project managers, 25 technicians with a national diploma in electrical engineering, 27 artisans with a higher certificate, and nine candidates with learnership certificates NQF Level 3-4.

**Enquiries: Keshin Govender**  
**Tel. 27(0)11 652-2000 or email**  
[Keshin.govender@siemens.com](mailto:Keshin.govender@siemens.com)



*Clifford Klaas, Siemens Executive Director and Head of Human Resources for Siemens in Southern and East Africa, Nake Maepa, Eskom, and Thandeka Mnisi, professional technician at Siemens, receiving her National Diploma in Electrical Engineering and her BTech.*

## Transformer order for South Africa's expanding electric rail fleet

ABB, power and automation technology group, won an order worth around \$50 M from Bombardier Transportation for traction transformers and associated products for 240 freight locomotives that will help form the backbone of South Africa's electric rail fleet. The order was booked in the fourth quarter of 2014.

The traction units, to be installed in Bombardier's TRAXX locomotives to be built in South Africa, will reliably transform electricity for trains running on the country's dual 3 kV direct-current (dc) and 25 kV alternating-current (ac) overhead voltage network. ABB has supplied traction transformers for several of Bombardier's electrical locomotives since 1998. Designed for their versatility and ruggedness, ABB traction transformers already power more than half the world's electric locomotives and train sets.

South Africa, with the continent's most-comprehensive railway system, is investing nearly \$5 billion to renew and expand its rail fleet, not only to boost passenger travel but also to increase its ability to efficiently ship freight including iron ore for export around the world. South Africa aims to boost the share of freight shipped by rail significantly over the next decade.

"Compact design and exceptional reliability make ABB traction transformers ideal for powering freight loads under challenging conditions, ensuring both high performance and energy efficient rail operations," said Bernhard Jucker, head of ABB's Power Products division.

Enquiries: Email [shivani.chetram@za.abb.com](mailto:shivani.chetram@za.abb.com)



## 'Just Imagine' – a future focused blog

Imagine a world where the physical and digital interact seamlessly; where creativity is the new corporate currency; and where business minds take lessons from children when it comes to innovation. Aurecon's new blog, Just Imagine, provides a glimpse into the future for curious readers. "If businesses are to thrive in a future that is as yet unwritten, creativity must shape how they operate, and design and innovation are the tools that offers the solution," says John McGuire, Aurecon's Chief Innovation Officer.

For Aurecon, this means finding new ways to transform clients' businesses and help them become more competitive through innovation.

"Innovation is grounded on deep technical expertise, but it's not enough to invest in being 'smart'. We need to foster creativity, challenge the 'status quo', explore and experiment to envision what's possible," believes McGuire.

In line with this, the company's new blog, Just Imagine, explores ideas that are probable, possible and for the imagination. Forward thinking, imaginative and innovative, the content is everything but the ordinary. It seeks to push the boundaries and imagine what might be possible if we challenge the status quo, asking 'What if...?' and 'Why not...?' across a broad spectrum of leadership and business theories and ideologies, technological innovations and processes.

Enquiries: Email [Jody.boshoff@aurecongroup.com](mailto:Jody.boshoff@aurecongroup.com)  
Visit [www.aurecongroup.com](http://www.aurecongroup.com)



## World's first thermal imaging clamp meter

In the new FLIR CM174, the world's first thermal imaging clamp meter with IGM (Infrared Guided Measurement), electricians have a highly effective tool for quick and efficient troubleshooting.

For a long time, electricians investigated complex compounded problems by chasing down the cause – one electrical measurement at a time. A lot of the time the true source of the problem was never found, leading to call-backs from customers asking the electrician to fix the same issue over and over again.

Not only did they waste time troubleshooting problems they thought they had

resolved, but they also put their safety at risk without knowing what dangers they faced. The FLIR CM174 puts an end to any uncertainty.

The FLIR CM174 600 A ac/dc Clamp Meter has a built-in thermal camera that powers the FLIR IGM technology, which visually guides users to temperature differences and pinpoints anomalies, so they can fix the system, not just the fault, to get the equipment up and running and ensure that it will not go down again.

Electricians may even find new issues they didn't expect to see, expanding their scope of work and resulting in more busi-

ness. For instance, they might have a hunch that a faulty motor controller caused an equipment failure, but after using FLIR CM174 they discover that an overheating motor or a loose connection was to blame.

Enquiries: Email [sales@flir.uk.com](mailto:sales@flir.uk.com)





## Africa Energy Indaba 2015

The 8<sup>th</sup> Africa Energy Indaba, organised by Siyenza, was held on 16 – 17 February 2016 at the Sandton Convention Centre in Johannesburg, South Africa. The associated Women in Energy Conference took place on 15 February.



Keynote speakers at the Women in Energy Conference (a component of the Africa Energy Indaba): H.E. Dr. Elham Mahmood Ahmed Ibrahim, Commissioner, Infrastructure and Energy (African Union Commission); Thembisile Majola (Deputy Minister, Department of Energy, South Africa); Geraldine Fraser-Moleketi (Special Envoy on Gender, African Development Bank).



Brian Statham (Africa Energy Indaba Chair) and Dr Christoph Frei (Secretary General, World Energy Council).



The Hon. Dr. Samuel Undenge, Minister in the Ministry of Energy and Power Development, Zimbabwe.



STAG African: Thami Khanyile (Director) and Adam Essa. ZESCO: Dillion Chipungu (Board Chairman).



Zimbabwe Energy Regulatory Authority (ZERA): Gladman Njanji.



Thomas Motheko, Energy Training Foundation and Rajan Moodley, Investonomics.





*Sifiso Dladla of ZingCo on the Zing bike.*



*Tnei: Charlotte Higgins and Kumbuyani Chisoro.*



*Alejandra Curcio and Dr. Guillermo Pinedo, Embassy of Spain.*



*SANEDI: Wendy Jali, Wandile Langa, Khothatso Mpheqeke, Bronwyn Grant.*



*Santa Scheepers (ZingCo), Yolanda de Lange (Energy Training Foundation (EnTF) and Payge Scallan (Investonomics) with the exciting Energy Awareness Game which teaches energy saving techniques.*



*LiGe Eco-mc2: Warwick Leaper and Magriet Leaper.*

Aurecon



Country Manager,  
Angola  
Carlos Seara



Global Design to  
Innovate Director  
Maureen Thurston



Chief Financial Officer  
Andrew Muller



Managing Director, Clients  
and member of Executive  
Committee. Michael Shirley

|                                  |                          |                              |                              |
|----------------------------------|--------------------------|------------------------------|------------------------------|
| ABB.....49                       | H3Squared.....2          | Omron.....16                 | Voltex ..... IFC             |
| Beckhoff .....13                 | HB Systems.....12        | Phoenix Contact .....14      | WIKA .....29                 |
| Cummins Power Generation .....45 | Helukabel .....35        | R&C Instrumentation.....40   | Wilec ..... IBC              |
| Endress+Hauser .....47           | ifm electronic ..... OBC | Schneider Electric ..... ðFC | Woodbeam.....19              |
| Engen.....15                     | Krohne .....39           | VEGA .....41                 | ZEST WEG Group Africa.....33 |

INDEX TO ADVERTISERS

**Power & Electricity World Africa**

15 – 16 March 2016,

Sandton Convention Centre

This conference is in its 19<sup>th</sup> 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](mailto: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](mailto:info@spintelligent.com)**

...

**POWER-GEN Africa 2016 & DistribuTECH Africa**

19 – 21 July 2016, Sandton Convention Centre

POWER-GEN Africa and its sister event, DistribuTECH Africa, will once again provide comprehen-

sive coverage of the power needs, resources and issues facing the electricity generation industries across sub-Saharan Africa.

**Enquiries:**

**Email [registration@pennwell.com](mailto:registration@pennwell.com)**

...

**Electra Mining Africa**

12 – 16 September 2016,

Expo Centre, Johannesburg

**Enquiries: Email [leatitiavs@specialised.com](mailto:leatitiavs@specialised.com)**

...

**SAEEC 2016 - 11<sup>th</sup> Annual Southern African Energy Efficiency Convention**

8 – 9 November 2016,

Gauteng, South Africa

Bringing together energy management/engineering, environmental, facilities building upgrades, cogeneration, power generation, efficiency improvement industries to discuss RE, power generation, lighting efficiency, thermal storage and more.

**Enquiries: Email [marketing@saeec.org.za](mailto:marketing@saeec.org.za)**

# Green Transformers

Ester Dielectric Fluid application in Transformers



**envirotemp**  
ester dielectric fluids

**FR3**  
ENVIROTEMP™ NATURAL ESTER FLUID

**200**  
ENVIROTEMP™ SYNTHETIC ESTER FLUID

### Increasing transformers capacity up to 20%

- Additional overloading capability while maintaining life expectation and footprint for large population growth areas
- More compact transformers
- Kraft paper + Envirotemp FR3

### Green Transformer more compact and more efficient

- 15% lower oil volume
- Up to 18% less copper
- About 5% less general materials
- Extended life expectancy

**WILEC**

A division of ACTOM (Pty) Ltd

**Transwire**

**08611WILEC**

Johannesburg (Head Office) +27 (0)11 629 9300 Durban +27 (0)31 569 4883  
Cape Town +27 (0)21 556 5720 Middelburg +27 (0)13 246 2330/1  
sales@wilec.co.za www.wilec.co.za



Envirotemp, FR3 and Envirotemp 200 are trademarks of Cargill, Inc.

ifm electronic



# New benchmark in thermal flow measurement

Calorimetric flow meter for liquids and gases

 **IO-Link**

**TOP  
PRODUCT**

- ✓ Optimised for water, oils, glycol and air
- ✓ Fast response time and integrated temperature measurement
- ✓ Red/green colour change for process values
- ✓ Internal pipe diameter selectable from 15...400 mm
- ✓ The process connection can be rotated for optimum alignment
- ✓ Industry 4.0



National: 0861 IFM RSA (436 772)  
International: +27 12 450 0400

Centurion, Durban, Rustenburg, Port Elizabeth,  
Vaal Triangle, Klerksdorp, Richards Bay, Lydenburg,  
Cape Town, Northern Cape, Namibian Subsidiary