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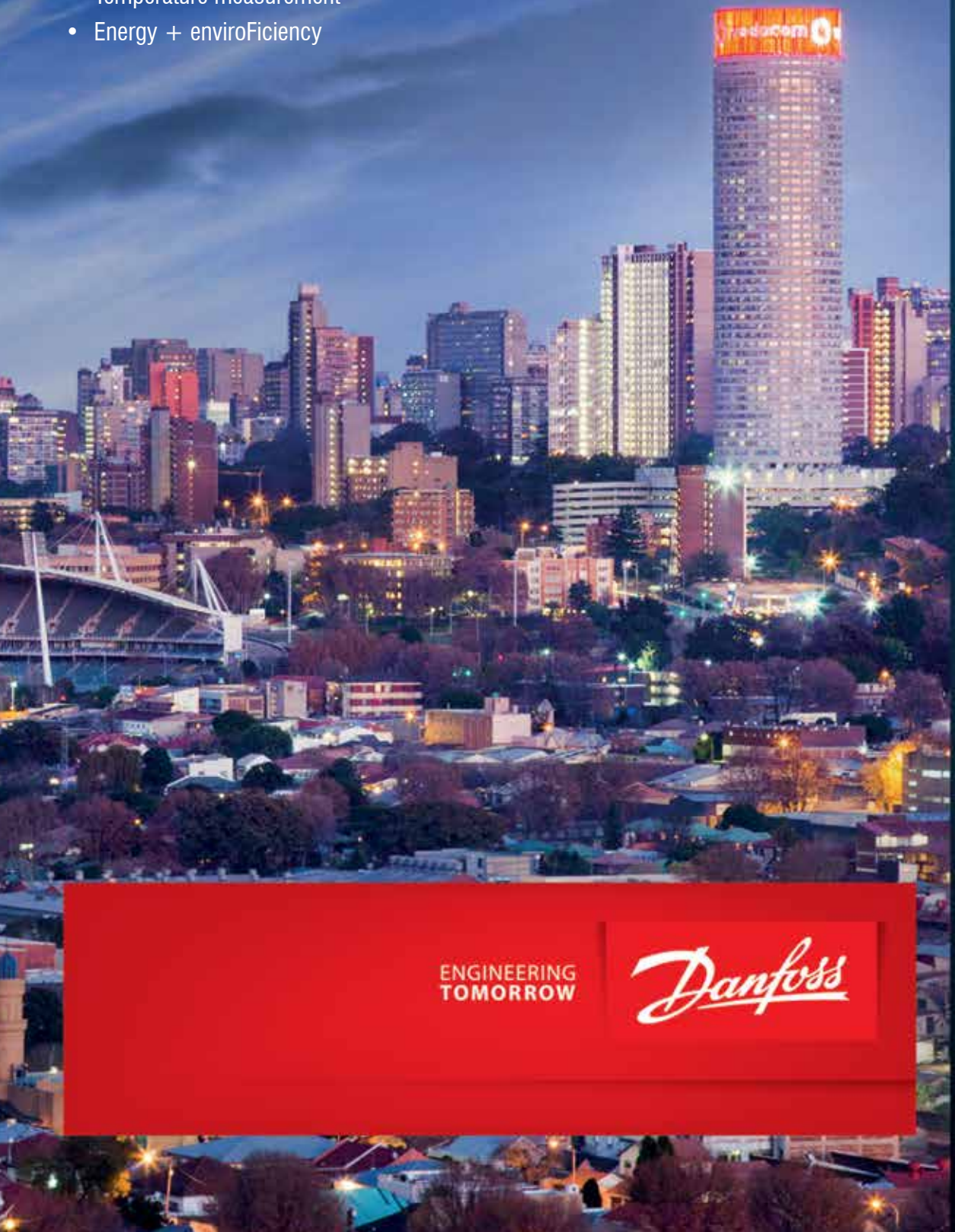

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It has become a tradition for me to write about the Eskom Expo for Young Scientists at this time of year. The event inevitably fills me with immense pride as I see what young people can do.

Is there evidence of naiveté? Sure there is! Is there evidence of bad scientific process? Sure there is! Is there evidence of bad reports and data analysis? Sure there is! But make no mistake, most of these young people are far beyond where we were at that age.

It is important to understand the role of the professionals interacting with them. One needs to remember that these young scholars have not, in many cases, learned about of the rules of the universe. So they dream up interesting things to investigate. Some of them (perpetual motion springs to mind) are crazy. But let them do it! And, if anyone of them gets something like that to work ... well, wouldn't it be amazing!

The point is, they do not get it to work. And our challenge is to guide them in the understanding of their own findings - without belittling or discouraging them. You learn by doing stuff, finding out on your own. Books are useful – yet nothing compared to the lab. Once the lessons have been learned, you have a budding young scientist. This year had a poignancy to it. I interacted with these bright young minds - from all over the country and from all walks of life - and realised how they were genuinely there for each other. I watched groups from far-flung rural areas cheering for their new found friends from top city schools.

While it gave me absolute hope for the future, I found myself wondering how, exactly, another burnt bus, or burned library, or looted shop contributes to the vision of free, quality, decolonised education for all. I am not able to figure that out yet.

I wonder if some of the bright young folk I saw at the Eskom Expo for Young Scientists may be able to.

The November edition of Electricity + Control represents the 30th anniversary of Crown Publications and of this magazine.

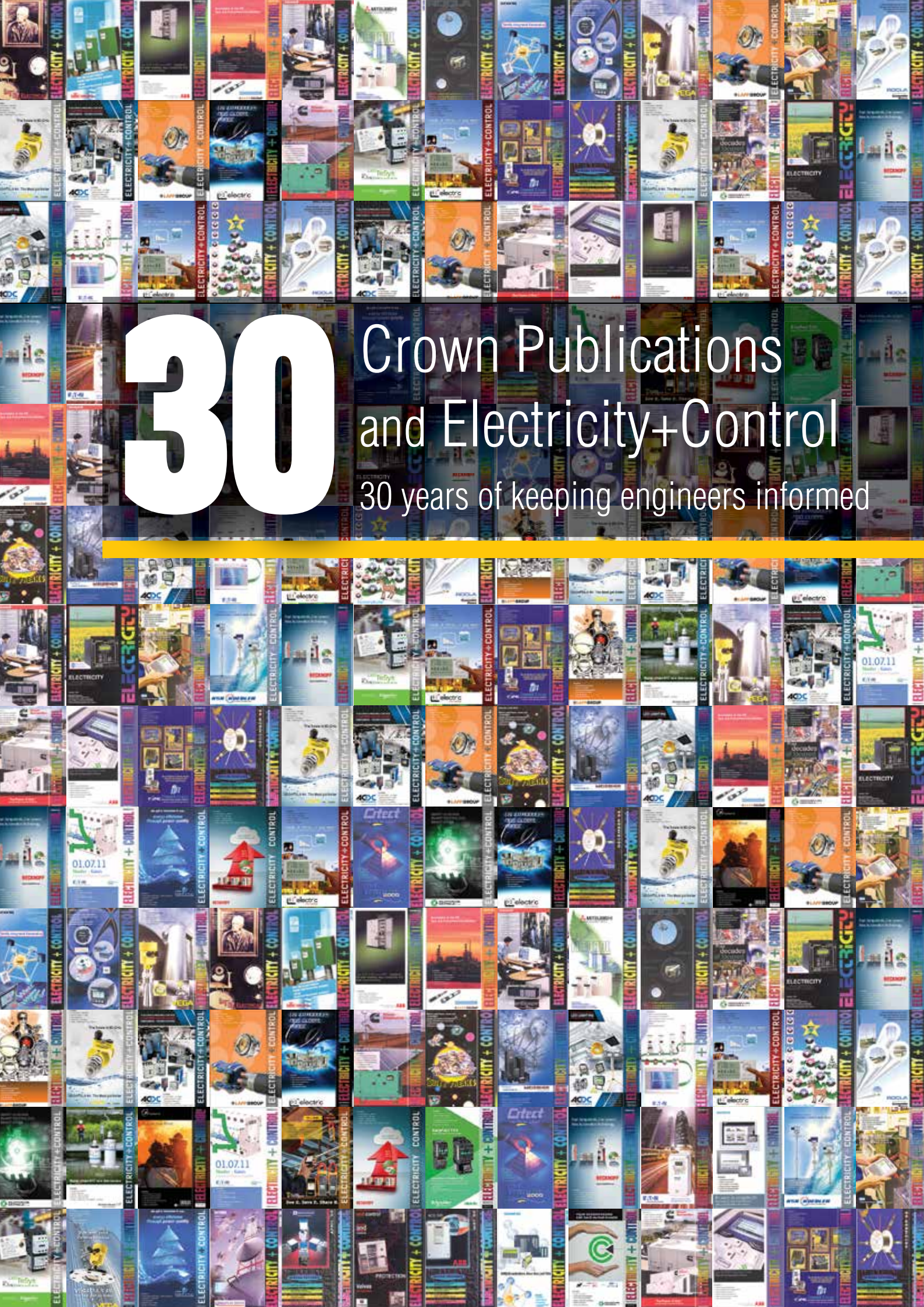
The magazine was launched, as Electricity SA, in November 1986 by Jenny Warwick. Rebranding to the title Electricity + Control happened during 1990 at a time when I was privileged to become involved, initially with Mick Crabtree as co-editor. I also worked with consultant, Dag Hammerschlag. I learned huge amounts from these two individuals who significantly influenced my understanding of the role of 'engineer' in the profession.

Thirty years is a long time and I would like to thank our advertisers, our readers and our editorial contributors for the support they have given us for three decades. The landscape has changed, many times, so it means a lot to us that many of our advertisers, those who placed advertisements in the very first issue, are still with us today.

These include Aberdare Cables, African Cables (now CBi electric: african cables), ATC (now CBi electric: telecom cables, Asea (now ABB), Hawker Siddeley (now part of the Zest WEG Group), Newelec, Phambili Interface (now Voltex), Fuch (now CBi-electric: low voltage), Three-D Agencies and Telemecanique (now Schneider Electric). In the past three decades, the economic outlook of our country has shifted many times and we are in a particularly tough patch at the moment. But, have no doubt, this will change too, as it always does.

I would like to thank our publisher, Karen Grant; deputy editor, Wilhelm du Plessis; editor Wendy Izgorsek; Helen Couvaras and Heidi Jandrell our sales managers; and Adel Bothma our layout artist, for their excellent contributions to Electricity+Control over so many years and to wish them continued success as we tackle the new era ahead!

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



30 Crown Publications and Electricity+Control

30 years of keeping engineers informed

CONTENTS

Control systems + automation

Drives, motors + switchgear

Plant maintenance, test + measurement

Temperature measurement

Energy + enviroFiciency

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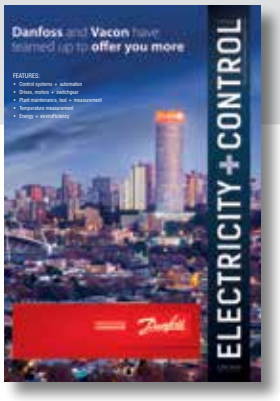


Cover

Low voltage and medium voltage **Danfoss LT® and VACON®** drives are used with all major motor brands and technologies in power sizes from small to large. *Read more on page 25.*

Regulars

Grundfos **'Living Lab'**

Sven Goldstein, Beckhoff

Intelligent energy monitoring with the Microsoft Azure IoT Suite and TwinCAT IoT.

As part of a project to explore energy monitoring and smart metering technologies, Grundfos, Microsoft and Beckhoff have equipped the 'Grundfos Kollegiet' student dormitory in the Danish town of Århus with intelligent PLC systems that transmit data to an energy monitoring system in Microsoft's Azure cloud computing platform. The dormitory is near the town's port district and was built in accordance with the most advanced energy efficiency standards and equipped with the latest building and automation technology. The energy monitoring system creates a database for optimising building operations. By including the residents of the 'Living Lab' in the project itself, the building owners can increase efficiency without reducing the residents' comfort.

First version

The first version of the Grundfos project was implemented as early as 2012 by installing a special server infrastructure and database in the building. As the monitoring cycles grew shorter and the amount of data needed for the seamless analysis of current and historical conditions larger, administering this IT infrastructure became increasingly expensive in terms of both money and personnel. Protecting access to all this data by various groups of users also required increasingly complex systems.

Redesign

In order to meet these requirements in the future, the parties involved in the project decided in 2015 to redesign the project and migrate the server infrastructures to a cloud-based system. As part of this change, Beckhoff's highly scalable control technology demonstrated its flexibility, providing a seamless retrofit of the local building automation platform with a link to the cloud. The PLCs and I/O subsystems now transmit the energy data to the cloud-based system via TwinCAT IoT software, which is easy to configure and does not require programming.

> *Access to the energy monitoring data from the 'Living Lab' can be defined and enabled for a wide range of user groups.*

Microsoft's Azure cloud platform

Microsoft's Azure cloud platform provides everything necessary to create a fast, scalable infrastructure for processing and storing the data.

Access to the energy monitoring data from the 'Living Lab' can be defined and enabled for a wide range of user groups. The information is made available to the building's residents and management, as well as to the research and technology department of Grundfos.

By conducting various studies in connection with the residents and the building management system, Grundfos hopes to use the data to identify new usage options for its current products, as well as for new product offerings and business models. Also involved is the University of Århus, which analyses the connection between resident behaviour and energy usage.

GUI – Geographical User Interface
I/O – Input/Output
IoT – Internet of Things
IT – Information Technology
OPC UA – Open Platform Communications – Unified Architecture
PC – Personal Computer
PLC – Programmable Logic Controller
SQL – Structured Query Language

Abbreviations/Acronyms

Energy monitoring system

The energy monitoring system is used to store and analyse all energy consumption data, as well as for managing alarms. The 12 floors of the building house 156 residential units, with 3 000 sensors that collect energy data every three seconds and transmit them to the higher-level system. The sensors are linked to Beckhoff BC9191 Bus Couplers and CX9020 Embedded PCs.

A central Beckhoff Industrial PC runs the TwinCAT IoT Data Agent software to collect sensor data via OPC-UA and functions as the gateway to Microsoft's Azure cloud, in particular the Azure IoT Hub. The TwinCAT IoT Data Agent effectively separates the PLC systems from the cloud environment.

Thanks to the publisher/subscriber mechanisms and communication via the Azure IoT Hub as a central message broker, there is no need for the devices and services involved in the communication process to divulge their addresses to each other. They communicate exclusively via the central broker, which handles all message addressing functions.

From the perspective of the firewall placed in front of the gateway PC, the data communication provides an encrypted link for both transmitted and received messages, and the firewall makes it possible to completely block all incoming communications, thus preventing any unwanted access from the outside. This protects the residents' personal data, the companies' intellectual property and building operations from accidental or intentional manipulation.

Graphical user interface

The Data Agent's Graphical User Interface (GUI) makes it easy to configure the sensor data for transmission to the Azure IoT Hub. Through various parameters, the administrator can also define when the transmission will be initiated: cyclically, when certain values change or when certain actions are executed.

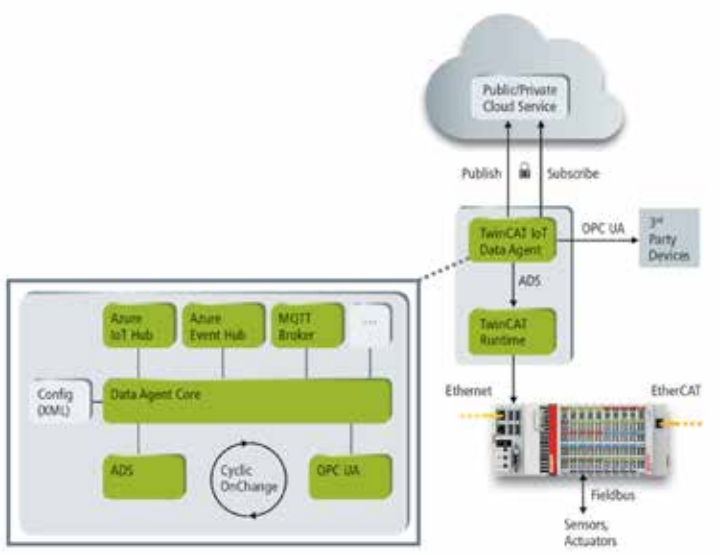
Internal buffering mechanisms also ensure that any missing sensor data will be transmitted after a power failure. If the connection fails, the TwinCAT IoT Data Agent records a timestamp. As soon as the connection has been restored, the Data Agent retrieves the missing data from its internal memory and sends it to the Azure IoT Hub.

Azure IoT Hub

As a central and secure message-based connectivity service, the Azure IoT Hub is responsible for receiving and forwarding the energy data

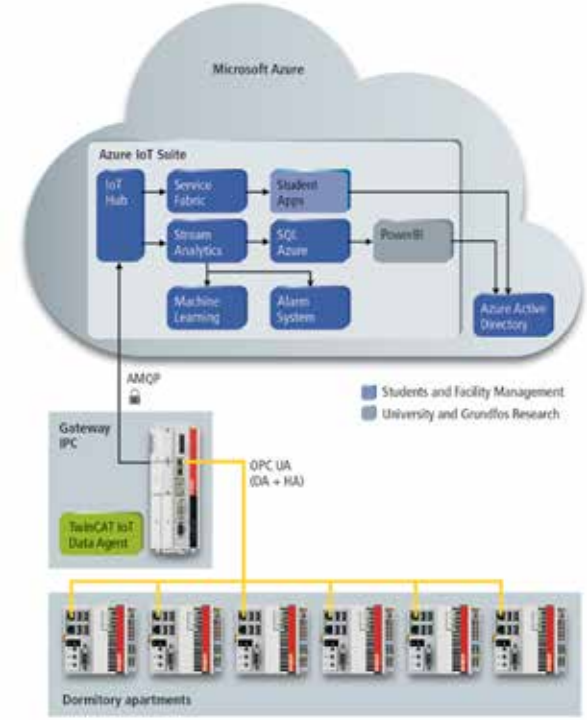
to all participating cloud services within Microsoft Azure. Further analysis of the energy data is possible with the help of the Microsoft IoT Suite, which administers the devices and collects raw data for processing via the Azure SQL Data Warehouse and PowerBI. Azure Stream Analytics and Azure Machine Learning are used to detect anomalies. Special algorithms in these services recognise whether the values detected by the sensors over a specific period fall outside the normal range or could possibly not be recorded. If such an event occurs, the system issues an alarm via e-mail.

In addition, the various user groups such as the student residents can access the energy data via a special programming interface to develop their own apps or algorithms, as part of a project or to meet college course requirements, for example. The programming interface, which includes a function for retrieving historical energy data, is based on the Azure Service Fabric. The data is protected via Azure's Active Directory and Application Insights services, which authenticate the various user groups.



Conclusion

As this project demonstrates in impressive detail, the Data Agent can be used to easily retrofit older, existing control systems with new technologies and connect them to the cloud. This is all possible without having to modify the actual TwinCAT automation project, protecting the investments made in existing systems. Using cloud-based services also makes it possible to flexibly adapt systems to changing needs without having to invest in your own hardware or software, which also significantly reduces operator costs.



take note

- A student dormitory (Grundfos) in Denmark has become a 'living lab' to explore energy monitoring and smart metering.
- The dormitory is equipped with intelligent PLC systems that transmit data to an energy monitoring system in Microsoft's Azure cloud computing platform.
- The energy monitoring system is used to store and analyse all energy consumption data and manage alarms.

Sven Goldstein is a product manager of TwinCAT, Connectivity & IoT at Beckhoff Automation.
Enquiries: Kenneth McPherson. Email kennethm@beckhoff.com

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Remote Access Solutions: How, when and which Clouds?

Doron Kowensky, H3iSquared

Knowledge and skill are required to complete configurations for remote access solutions.

Most if not all control systems are in the process of migrating or have migrated to an Ethernet based solution for their backbone communication infrastructure. There are numerous motivations for this such as expandability, open standards, security ... and many more. Once customers start enjoying some of the benefits from Ethernet, their next question is: How can they get secure remote access to their systems?

This request has become extremely popular over recent years from remote engineering access to home users wanting to view IP Camera's or even control devices in their houses. There are two ways in order to gain remote access (access through an unsecure network such as the internet) to your private network:

- Direct connection to the private networks via open ports (service-based ports such as VPN)
- Cloud-based solutions (hosted internally or with a third party provider)

When a private network connects to the internet, its router would receive a Global IP Address (IP Address on the internet) that uniquely identifies its router on the internet. A Global IP Address from an ISP is dynamically allocated and can change up to every 12 hours. As we would be using this GLOBAL IP Address for our remote access, we need to know what the address is all the time or we don't know how to connect. There are two common solutions to this:

- ***Request a STATIC IP Address from your ISP***
  This means your Global IP Address will never change.
- ***Make use of Dynamic DNS (Domain Name Search) services such as DYNDNS***
  Instead of using an actual IP Address to connect to your remote network, you could use a predefined URL which would ALWAYS be updated to the most current Dynamic IP Address received from your ISP.

Now that we have ensured a way to always know we are trying to connect to the correct GLOBAL IP ADDRESS (Correct Private Network) we then need to identify the services required. Each GLOBAL IP Address has numerous ports allocated to it where each port can represent a different service i.e.

- Port 21 FTP – File Transfer Protocol
- Port 25 SMTP – Sending Email
- Port 80 HTTP – Web Browsing/CCTV Camera
- Port 110 POP3 – Receiving email
- Port 443 UDP L2TP – VPN Dialup
- Port 1723 TCP PPTP – VPN Dialup

In order for a direct connection to work, we need to ensure the ISP (Internet Service Provider) allows an inbound message. (This means the ISP would allow a request from the internet to pass through their systems and forward the request directly to the router on the ports required – most if not all ADSL solutions cater for this, but with SIM Cards some additional effort is required to have this enabled).

Once we know traffic from the internet is being correctly forwarded to the router then the next step is to configure routing table, port forwarding and firewall rules to ensure the correct devices can securely connect (with authentication) and communicate. The router should BLOCK ALL traffic so none of these services should be able to work remotely, unless we open the specific port relating to the service required.

A strong IDS/IPS (Intrusion Detection System/Intrusion Protection System) would prevent and warn the administrators about any potential DoS (Denial of Service) attacks or similar. As we can see, for this remote access solution, some knowledge and specialised skills are required to complete the configuration.

Cloud-based

A Cloud solution would be made up of three parts:

- The collection of servers on the internet (these servers would have all required port forwards enabled as part of the default set-up)
- Device you wish to access (PC/Server onsite)
- Device you are connecting from (Laptop/PC)

A client would be loaded on the PC/Server you wish to access as well as on the Laptop/PC from which you would be connecting. Any client would need username and passwords entered in order for correct authorisation and access. When you connect with the client on your laptop/PC, this will then access through the Cloud which in turn would pass

take note

- The Cloud solution is generally hosted by a third party provider.
- There have been numerous Cloud breaches following Cloud hacks.
- Steps need to be taken to ensure the safety of data if using Cloud-based solutions.

ADSL	– Asymmetric digital subscriber line
CCTV	– Closed Circuit Television
DNS	– Domain Name System
DoS	– Denial of Service
DYNDNS	– DYNamic Domain Name System
FTP	– File Transfer Protocol
HTTP	– Hypertext Transfer Protocol
IDS	– Intrusion Detection System
IPS	– Intrusion Protection System
IIoT	– Industrial Internet of Things
IoT	– Internet of Things
IP	– Internet Protocol
ISP	– Internet Service Provider
M2M	– Machine-toMachine
PPTP	– Point-to-Point Tunneling Protocol
SIM	– Subscriber Identity Module
SMPT	– Simple Mail Transfer Protocol
TCP	– Transmission Control Protocol
UDP	– User Datagram Protocol
URL	– Uniform Resource Locator
VPB	– Volume Parameter Block

Abbreviations/Acronyms

access through the Cloud to your Server/PC on the private network. The Cloud solution is generally hosted by a third party provider. As you can see this is a much easier to implement solution with fewer skills required and is therefore a very attractive option for most users.

Practicality

Now that we understand the core differences between cloud based remote access and direct remote access it is a good idea to look further into security risks with each option.

While I do enjoy making use of the easy set-up for Cloud based solutions I do find it very concerning that potentially highly confidential information and access would be stored on hardware that you are NOT responsible for. If you are not responsible for the hardware who would take ownership for lost or stolen data upon an incident? I only ask this because of the numerous Cloud breaches in the past as per following cloud hacks and outages examples:

- TeamViewer (2016)
- DropBox (August 2016)
- iCloud (2014 biggest breach; every three to six months)
- MWeb VMWare Crash (2015)
- IS VMWare Outage (2015)

> *Be mindful of the security risks that come with emerging technologies.*

So if you are making use of third party Cloud based solutions, have you taken the steps required to ensure the safety or your data on their third party solutions? Have you determined who will take ownership of accountability upon an event?

While on the topic of sending data through a potentially untrusted network such as the internet to a Cloud solution, this also then introduces the topic of Internet of Things and Industrial Internet of Things (IoT, IIoT). While IoT would make use of third party servers and mostly be sending data on usage details rather than receiving commands, IIoT would be more interested to have this in their own privatised secure internal Cloud, assuming they have the internal capability for maintenance and security upkeep on the system.

One definition for IoT is: The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

One definition for IIoT is: The Industrial Internet of Things (IIoT) is the use of Internet of Things (IoT) technologies in manufacturing.

Also known as the Industrial Internet, IIoT incorporates machine learning and big data technology, harnessing the sensor data, machine-to-machine (M2M) communication and automation technologies that have existed in industrial settings for years. The driving philosophy behind the IIoT is that smart machines are better than humans at accurately, consistently capturing and communicating data. This data can enable companies to pick up on inefficiencies and problems sooner, saving time and money and supporting business intelligence efforts. In manufacturing specifically, IIoT holds great potential for quality control, sustainable and green practices, supply chain traceability and overall supply chain efficiency. *www.TechTarget.com*

While the concept of IoT is great for manufacturers of refrigerators and such to get additional information on how to better streamline usage, as it would send data through your internet connection to their cloud. However it is important to understand the key difference between IoT and IIoT as IoT would almost always make use of a 3rd party Cloud where IIoT has more sensitive information and IP (Intellectual Property) that is only for internal use and therefore their clouds would be hosted and managed internally.

While there are great advances and huge advantages of these technologies, such as Cloud based remote access, cloud based storage and IIoT, it is even more crucially important than before to ensure you have the correct use for each relevant application and that security is always on the front of your mind with the different types of emerging technologies.

Conclusion

As technology is emerging to help make our lives easier, there could be certain security risks that come with it and we should be mindful of those risks and ensure we are not exposing ourselves by using the incorrect technology for the incorrect applications.

Doron Kowensky has been working with Industrial Ethernet and IP-based systems for over 10 years and has intimate knowledge of the design, implementation and maintenance of such mission critical applications. He started H3iSquared in 2006 to better serve the industry with products that are leaders in their class. He has provided infrastructure for automation systems, IP telephony and video solutions to the Industrial and Utility industries and is deeply concerned about supporting his customers quickly and effectively. Doron also provides extensive training and is a supporter of institutions such as CPUT (Cape Peninsula University of Technology) for the professional development of students. Enquiries: Email doron@h3isquared.com

Sensor solutions for shuttle systems in intralogistics

Operators in the field of intralogistics are under pressure to achieve greater throughput, while remaining agile and flexible. This necessitates ever more efficient utilisation of space as well as more sustainable use of resources including shuttle solutions.

This, in turn, places higher demands on the growing requirements for small but still powerful sensor solutions and automation components. This requirement should be seen in the context of Industry 4.0, including networked devices.

Leuze, available from **Countapulse Controls,** offers high-end solutions with application know-how in all areas of intralogistics, and the significant advantage of this is that the solution is from a single source. One mega trend in intralogistics, which can attributed to the rapidly developing e-commerce sector, is the volatility of markets and competitive conditions. On the one hand, there are increasing volumes of parcels that need to be shipped. This results in increases order picking and associated processing.

On the other hand, smaller orders cause growing uncertainty for the manufacturer and this impacts on forward planning. As a result, procurement, production and distribution become considerably more complex.

This scenario makes innovation topics such as Industry 4.0 ever more important for intralogistics. And increases the need to create integrated networking and transparency as well as to constantly improve speeds, precision, flexibility and availabilities.

The growing demands that all intralogistics applications place on sensors are particularly evident in modern shuttle solutions. Shuttles are extremely flexible, dynamic and, not least, resource-friendly with regard to space utilisation and energy consumption.

For systems such as these, reliable, space saving sensors are needed for fine positioning, for the detection of free spaces, presence monitoring and for collision prevention. For all these tasks, Leuze offers suitable solutions that ensure availability and can be easily and quickly mounted and commissioned.

Optical distance sensors are used in shuttle systems for compartment occupation checks, collision protection or positioning applications. These smart sensors have a high tolerance to colour and material differences, and offer precise surface and angle detection making for reliable operation.

Whether organic surfaces such as wood, metal or plastics, and whether matt, deep black or glossy, the Leuze ODS 10 and HT 10 optical distance sensors offer a constant switching point. These sensors function reliably even in changing environmental conditions or materials as well as with various object detection angles. This is particularly useful with objects that are not exactly aligned or that are being rapidly transported. As a result, detection errors are avoided and complicated readjustment is eliminated.

With respect to the electrical connections and the number of I/Os, the Leuze ODS 10 and HT 10 sensors can be adapted to individual application requirements, offering optimum flexibility.

Both device models provide an IO-Link interface ready for Industry 4.0. In this way, diagnostic data can be transferred in real time and alert the user timeously to any impending failure, for example excessive soiling of goods being handled or misalignment.

In addition to these measuring distance sensors, miniaturised sensors, such as photoelectric sensors and light diffuse sensors, are preferred for use in shuttles. This is due to the limited available space.

Leuze LSR 2 throughbeam photoelectric sensors or Leuze PRK 2 retro-reflective photoelectric sensors are ideal on the outer edge of the shuttle where overhang controls can be implemented simply but very effectively. Leuze PRK 3B retro-reflective photoelectric sensors or Leuze HRT 3B diffuse sensors can be used at the end of aisles or for reference runs. This will allow detection of the reference points with maximum precision using scanning or reflective technology.

Leuze HRTL 3B diffuse sensors are predestined for compartment fine positioning, while Leuze 3B series sensors offer a range of unique features and the largest selection of functions available from any device currently available on the market.

In addition to the sizes and sensor types already mentioned, Leuze offers an extensive range of products with countless functions for every application field in intralogistics.

Enquiries: Gerry Bryant. Tel. +27 011 615 7556 or email bryant@countapulse.co.za

New handheld communicator for efficient maintenance

Emerson Automation Solutions has introduced the AMS Trex Device Communicator, a handheld communicator delivering an intuitive consumer-quality user experience and a brilliant modern display in a tool built to withstand harsh industrial environments. With a task-based graphical user interface built on human-centred design, the Trex communicator makes device and loop diagnostics easy to understand and field activities easier to complete.

"With the Trex communicator, technicians can work more effectively in the field – with fewer tools to manage – anywhere in the plant they need to go," said Duncan Schleiss, vice president, reliability solutions marketing, Emerson Automation Solutions.

Protected against moisture and extreme temperatures, the Trex communicator boasts a rugged design that can withstand the bumps and drops that come from normal use in the plant. The large, full-colour touch-screen display adjusts to lighting conditions and aids troubleshooting in areas where too much or too little light makes other devices difficult to read.

With intrinsic safety certifications, the Trex communicator is certified to go anywhere a technician can go, with no need to shut a process down or get a hot work permit. Long-life batteries ensure that the communicator keeps working even through long days.

Enquiries: Visit www.emerson.com/trex

New sensor redefines the vision system market

The FQ vision sensor family provides advanced inspection, code reading and verification capabilities previously only available in higher-end vision systems. With improved performance and expanded functionality, the new FQ2 addresses market requirements for an easy-to-use vision sensor that can address more complex applications. "The FQ2 truly defines a new standard in image inspection and code verification," comments **Omron** Vision specialist Josh Hodgkinson. Due to its compact design, the FQ2 can fit easily into confined spaces. Unlike conventional vision sensors with multiple components, it is available in a single, all-in-one package. In addition, the FQ2 supports a diverse range of inspection items, including shape search, colour inspection, OCR, code reading and verification.

Multiple inspection and positioning tasks can be performed using a single sensor. For example, the position of an entire tray of ICs can be adjusted on the image itself prior to inspection. This saves time by reducing the work needed to boost the positioning accuracy. As the sensor can measure angles of rotation and other positional information, it can also be used for positioning.

Searches can be carried out to detect items such as labels, and to identify shapes or positions. Shape searches generally run into difficulties when it comes to an overlap or 360° rotation. However, the FQ2 achieves high-speed (up to ten times faster) stable searching of any shapes that match the model. Multiple searches can be performed simultaneously, which enables inspection of a group of items, such as in a tray, or for picking applications.

Enquiries: Tel. +27 (0) 11 579 2600 or email info.sa@eu.omron.com

Driving the future of CSP with advanced steam turbines

Having set the African record of 161 hours for continuous operation at a load factor of 76% before an inclement weather interruption during its first month of operation, the Bokpoort concentrated solar plant (CSP) in the Northern Cape is a shining example of the immense potential of CSP technology as a renewable energy source.

Powered by a **Siemens** SST-700 two-casing steam turbine generator set, the multi-billion rand Bokpoort plant also boasts 9,3 hours of storage, thanks to molten salt storage facilities that act as a massive rechargeable battery. Bokpoort is among the most efficient solar plants in the world operating in this class of capacity and technology.

It has a total power generating capacity of 50 MW net power output, and is equipped with the largest thermal storage size ever adopted for a parabolic trough plant. It is expected to yield more than 230 GWh/year to support the national power grid.

An estimated 89 000 TW of solar energy reaches the Earth's surface annually – over 5 000 times more than the average yearly power consumed by humans. With most parts of South Africa averaging more than 2 500 hours of sunshine per year, solar technology is a very viable form of clean renewable energy.

South Africa has emerged as a renewable energy leader and billions of rand is being invested in CSP. The Solar Energy Technology Roadmap (SETRM) – a joint initiative of the Department of Energy and the Department of Science and Technology – estimates that 30 GW of CSP can be developed locally by 2050.

Enquiries: Keshin Govender. Phone: +27 11 652 2000 or email keshin.govender@siemens.com or visit www.twitter.com/siemens_press

Block I/O module

RET Automation Controls offers a communication module with serial interfaces for its ultra compact TBEN-S Ethernet block I/O series: The TBEN-S2-2COM module comes with two serial ports, which can be individually configured as RS232 or RS485 interfaces as required. Two additional slots offer four universal digital inputs or outputs. A Modbus RTU master is also integrated for the RS485 interface, which can connect up to eight Modbus devices. The new TBEN-S2-2COM modules also support Turck's multiprotocol technology and can therefore be run in Profinet, Ethernet/IP or Modbus TCP networks without any intervention required by the user. The slim 32 mm 2COM modules particularly simplify applications requiring the connection of digital signals in restricted spaces next to devices with serial interfaces. Thanks to its IP67 protection, the modules can be mounted directly in the machine and thus reduce the wiring effort required. All parameters of the serial interfaces, such as start-stop bits, parity or baud rate are set simply via GSDML or a parameter software such as Pactware. The power supply of the serial field devices can be set between 5 and 24 V. Other technology modules for SSI and other interfaces will follow as part of the expansion of the TBEN-S series.

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

Windows 10 for panel PCs

Phoenix Contact is equipping its panel PCs in the Embeddedline family with the modern Windows 10 Enterprise operating system.

Windows Embedded Standard 7 is available as an alternative. If applications are not approved for this operating system, the Windows 7 Professional standard operating system can be used.

Phoenix Contact is also adding further functions to the panel PCs with analogue resistive touch display – a new Intel Atom E3845 Quad Core processor is now available as a high-performance CPU for entry-level applications. A robust 2,5" SSD with 240 GB offers plenty of space for demanding applications. Furthermore, two additional electrically isolated CAN interfaces are available as an option. Where space is limited, the Embeddedline PC portfolio now offers the ideal solution in the form of a particularly compact device with 5.7" display.

Enquiries: Patrick Rowland. Tel. +27(0)11 801 8200 or email patrickr@phoenixcontact.co.za

New universal meter with ultra bright or multicolour display

RET Automation Controls has introduced the SUR-457 Universal Indicator from Simex. The SUR-457 is an IP67 wall-mounted indicator with a large 57 mm LED display. The display is available with a multicolour or ultra bright option. The versatility of the measurement inputs and control outputs ensures that this unit is suitable for most industrial applications. Main features:

- Multicolour or ultra bright red, green and blue, 57 mm LED display
- Water tight IP 67 housing
- Displayed values range: -999 to 9999
- Universal input: 0/4-20 mA, 0-10V, 0-150 mV, RTD or TC
- Binary outputs: Relay / Optocoupler; analogue output: active or passive
- Temperature range: -20°C to +50°C
- RS-485 / Modbus RTU
- Free configuration S-Config software

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

RFID I/O compact module for Ethercat

Turck's new BL compact RFID module with an Ethercat interface is now available from **RET Automation Controls**. The robust IP67 I/O module enables the BL ident RFID system to be connected directly to Ethercat master systems. In this way, the controller can read out and process large data sets from the BL ident system. This is executed with acyclic services so that data is always available in the controller at the right time and time-critical and decision-critical data can be processed in real-time. For this Turck provides standard function blocks which are processed in the controller and thus simplify the integration of the RFID system in the system landscape of the user.

With 16 Kbytes of memory per channel the BL compact module provides a sufficiently large memory for processing even large data volumes. Read and write commands can also be saved directly in the module to shorten the reaction time and increase processing speed. This makes it possible for the system to respond more quickly to the application. Like all BL ident modules, the new system also allows the parallel operation of read/write heads in HF and UHF. This gives the user greater flexibility and the choice of the basic RFID technology used to be defined by the application.

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

New ac power supply with integrated energy storage

The new **Phoenix Contact** uninterruptible power supplies (USP) from the TRIO product range for the DIN rail reliably supply ac loads with up to 750 VA/600 W. The power supply is for 230 Vac and 120 Vac applications. Thanks to the integrated USB interface, high-level devices can be connected to it. In this way, any industrial PCs connected to the power supply can be shut down in a controlled way. The pure sine curve at the output enables a seamless transition, as the sine generated in battery operation runs in sync with the mains previously used for the supply. Since a UPS module and energy storage are combined in one housing, the power supply is particularly space-saving. The integrated VRLA energy storage ensures long buffer times and can be extended with a further energy storage unit. Supplying loads from the energy storage is possible, even without mains input. The device also has LED status indicators for signaling and function monitoring, as well as active 24 Vdc switch outputs for forwarding to a higher-level control system.

Enquiries: Tony Rayner. Tel. +27 (0) 11 801 8200 or email tonyr@phoenixcontact.co.za

Ecolink – for demanding applications

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Electric Induction Motors: **Power Management System**

Henry du Preez, Consultant

The author responds to the quote by Dan Jones which suggests that: 'Competition pushes for innovation ahead of regulations in the electric motor industry'.

Dan Jones, acting chief engineer for St. Petersburg, Florida-based Revolution Motor Industries (RMI), claims that: "Government regulations meant to boost electric motor efficiency and curb carbon emissions may have started the race for achieving ever-increasing output with lower energy intakes. But lately it's the industry itself, propelled by competition that has developed engines that can not only meet – but also exceed - the toughest European and U.S. standards".

******

Are we barking up the wrong tree? Should we not be looking at the systems where motors are used? I believe that this is where the greatest savings are possible – by using a system's approach to optimising the motor management. Yes, it is important to improve efficiency but in general, electric motors are efficient at rated power and less efficient at low loads. It is therefore important to use motors more efficiently: This can be done by optimising the energy consumption under varying loads.

On average motors do not operate at, or consistently at, rate motor loads. There are a number of reasons for this; these include the application of compressors, pumps and mechanical presses and others, where the load could drop considerably – even as low as no load for a fair period of the operation. Medium range motors are manufactured in set standard ratings, for example – 37, 45, 55 and 75 kW. So if the load requires a 63 kW peak, a 75 kW motor has to be installed. On average this means that medium rated motors operate as low as 50% of rating.

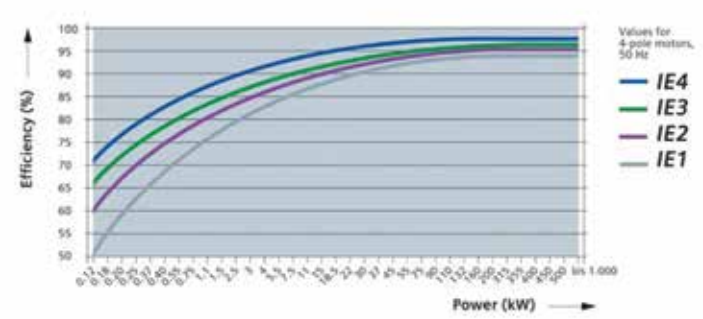

Figure 1: Efficiency curves for 4 pole induction motors as per IEC specification IEC 60034-30-1 [1].

The regulation IEC 60034-30-1 [1] shows the efficiency minimum requirement to be met to comply with categories IE1 to IE4.

As can be seen in *Figure 1* the improvement in efficiency for motors above 37 kW is small.

Coverage of IEC 60034-30-1 [1]

Generally speaking three-phase induction motors for the intermediate range 37 kW to 500 kW are relatively efficient when operated at load close to full rated load.

If we wish to save power the manufacturers would have to improve efficiency at a load lower than the motor rating – bearing in mind that many motors do not operate at a constant load peak efficiency and the Power Factor (PF) should be maintained throughout the operating range.

In terms of numbers of running motors (installed stock), small motors are the most common: 2 billion out of an estimated global total of 2,23 billion are rated at less than 0,75 kW.

The relatively few large motors account for a considerable share of overall motor electricity consumption. It is estimated that medium size motors consume almost three-quarters of the global electricity demand of all motors (Wikström, 2009).

Studies carried out show the approximate world-wide power consumption admittedly 10 years ago, but I do not believe the trend has changed radically.

Top-down analysis provides several preliminary results:

- The estimated total global electricity use of all electric motors in 2006 was between 6 900 TWh and 7 200 TWh
- Electric motors account for between 44% and 46% of total global

DOL – Direct Online
IEC – International Electrotechnical Commission
MTL – Motor Terminal Latency
PF – Power Factor
VFD – Variable Frequency Drive
VSD – Variable Speed Drive

Abbreviations/Acronyms

Limiter Power Management System (patent pending)

A motor power management system which optimises the energy consumption and lifespan of electric induction motors using the technology is available owing to the advances in power electronics and system monitor capabilities.

electricity consumption; industry accounts for 64% of this, the commercial sector for 20% and the residential sector 13% general purpose industrial electric motors of between 0,75 kW and 375 kW consumed 4 700 TWh (68% of the total for all motors); their share of global electricity demand is 30%

- The three economies with the highest electricity consumption for motors are China, the USA and the European Union which collectively consumed 4 000 TWh (56% of global electricity demand for motors); the addition of four more countries (Japan, Russia, Canada and India) adds another 1 200 TWh (18%), which makes a total of 5 200 TWh (74%)
- The net mechanical energy used in motor applications is estimated to be roughly 50% of the electrical energy input into motors (e.g. on average it is thought electric motor systems operate at an efficiency of about 50%). The losses occur in the motors themselves as well as in throttles and dampers, gears, transmissions, clutches, brakes, VFDs, etc. [2]

It is estimated that 67,6% of electricity use by electric motors falls into the medium range between 0,75 and 375 kW, (I believe this is actually between 7,5 kW and 375 kW as although the number of small motors (0,75kw to 7,5 kW) in operation is very large these motors tend to be largely in the domestic market and therefore have very low operating hours in a year [3].

Energy-saving technologies and saving potentials

The most obvious is improvement of component efficiency.

Ac induction motors

Standard ac cage induction motors are probably the cheapest and most effective means of converting electrical energy into rotational mechanical power.

Medium sized motors (7,5 to 375 kW)

The medium range of motors, the largest user of electric power, are manufactured in standard sizes and traded on the world market as a standard, interchangeable product. These products are manufactured to various international standards which means motors from any particular supplier are exchangeable.

Most manufacturers manufacture the motors to meet the requirements of the International Electrotechnical Commission (IEC) specifications, including efficiency. The efficiency classes that cover motors from 0,75 kW to 375 kW, 2 pole, 4 pole, and 6 pole, for both 50 Hz and 60 Hz. The losses in an ac induction motor consist of the following:

- Stator losses
- Rotor losses
- Core (iron) losses
- Stray (additional load) losses
- Friction and windage (mechanical losses)

If each of these points is studied individually, there is always the possibility to reduce the losses in that component. Care must be taken, as changing materials or components can have other effects on the motor performance and characteristics.

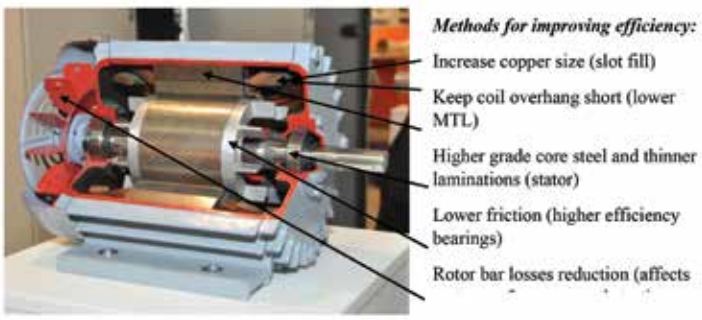

Figure 2: Typical induction motor showing components for potential improvements of efficiency.

All this is relevant but if the motor is operating at 94% or 95% the possible increase in efficiency is going to be small; and 1% increase from 94 to 95% in efficiency of a 55 kW motor running at full load is only going to save 0,616 kW, operating for 300 days a year and eight hours per day. a total of 1 478 kWh – financially not a great amount, but a saving.

Lower range of induction motors (0,75 to 7,5 kW)

There is a large number of these motors in use but the power consumed is relatively small. In this range you find motors used in domestic applications where the usage is low and the efficiencies relatively poor – but the total power consumed is very small. These motors are generally mass produced and have poor efficiency ... as low as 60%.

Mechanical considerations

Transmissions are used in some applications to adjust the speed of the driven equipment. This can have a number of benefits, such as reducing vibration transmitted between the motor and driven machine, and speed change to suit the requirements of the driven equipment. The method used (belt, chain, gears etc.) all have their own advantages and disadvantages. Each method has an efficiency associated with the device used. Belt and chain drives are reasonably common; vee belts' drive efficiency could be as low as 93%, whereas toothed belts' efficiency would be around 98%. Roller chains would be around 98% efficient and gearbox efficiency would depend on type and ratio.

Motor control technology

With the event of power electronics, we now have VSD (VFD) drive systems which enable the motor speed to be controlled, thus optimising the speed characteristic of the load. Many motors have high operating hours but variable loads. The continuing trend by the motor manufacturers is to improve the design of ac induction motors to have a relatively flat efficiency curve between 50% and 100% ... or even up to 125% load.

> *More efficient operation of motors can be achieved by optimising the energy consumption under varying loads.*

There are still large gains to be made by adapting motor speed and torque to suit the required load.

Pumps and fans have input power requirements that vary as a cubic of their rotational speed. With speed adjustment power can be saved owing to the development of power electronics used in VFD drive systems. The traditional systems required use artificial brakes such as control valves, dampers, throttles, bypasses etc.

Operating the driven equipment at an optimum steady speed has a number of benefits to the stop-start operation. Stress on the switchgears, shafts and on the motor windings is greatly reduced, thus increasing the life of the motor.

Stop/start operation with a Direct Online (DOL) system introduces mechanical stresses, switchgear operations and stress on both stator and rotor windings (high torque and acceleration due to high inrush currents at starting). Dc motors were used in the past as the speed could be easily controlled and starting torque was high. Dc machines are expensive and traditionally high maintenance because of commutation and brushes.

VFDs automatically adjust the voltage with frequency according to the formula:

Voltage = 4,44 X Flux X Turns X Frequency

This is to prevent over fluxing the motor and driving it into saturation. VFDs are used to eliminate mechanical systems such as belt, chain or gearboxes which reduce the overall efficiency of the system.

VFDs use electric power more effectively as they optimise the power /speed characteristics of the load (losses in the motor are also reduced). It may be necessary to force cool the motor if the speed is reduced below the fan designer's low speed limit, which would affect the overall efficiency.

Related energy-saving opportunities

The electric motor converts supply electricity into mechanical power, usually in the form of a shaft delivering torque at the required rotational speed to the load machine.

The motor is effectively a converter of electrical power into mechanical energy. The power consumed in the electric motor is the sum of the output mechanical power and all the losses in the motor and any other devices in the system.

The net objective is to save energy while maintaining the mechanical output; this is not only related to the motor but the whole system.

Area of energy efficiency in electric motor systems

We know that the medium range of motors is the major user of electrical power, so this is the major focus of improvement in ef-

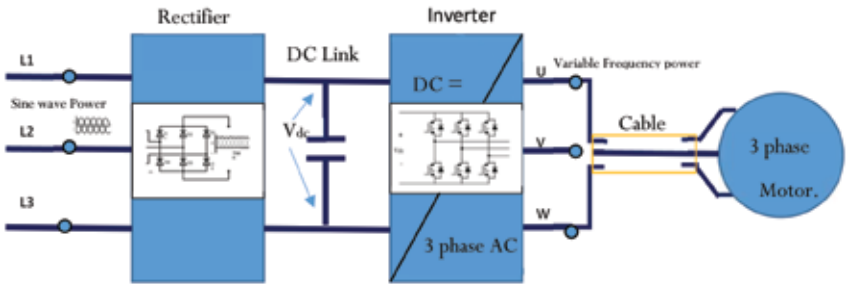

Figure 3: Typical VFD system.

take note

- It is important to use motors more efficiently.
- A system's approach is the only effective solution to optimising motor management.
- A Power Management System, that optimises the energy consumption and lifespan of electric induction motors, exists.

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The Zest WEG Group has been servicing the mining sector for more than 35 years and by leveraging best practice engineering and manufacturing capabilities, the group is able to offer a range of standard off-the-shelf products as well as end-to-end energy solutions.

An in-depth understanding of the harsh conditions found within the mining sector and years of experience on the African continent, have ensured that the Zest WEG Group service offering is fit-for-purpose.

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ficient operation. Large machines are generally manufactured to the specific requirements of the system, whereas the medium range is manufactured to standard sizes and therefore underutilised and operated at a poor overall efficiency. Mechanical means of control are inherently inefficient whereas modern power electronics has provided the advantage of efficient control and operation.

Up to now we have just looked at improving the efficiency of the ac electric induction motor and the use of VFD systems to optimise the speed for efficient operation. There are recently developed systems which combine a number of these features to optimise the energy consumption and lifespan of electrical induction motors. A power management system combines a number of these features in one unit which achieves this offering the following in one competitive unit:

- Soft start
- Speed control (VFD)
- Monitoring of the load and adjusting the input voltage to the motor to optimise the performance of the motor

The first two are generally known and will not be discussed further. The third requires a few pointers:

- We are aware that the torque produced by an induction motor is proportional to the square of the input voltage
- The medium range of a motor very seldom runs at or close to the full rated load; so if we reduce the voltage input to the motor, maintaining the rated or set speed to maintain the required torque, there is a large potential to save power
- If the voltage supply to the motor is reduced, the torque decreases proportionally to the square of the voltage, power is monitored and the voltage controlled to supply sufficient torque; the loss in the motor decreases as a result of reduced current. Iron losses are less due to reduced voltage and current is down due to reduced load, the PF being maintained at the higher value.
- Because the system is fully automated when the motor load drops for any reason, the voltage will be reduced and controlled to take advantage of the lower load condition. If the load increases, voltage is automatically restored

Conclusion

South Africa's generation capacity is stated to be 44 175 MW; if the usage is taken as 75%, the usage would be 33 131 MW, assuming that the electric motor's load is 60% which amounts to 19 878 MW (based on figures quoted in various studies). From the studies as quoted in [2] if we assume that 67% of power is used in medium range motors, this would amount to 13 318 MW.

Making the assumption that 50% of the medium range motors operate on a fluctuating load and only 50% of these are suitable for a power management system with a potential saving of 20%, the capacity saved would be approximately 670 MW – equivalent to one large generator set at one of the newer power stations.

Currently there is a unit available that is a 'Power Management System' which optimises the energy consumption and lifespan of electric induction motors. The unit is a high quality motor management unit which provides the following:

- Soft start
- Controlled shutdown
- Automatic shutdown
- Energy reduction to optimise power savings

VFD speed control for the optimal matching of the speed to best suit the driven equipment:

- Further advantages are its lifespan optimisation because of:
- Reduction in operating vibration
- Reduction in operating temperature
- Motor overload and thermal protection
- Reduction in stresses in the winding due to ramp-up and ramp-down operation
- Reduction in temperature due to effectively controlling power requirement (efficiency and PF)

The system's approach would be the only effective solution to power saving. A management system that optimises the energy consumption use by the motor would be the best way to achieve maximum system efficiency and power savings. Alternative power sources solar, wind etc. should not be discarded but does not save on power consumption.

References

[1] IEC 60034-30-1:2014. Rotating electrical machines - Part 30-1: Efficiency classes of line operated ac motors (IE code).
[2] Waide P, Brunner, CU. Energy-efficiency policy opportunities for electric motor- driven systems. International Energy Agency. Page 39
[3] Limiter Power Management System (patent pending).

Henry du Preez has a BSc degree from the University of the Witwatersrand, an MBL from UNISA, GED electrical engineering (Wits) and an Electrical and Mechanical government certificate of competency. He is a Fellow of the SAIEE and a registered Professional Engineer. He has fifty years' experience in the heavy engineering field, industry and mines and specialises in electrical machines and transformers. He currently works as a consultant, predominantly for repair and maintenance in mining and industry. He offers training courses in the field of machine and transformers aimed at users, engineers, maintenance staff and the repair industry. Enquiries: Email henry@hdupreez.co.za

Lubrication solution for China Star bullet-train project

A lubrication solution from Royal Purple, distributed exclusively in South Africa by wear-control specialist **Filter Focus**, has been specified for the flagship China Star bullet train project.

The bullet trains will be powered by 1 250 kW motors from Zhuzhou that use specially-insulated, resin-coated roller bearings supplied by NSK Bearing Company of Japan. It is essential that the bearings be insulated in order to prevent damage to the raceways and rolling elements caused by electrical arcing.

Each motor incorporates a 170 mm (NH219) grease-lubricated bearing and a 280 mm (NU326) thrust bearing, lubricated by the same oil as the drive gear. The lubricants for the traction motors were selected based on tests carried out at NSK's dedicated traction test facility in Tokyo.

The greases were subjected to high temperatures and speeds in order to detect any leaking, as well as to ascertain adhesion and grease life. A general-purpose lithium complex grease thickener was selected as the standard traction motor bearing grease for the China Star project.

However, the greased motor bearing was subsequently found to overheat at speeds in excess of 160 kph, resulting in high vibrations and reduced bearing life.

The China Locomotive Research Institute began a global search for a grease that would allow the traction motor to run at higher speeds. It eventually settled on Royal Purple's Ultra-Performance Grease No. 2, an aluminium complex EP grease.

High-speed motor tests were conducted with the new lubricants. Not only was a new Chinese rail speed record of 321,5 kph set, but all of the bearings still looked like new after 80 000 km of high-speed testing.

Enquiries: Craig FitzGerald. Email cfitz@filterfocus.co.za

Key role in the power and utilities sectors

The company has completed projects in thermal power generation, renewable power, hydro power, transmission and distribution, potable water treatment plants, wastewater treatment plants and desalination plants.

AECOM was appointed by Alstom for the civil design and construction supervision of the turbine generator island at both Medupi and Kusile power stations. Hitachi tasked it with the civil design and construction supervision of the boiler island, while Tenova appointed it for the materials-handling component at Kusile.

"We are proud to have contributed towards these much-needed installations, notwithstanding the challenges that these projects have faced," Nico Kruger, Business Line Leader Energy – Africa, Resources and Industry at AECOM comments. In South Africa, AECOM is currently busy with a number of renewable projects in the Renewable Energy Independent Power Producer Procurement Programme (REIPPP). In Central and East Africa, it is working on various transmission and distribution projects ranging from 132 kV to 400 kV.

Enquiries: Visit www.aecom.com

X-series agitator for minerals processing

Responding specifically to customer requirements, the new X-series Agitator features an integrated Extended Bearing Distance (EBD). This means it consists of a standard gearbox with a modified output side in order to increase the radial and axial forces. The distance between the low-speed shaft bearings has been increased, while bearings with larger dynamic capacities have been used.

"An integration of the EBD with axial and/or radial bearings into the gearbox is far more cost-efficient for the customer than a purely external bearing configuration mounted on the application," Head of Department – Engineering, **SEW EURODRIVE**, Andreas Meid comments. The main applications for the X-series Agitator are mixers, agitators and aerators, where high radial forces, combined with axial forces, act on the low-speed shaft. "We already have a strong footprint in these sectors with our existing X-series and MC-series Gearbox, and it is anticipated that the new X-series Agitator will only enhance that. What we have done is look at all competitive products available on the market, and incorporated the strongest features in our unit. This means we have a lot of extra selling points, in addition to unique accessories on offer, such as a Condition Monitoring System," Meid explains.

The main advantage of the X-series Agitator is that it is essentially an off-the-shelf unit that uses existing components. The entire design is fully integrated, which makes for a highly efficient and compact unit that is easily maintainable. "Different lubrication options are available, such as bath lubricated with expansion tank, or pressure lubrication with drywell. All the lubrication piping is integrated fully into the unit, which is thermally optimised as well. Different filter options are also available," Meid points out.

Enquiries: Email JKlut@sew.co.za

H H Kanwischer

CELEBRATING 40 YEARS OF LIGHTNING SERVICE

HHK was established in 1976 by Helmut Hermann Kanwischer (HHK). Helmut emigrated in the late 1960's to South Africa and saw the potential in South Africa as having one of the highest ground flash density of lightning discharges in the world. From a humble beginning of having just a simple secretarial service and garage, he developed his business plan and through his vision, innovative thinking, unrelenting determination and will-power, forged the Company into what it has become today.

HHK has become the biggest lightning protection and earthing contracting Company in the Southern Africa region, which has never changed hands, Company name or logo, etc. for the last 40+ years. Their Head Office is in Johannesburg (Northcliff) with eight branch offices and approximately 160 people in their employ. The Company obtained the SABS Quality Management System listing on 16 October 1987 and thereafter has grown from strength to strength. Helmut is also a member on the various SANS/IEC committees/working groups for lightning protection, earthing and surge protection Standards.

HHK provides complete turnkey solutions including design, soil resistivity surveys, installation, final commissioning and certification, as well as 'as built' design drawings approved by SANS for any project from simple golf/bus shelters and residential houses to major structures and mining plants, etc. At present one of their biggest contracts ever is the Husab Mine Project in Namibia with a turnkey value of well over R35 million for the overall lightning protection and earthing installation.

HHK Earthing & Lightning Protection Systems offer the following services:

- Structural lightning protection systems for both industrial and domestic projects, including all mining plants.
- Provide risk assessment and protection level reports.
- The performance of soil resistivity surveys so that an earth can be designed to exact electrical specification rather than by physical dimensions, based on the Wenner and fall of potential methods.
- Resistance test measurements on installed earthing systems for structural lightning protection and electrical earthing systems.
- All installations in strict accordance with SANS Code of Practice 10313 (2012) in conjunction with SANS 62305 and IEC Standards.
- Supply and install high voltage lightning conductor cable – Obo isCon® - for Protection Levels 1 – 4.
- Designs of lightning protection and earthing systems for structures, substations, computer and data systems, exposed power lines, etc, including approval and stamped drawings by SANS.
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DRN asynchronous motor series sets new benchmark for IE3 compliance in Africa

Stricter international regulations have meant that, as of the beginning of last year, all two-, four- and six-pole asynchronous motors with a power rating of 7,5 kW to 375 kW must meet the requirements of energy-efficiency class IE3 in the European Union (EU). At the beginning of next year, IE3 will become applicable to all asynchronous motors with a power rating of 0,75 kW to 375 kW.

While South Africa does not face the same regulatory pressure as the EU, SEW-EURODRIVE has decided to raise the benchmark locally by launching its new DRN series as its standard range of electric motors.

"We also have to take into account our customers across our borders. For example, if we supply an OEM in Africa carrying out a project in the US, the IE3 requirement has to be met. We not only supply the local market, but have to take our export obligations into account as well," National Sales Manager Norman Maleka comments.

In terms of South Africa, SEW-EURODRIVE will offer the DRN series as a complete new range. "It will set the standard. A customer who buys a gearbox or drive from us will automatically have an IE3-compliant motor," Maleka explains.

"What is equally important is the fact that the DRN series is downward compatible with our previous motors, regardless of the energy class. It fits right onto our gearboxes, for example, which means no additional effort on the part of our customers." Another feature is a global stator, which boosts both parts availability and stockholding.

Commenting on the benefit of using energy-efficient motors such as the new DRN series, Maleka points out that the total cost of ownership of the equipment is reduced significantly over the long term. "Not only do we inform our customers about these benefits, but we also advise on application requirements. Our aim is to offer a total solution, as opposed to simply being a component supplier. Our expertise and experience stands us in good stead in this regard, with SEW-EURODRIVE celebrating its 85th anniversary this year," Maleka stresses.

Enquiries: Visit www.facebook.com/SEWEurodriveSA

High speed motor design

Technology progress in high speed motor design has led to ever-increasing rotating speeds for electric machines, enabling them to shrink in both volume and weight—ultimately leading to high power density and savings in energy consumption. But the surge in speed incurs in a number of design challenges, namely for mechanical rotors, bearings, and for thermal stability due to high frequency losses, among others.

According to Gerald Masson, business development, new technologies and licensing manager at Moving Magnet Technologies (MMT), high speed motor adoption has been a trend in Europe in the automotive industry and lately it has also been considered for applications in several other areas as well.

"We specialise in designing brushless dc motor technologies and we have developed a specific technology for high speeds—meaning speeds higher than 20 000 rpm," he says. "In fact, we have some prototypes running at 100 000 to 200 000 rpm. Very, very high speeds. For such velocities, we need some very specific and fitting design, while keeping it simple to manufacture."

Enquiries: Email ricardo.rosa@se10.com

MPTC protects against gas supply interruptions

ABB has released the first variable speed drive control software that uses Model Predictive Control to regulate the drive's torque. The MPTC software was initially developed to ensure the operation of compressor stations during voltage disruptions, caused by lightning strikes, winter storms or ice build-up on power lines.

The stations use large compressors, up to 50 MW, to compress natural gas for travel through hundreds of miles of pipeline. Historically gas turbines powered the compressors, today, more efficient large synchronous electric motors are used. The motors are controlled by variable speed drives, such as ABB's largest drive, the MEGADRIVE-LCI.

When power supply disruptions happen, protection systems quickly shut down the compressors. This halts the supply of gas. Restarting compressors lasts from a few hours to days. The resulting interruption in the gas supply can mean financial losses that range into the hundreds of millions USD per year for large facilities.

Installed in the MEGADRIVE-LCI, the MPTC uses a control algorithm based on Model Predictive Control that ensures the operation of the drive during power and grid disturbances in order to provide the compressor with partial torque, preventing the compressor from going into surge.

The MEGADRIVE-LCI application is the first where MPTC is used to control a commercial multi-megawatt drive system with much faster dynamic behaviour, where the underlying optimization problems need to be solved in less than a millisecond.

Live testing of the software was done over the winter at two Statoil gas facilities in Norway. It was installed on ABB MEGADRIVE-LCIs used to power two 42,2 MW compressors at a gas processing plant in Kollsnes, and three 7,5 MW booster compressors in Kårstø. The control software successfully protected the compressor operation during voltage dips.

Enquiries: Vilma Lindell. Email vilma.lindell@fi.abb.com

Portable oscilloscopes for harsh industrial environments

Fluke, represented locally by the **Comtest Group**, has on offer the first high-performance portable oscilloscopes with two or four independently insulated input channels, an IP51 dust and drip waterproof rating and a CAT III 1000 V/CAT IV 600 V safety rating. Users can choose from 500 MHz, 200 MHz, 100 MHz or 60 MHz bandwidth models.

Especially designed for plant maintenance engineers, there is a choice of either a 2- or 4- channel scope for the harsh conditions or industrial electronics. A 5 000 count digital multimeter (DMM) is included in the 2- channel models.

The 190 Series II has up to four independent floating isolated inputs, up to 1 000 V and a real time sampling of up to 5 GS/s (depending on model and channels used).

Frequency spectrum using FFT-analysis and automatic capture and REPLAY of 100 screens, as well as a deep memory of 10 000 points per trace waveform capture (scope mode), are all features of this new generation oscilloscope.

190 Series II software:

- Connect-and-View triggering for intelligent, automatic triggering on fast, slow and even complex signals
- ScopeRecord Roll mode gives 30 000 points per input channel for low frequency signal analysis
- TrendPlot paperless recorder mode with deep memory for long-term automatic measurements

Enquiries: Tel. +27 (0) 10 595 1821 or visit www.comtest.co.za

Mini subs mitigate against vandalism

Electrical substations pose a number of unique challenges including vandalism and the theft of copper. This is especially true for mini substations, which are often located in residential areas and in remote rural areas, and applies to those owned by power utilities as well as private owners. While larger substations are often protected using surveillance equipment, this is not always feasible with mini substations and apart from the unnecessary disruption of electrical services, the damage done to these installations could have potentially lethal consequences for maintenance personnel. Working in collaboration with Eskom, WEG Transformers Africa (WTA), part of the **Zest WEG Group**, developed a vandal proof mini substation which is now approved by the power utility.

Andre Mans, chief operating officer of WTA, says that this approval is very important as it confirms the functionality as well as reliability of the vandal proof mini substation. "This level of approval not only underpins that the mini substation meets all the criteria but also gives absolute assurance to the marketplace," Mans says. Notably, the mini substations are targeted at both power utilities and private end users. The WTA vandal proof mini substations are ideal for installation in high risk areas. The entire enclosure, including doors and lock protection facilities, are constructed from 6 mm steel with the doors being specially reinforced. The four way locking mechanism is complemented by heavy duty door hinges. The transformer unit is sealed, further protecting the installation.

Enquiries: Kirsten Larkan. Tel. +27 011 723 6000 or email marketing@zestweg.com

Process optimisation for accuracy, quality, and reliability

Today's production facilities are often textbook examples of optimisation. Speed control of motors according to changing needs improves process control, which is essential to ensure high quality of the product produced. Accurate control from a VLT® drive has positive effects on efficiency, material usage, environmental emissions, and production yield. A recent major trend is towards increasing user friendliness and drives dedicated to and optimised for specific applications.

Digitalisation drives down operating costs

The era of digitalisation has long begun and our dependence on data, analytics, and the cloud will develop dramatically in the coming decades. For ac drives, the potential is enormous and includes:

- Predicting customer problems and solving them before they start
- Enabling OEMs to run their applications even better
- Leveraging data utilisation to reduce costs for the customer
- New services drawing upon analysis of big data

With digitalisation developments, ac-drive programmability is enhanced with improved connectivity, data gathering and analysis abilities, moving towards more customisable solutions. Digitalisation also brings data handling, intelligence, and learning as totally new fields of ac-drive software functionalities; end-to-end communications, device availability, interoperability, and security on a wide variety of digital platforms including your mobile phone.

Energy efficiency drives development in new motor technologies

For each application, a different motor technology can provide the optimal performance characteristics. When the ac drive is compatible with all typical motor technologies, then the system designer is free to choose the optimal motor for overall system efficiency. This adaptability will become increasingly important with widening diversity of new motor technologies.

Energy storage and hybridisation

The increasing development of hybridisation involves equipping general processes and machines which with energy storage to upgrade performance and efficiency. VACON ® drives contribute to the advantages of energy storage which include:

- Peak shaving, removing the need to dimension systems to peak power demand
- Optimising performance by operating at the optimum point, avoiding over- and underload operation
- Back-up power, which removes the need for idle reserve running

Outlook

With their diminishing size, increasing capabilities, and growing intelligence, variable speed drives have become indispensable for both the industrial and domestic sectors. In the present economic climate, reducing total lifecycle costs and optimising system performance, without compromising on product quality, are now more crucial key factors in the early stages of the design process than ever before.

For more information, please check our local website: www.danfoss.ae

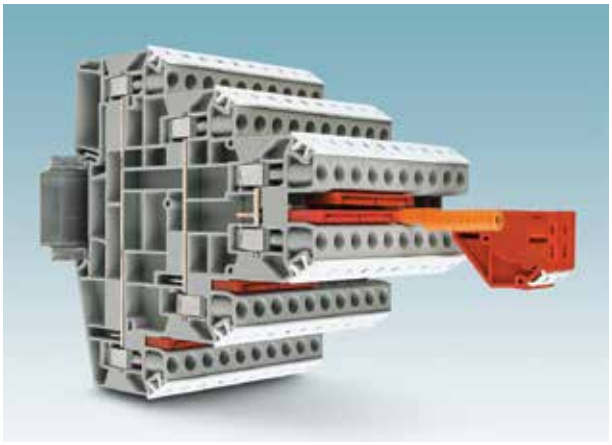
Danfoss Drives is a world leader in variable speed control of electric motors. We offer you unparalleled competitive edge through quality, application-optimised products and a comprehensive range of product lifecycle services. Our low voltage and medium voltage VLT® and VACON® drives are used with all major motor brands and technologies in power sizes from small to large.

Space-saving wiring up to 10 mm²

Wire conductors up to 10 mm² in a confined space with the new UT 6-3L three-level terminal block. Thanks to the function shaft on each level, up to three potentials can be distributed in one terminal housing.

The conductors are connected using the maintenance-free screw connection principle from **Phoenix Contact**. All terminal points can be marked individually, thereby ensuring very clear arrangement of the wired terminal strip. Power ratings of up to 1 000 V and 50 A can be wired with the new three-level terminal block. Since this terminal block also has all the system features of the CLIPLINE complete terminal block system, standard system accessories can be used. This reduces the logistics costs for the user.

Enquiries: Bruce Patton. Tel. +27 (0) 11 801 8200 or email brucep@phoenixcontact.co.za



Partnering to deliver power substation projects globally

ABB and **Fluor** have formed a global strategic partnership for the execution of large turnkey engineering, procurement and construction (EPC) projects for electrical substations.

By combining ABB's world-leading technology and its market leadership position in power transmission and distribution with Fluor's expertise and experience in delivering large EPC projects, the partnership will help meet the evolving need of power grids across the globe for safe, reliable and state-of-the-art electrical substations.

"We are proud to partner with Fluor to tap the vast opportunities of the ongoing Energy Revolution and related power infrastructure investments. Together, we intend to grow our businesses by complementing each other's strengths in unique customer services for substation projects," said ABB CEO Ulrich Spiesshofer. "Strategic partnerships like this are a core pillar of our Next Level strategy and help us to drive growth while mitigating risk."

"Fluor's new global strategic partnership with ABB targeting the substation market is expected to bring unique synergies to our Power clients," said David Seaton, Chairman and CEO of Fluor. "This approach exemplifies our focus on addressing client needs with our unique integrated solutions offering."

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

QSK95 Marine engine 4 200 hp, launched

Cummins Inc., a global leading manufacturer of diesel engines for the marine industry is proud to introduce the QSK95 marine engine to the South African market. With ratings from 3 200 hp to 4 200 hp (2 386 – 3 132 kW), the V-16 cylinder engine is the most powerful high-speed 95 litre engine available in its class.

"The innovative QSK95 engine allows us to meet our marine customers' increasing power requirements, while the engine's vast capabilities ensure we can successfully enter into new markets within Africa," comments Andy Pilkington, Segment Director Marine Oil & Gas Business, Africa. "This technologically advanced engine is designed to exceed the performance of comparable 20-cylinder high-speed engines and, compared with equivalently powered medium speed engines, it is far more compact and more cost-effective." The QSK95 offers flexibility in power configurations for main propulsion, auxiliary, genset and diesel electric applications, and provides an excellent solution for hard-working marine vessels such as tugs, both inshore and offshore patrol vessels, emergency search and rescue vessels, commercial fishing boats, passenger ferries, superyachts, offshore support vessels and crew boats.

Enquiries: Email sal.govender@cummins.com

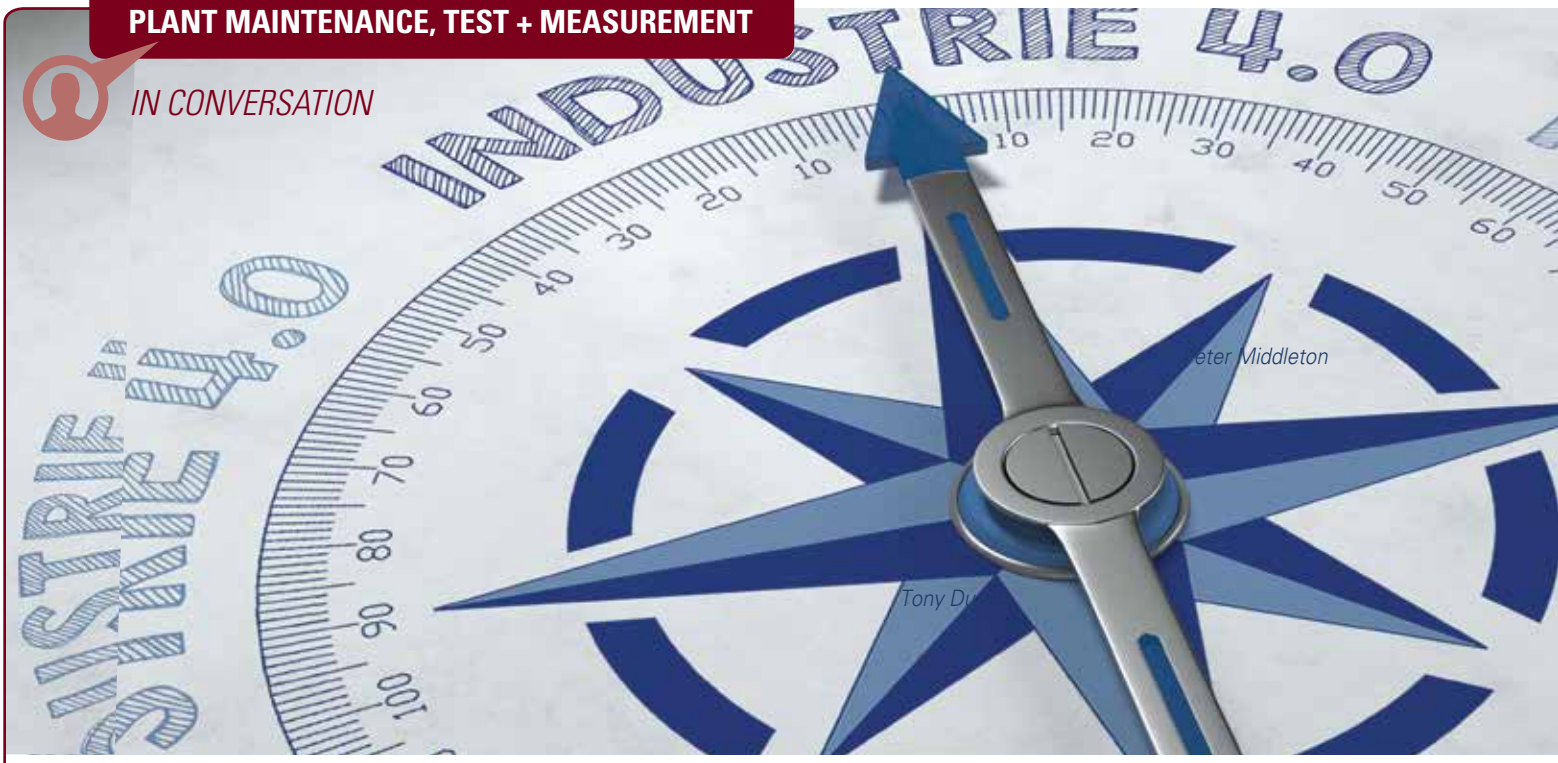
Ingula wins engineering excellence awards

On 13 October 2016, at Emperors Palace, Johannesburg, Eskom Ingula Pumped Storage Scheme Project won two prestigious awards during the Annual South African Institute of Civil Engineering (SAICE) & South African Forum of Civil Engineering Contractors (SAFCEC) awards. The first award was for the Most Outstanding Civil Engineering Achievement Award in the Technical Excellence Projects Category and the second one was the Technical Excellence Achievement Award.

A key objective of the awards is to give recognition to well-engineered civil projects. The annual awards function gives these companies, individuals and departments a unique opportunity to showcase their projects and work to the Civil Engineering industry. The multi-billion rand Ingula project, situated in Ladysmith and bordering the KZN and Free State Provinces, is a peaking hydro-power station comprising an upper and lower reservoir separated in elevation by 480 metres within the Little Drakensburg mountain range. This project involving Gibb, Royal Haskoning DHV and Knight Piésold as the consulting engineers, has already contributed to stabilising the South African power system.

Enquiries: Tel. +27 (0) 11 800 3304 or email mediadesk@eskom.co.za

IN CONVERSATION



Automation, Equipment **Efficiency** and the Connected Enterprise

"The 'Connected Enterprise' is the phrase we at Rockwell Automation use to embrace the Industrial Internet of Things (IIoT), the Fourth Industrial Revolution or Industry 4.0. It captures our interpretation of the tangible outputs we can deliver by leveraging modern networking and connectivity technologies."

What effect has 'connectivity' had?

Connectivity, through Wi-Fi and cellphone networks, for example, has already led to an explosion of social media platforms which has fundamentally changed the way people stay connected and communicate with each other. In the automation industry, through the IIoT, a similar 'revolution' is taking place, where most devices now have an IP address and some level of intelligence, enabling their status and condition to be interrogated and made visible to anything, anyone and anywhere.

Connectivity isn't new, surely?

Connectivity in itself is not new. In the mining industry, from the surface to the very ends of horizontal shafts and to the bottom of vertical shafts, mines are connected. But this is traditionally achieved via a multitude of network topologies and gateways, which create complexities and inherent limitations. More importantly, while it has long been possible to collect information, the question is what to do with it. Aggregating and gathering data is easy, but transforming it into useful information that can trigger a response or a management decision is the real goal. Typically less than 1% of the data collected from all of the currently connected 'things' is actually used – and here lies an enormous opportunity.

What exactly is The Connected Enterprise?

As a concept, The Connected Enterprise involves connecting plant, process or manufacturing equipment at the production level of an enterprise to all of a company's other production sites; to its entire supply chain, including raw materials and component suppliers, logistics, energy resources and utilities; and directly through sales to its customers.

At plant level, if the condition of all of production equipment is made visible through a networked system, then historical data collected can be used to establish trends, while real time data can highlight the current status and condition of every machine. Together, if the data is analysed effectively, good predictability and reliability is assured.

But the same data used by the operator and the maintenance manager might also be processed differently and displayed on different dashboards: to track production for the Chief Operating Officer (COO); predict operating costs for the Chief Financial Officer (CFO); or to compare investment options for the Chief Executive Officer (CEO).

Effect on profit

It is even possible to identify value drivers that enable live profits to be calculated. In the event of a breakdown or a power outage,

In conversation…

Crown editor, Peter Middleton, talks to Barry Elliott of Rockwell Automation about the advantages of modern connectivity and its role in fostering leaner and more sustainable process plants and enterprises.

for example, the effect on profit can immediately be calculated and displayed, highlighting the urgency of the reparation action required. Competitive advantage, waste reduction, time to market, research and development needs and a host of other performance indicators can be targeted and improved through the process.

In the current market, few have the luxury of replacing their plant with a newer and better-connected one, so we are mostly involved with analysing what we can do now to better sweat existing assets for clients. The current focus is all about improving Overall Equipment Efficiency (OEE) and The Connected Enterprise is an obvious way of doing this.

One of the most fundamental misunderstandings about this 'revolution' relates to costs. These systems are not big cost adders compared to total project values. Sensors are integral to the equipment, anyway, and the cost of aggregation and analytics software to process the data is often insignificant compared to total project costs.

> *Connectivity, through Wi-Fi and cellphone networks, has led to an explosion of social media platforms.*

As an example…

A process control system for a refinery or mineral processing plant, for example, is typically in the region of 1,0 to 1,5% of the total cost of a project. On a US$1,0-billion project, the entire control system is likely to cost in the order of $10 M to $15 M. If connectivity and a little smart analytics pushes that cost up by even 25%, say, the overall cost increment will still be below 0,4% – and on a Greenfield project, the savings that will accrue through implementing such a system can be huge compared to the investment.

On the mechanical side?

Citing a relatively simple local example on the mechanical side, Rockwell Automation Sub-Saharan Africa has successfully connected an entire compressed air fleet in the mining sector. Around the platinum belt of South Africa, we have connected our customers' entire fleet of nearly 30 compressors in sizes ranging from 2 - 8 MW. While we don't supply the compressors, we provide the control systems and all components are fully networked. Over time, we have developed some pretty clever management techniques – for surge control of compressed air, for example – along with sophisticated algorithms to measure performance and determine predictive maintenance needs.

By aggregating the data from all of these compressors, we compare the performance of each unit and each shaft. This allows live changes to be made to the ventilation system in response to breakdowns, to reduce energy use, or to increase or decrease the amount of compressed air needed in a particular area.

Simple dashboards give visibility, which underpins all efficiency management drives. And even though the compressors are spread over a 30 km radius, managers can quickly react to maintenance issues and target poorest performing units for replacement.

Simply put, the dashboard view enables management to take control of the compressed air fleet and to optimise performance and energy use, all of which minimises operating costs.

Is it just 'something you can have'?

While this example is tangible, a Connected Enterprise is not really something 'you can have'. It needs to be customised and broken down, and specific analytics, algorithms and metrics need to be developed and translated into software to enable valuable information to be effectively used.

As well as mine compressors, mine winders, mills, pumps and conveyors, a host of other energy, safety and production critical equipment can be connected for optimisation proposes. This makes it possible to systematically optimise each unit or plant area, simply by adapting the poorest performers to the strongest possible operational level.

In addition, by bringing in other information, such as the 20-year life-of-mine plan, enterprise-wide progress can be tracked and adapted to best suit emerging realities. Through transparency, mining operations can be redirected or new investments made to improve yields.

Once the connectivity infrastructure is in place, the software-based analytical possibilities are almost infinitely scalable. Once people see the potential, they invariably want more. This is the gist of

what one should seek to achieve by adopting a Connected Enterprise approach – and it's all underpinned by OEE.

Are only your products involved?

While Rockwell Automation can offer all the control system and connectivity technology required, establishing a Connected Enterprise does not depend on the sole use of our products. Although the integration and data gathering capabilities, and therefore the potential benefits, are significantly enhanced if a complete solution is implemented using our technology platforms. The single biggest thing that we hang our technology on is our use of standard Ethernet IP for connectivity across all our networks. Ethernet IP is open, unmodified and standard, so anyone can access it. The Connected Equipment does not require bespoke devices, nor is it limited to a particular vendor's set of compatible components.

But while open is good, it has industrial security consequences. This is the biggest risk area associated with connectivity. For example, a steel mill in Russia was 'hacked for fun' and put out of action for several months.

What causes damage to systems?

Most of the damage caused to systems happens as a result of people with legitimate access making mistakes. The real difficulty is striking a balance between enabling people to do their jobs and preventing them from making critical changes.

Security for a Connected Enterprise cannot rely on bolt-on, antivirus-type solutions, though. Security has to be built in. Increasingly, system designers are using the term 'defence in depth', which we all know in South Africa from the multi-layered approach to home security. The idea is that if a user gets though one layer, there are several more to go through before any 'dangerous' access is granted.

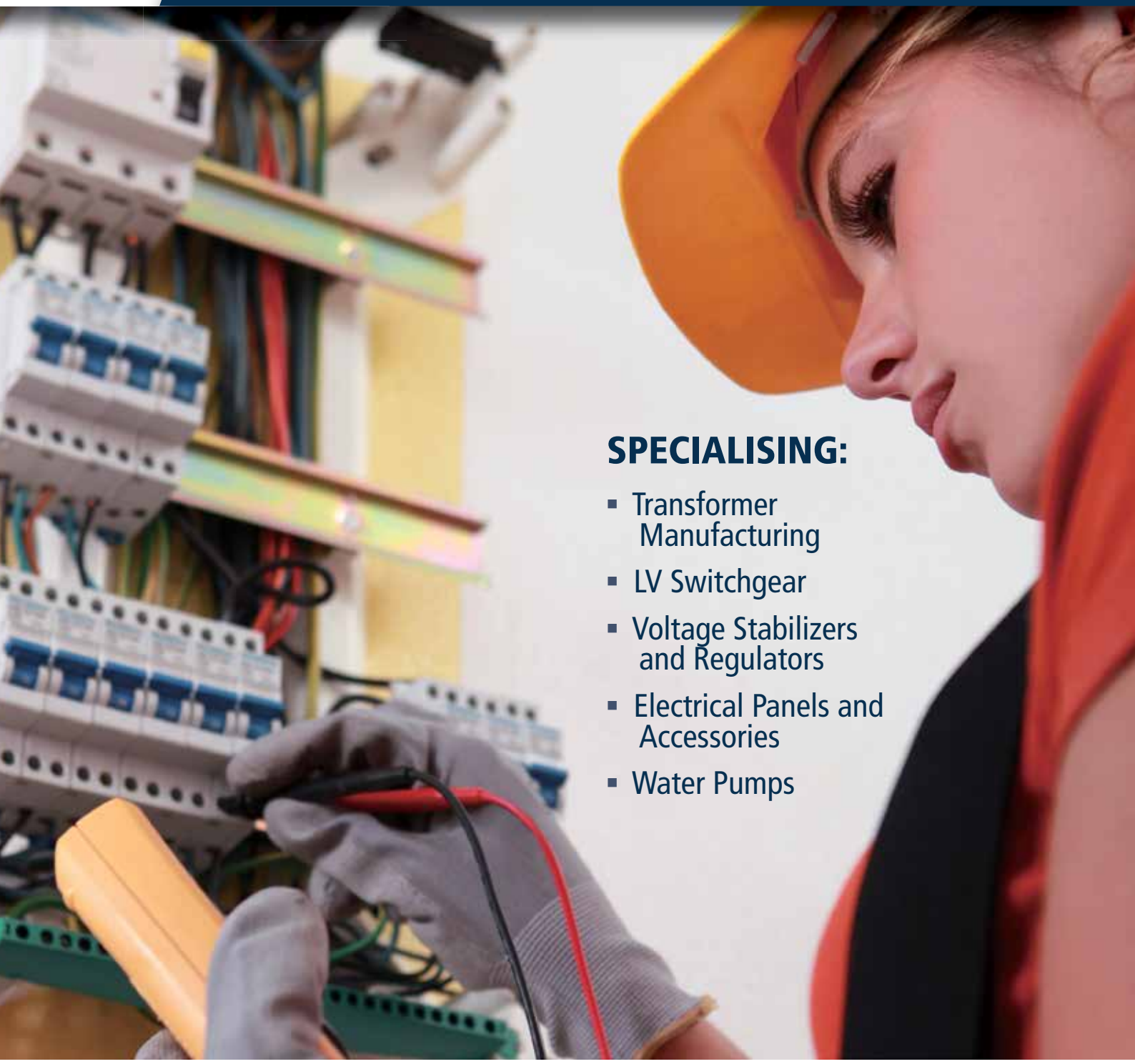
Of the future?

For the next five years, I do not foresee any surge in the price or demand for commodities. OEE is, therefore, likely to remain the priority as producers are forced towards becoming leaner in order to survive. Rockwell Automation has the ability and the scale to deliver Connected Enterprise solutions of any size; solutions that have short payback periods and, once installed, have the same low-cost potential for growth as social media platforms.

take note

- Connectivity, in itself, is not new.
- In the mining industry, from the surface to the ends of horizontal shafts and to the bottom of vertical shafts, mines are connected.
- 'The Connected Enterprise' connects plant, process or manufacturing equipment at the production level of an enterprise to all of a company's other production sites.

TRANS ELECTRON



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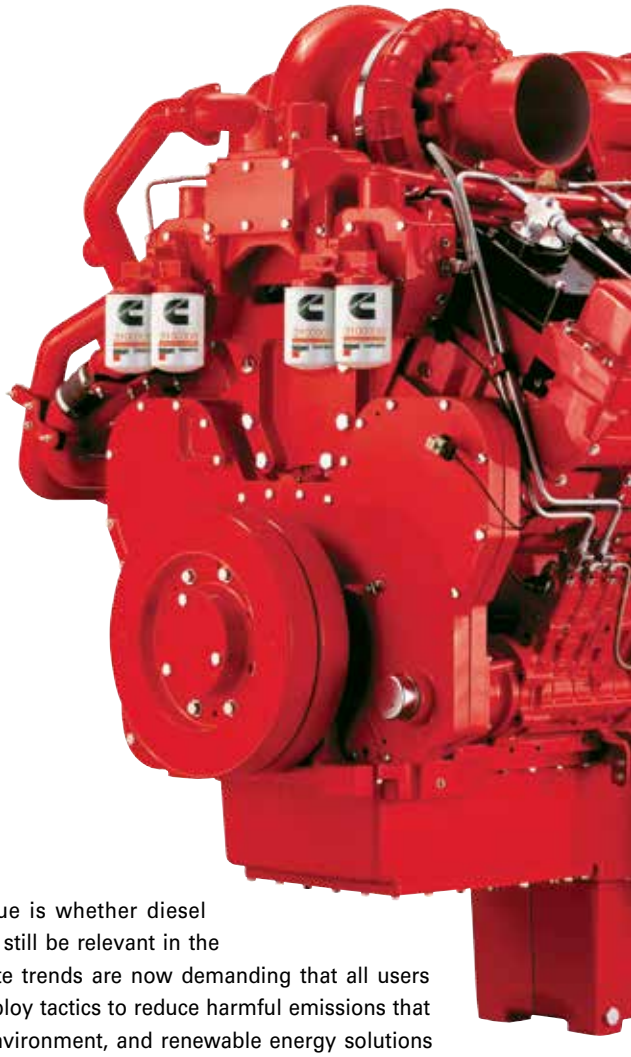


Nalen Alwar, Cummins

Research studies have shown that industrial activity is directly related to the demand for electric motors and back-up power through diesel generators for operational support.

The most prevalent end-use applications for generators include: industrial plants, manufacturing, construction, chemical applications, petrochemicals, agriculture, automotive, mining, oil and natural gas, telecommunications and healthcare.

Responses to climate change and energy efficiency worldwide have led to global fuel-source trends that would initially appear to reduce considerations given to diesel power, and increase the share of renewable and natural gas power applications in the power-supply mix.

Diesel fuel is still by far the most widely-used fuel source, especially in developing nations and emerging markets. A well-established supply chain exists in Southern Africa, where diesel-generated power has shown advantages of project simplicity, short project lifecycles, lower capital cost and rapid installation time for power on-stream.

There have been key challenges with regard to operating cost and emissions levels, and it is worthwhile exploring how technological development has addressed these. Falling crude oil prices have lowered diesel prices and impacted alternative-energy investment drivers. Furthermore, the concept of resilience through hybrid solutions has meant that diesel-generated power has to feature as a relevant component.

Instability in stakeholder structures for projects with alternate fuel feedstock, together with decreasing levels in dams and lakes, which has affected the performance output of hydropower plants, has yet again resulted in diesel-generated power being called on as emergency measures in Southern Africa.

> *Diesel fuel is by far the most widely-used fuel source, especially in developing nations and emerging markets.*

A topical issue is whether diesel power would still be relevant in the future. Climate trends are now demanding that all users of power employ tactics to reduce harmful emissions that impact the environment, and renewable energy solutions are advancing beyond the infancy stage of the technology lifecycle in Southern Africa. However, diesel power is still the mainstay solution for operational resilience and industrialisation in remote areas. Significant technology improvements have been made towards reduction in capital, operating costs and environmental stewardship.

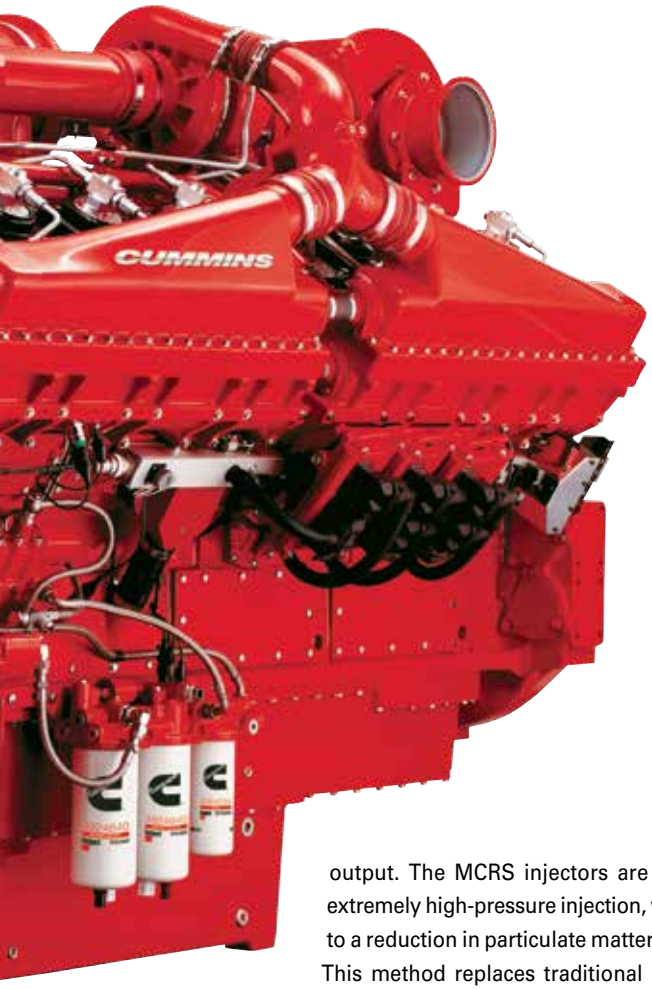
Compact designs have resulted in footprint reductions and increases in power output have been achieved by increasing cylinder peak pressure, while also reducing the conventional number of cylinders required. Ductile iron blocks with the highest structural strength are used to achieve multiple overhauls, with minimal remanufacturing. Durable pistons can be forged from a single piece of steel, allowing reuse at the rebuild stage.

Premium materials are used for piston rings and hardened cylinder features, together with enhanced piston cooling, reduced piston-ring temperatures and increased wear resistance and cylinder life. This reduces total lifecycle costs.

Efficiency of diesel

The efficiency of a diesel engine is most directly tied to combustion rate – the degree to which the fuel is completely burned during ignition. This is typically a function of how finely and evenly dispersed the fuel is during injection into the combustion chamber. Turbocharging, which forces excess air into the chamber, also improves the combustion rate, which is why two-stage turbocharging, with intercooling between the stages, is now common for diesel gensets.

A Modular Common Rail System (MCRS) enables diesel engines to achieve exceptionally low fuel consumption for their power



output. The MCRS injectors are capable of extremely high-pressure injection, which leads to a reduction in particulate matter emissions. This method replaces traditional mechanical injection with electronically-controlled multiple high-pressure injections during each combustion cycle.

Rather than rely on separate injectors controlled by a camshaft, it uses a single system that supplies all the injectors in the engine with a common source of fuel. This allows much higher fuel pressures than a mechanical injection system, which maximises vaporisation of the fuel, and thus combustion rate. Modern high-pressure common-rail diesel fuel systems allow for much higher fuel pressures, and much more precise and flexible injection of fuel into the combustion chamber.

Meeting international environmental standards

To meet Tier 4 low-emission standards as set out by the US government's Environmental Protection Agency (EPA), Selective Catalytic Reduction (SCR) technology has been used successfully on new Cummins diesel gensets to reduce NO_x emissions by as much as 95%. Another method often used with SCR is exhaust-gas recirculation, which sends part of the exhaust gases back to the combustion chamber. This lowers the adiabatic flame temperature, allowing for lower temperature combustion and reduced NO_x production.

SCR also results in 5% more fuel efficiency. Digital controls are essential for the newest gensets, which rely on high-pressure common-rail fuel-injection systems and precise control of ignition and combustion. They are also necessary where tight emissions compliance is a consideration.

Another advantage is that digital controls can monitor the real-time state of a wide variety of operating parameters, and display them on a centralised panel, as opposed to less sophisticated analogue systems. This allows operators to identify and correct faults much more quickly, leading to more reliable power and less downtime. What is more, they also allow for remote monitoring and operation.

Conclusion

With diesel gensets typically representing either emergency generation or generation where there may be no grid power to fall back on, these are critical considerations. Oil-management systems that replenish oil automatically, based on engine-load factors, fuel filtrations systems with enhanced durability, high-pressure fuel systems and prognostic capabilities, are other improvements that reduce operating costs.

The rise of distributed generation through decentralised power supply schemes are evolving further. Decentralisation is not just about displacement of grid power with

EPA – Environmental Protection Agency
MCRS – Modular Common Rail System
SCR – Selective Catalytic Production

Abbreviations/Acronyms

- Diesel-engine power plants have synchronous technology.
- Diesel-engine power plants contribute a high level of operational stability to standby or prime power applications.
- Diesel-generated power is likely to feature on its own, or incorporated into hybrid solutions, for many more years.

take note

one energy source, but how to optimise decentralised systems with various fuel sources to achieve energy efficiency, reliability and critical process protection.

A typical scheme could comprise renewable power generation sources such as wind and solar. However, these pose challenges to system reliability and performance, given their inherent intermittent contribution and associated disturbances. Gas-to-power programmes in Southern Africa are yet to overcome challenges such as natural-gas pipeline infrastructure and moderating market prices.

Diesel-engine power plants have synchronous technology and contribute a high level of operational stability for standby or prime power applications, together with mature diesel-fuel supply chains. Manufacturers of diesel gensets are making steady technological gains that reduce capital intensity and emission levels, and enhance power output and efficiency. Diesel-generated power is still likely to feature on its own or incorporated into hybrid solutions for many more years.

Bibliography

[1] Overton TW. Diesel Gensets Aim at the Future. Power Magazine, 2015.

[2] Natekar A; Menzel M. The Impact of Tier 4 Emission Regulations on the Power Generation Industry. Power Topic #9010 Technical Information from Cummins Power Generation, 2010.

Nalen Alwar holds a Master's Degree in Business Administration and a Bachelor's Degree in Chemical Engineering Technology. He has several years of senior management experience in the areas of Strategic Business Development, Sales, Key Accounts Management, Supply Chain Management and Process Operations. He has been working in the power industry for the past four years and is currently employed as the Projects Sales Manager for Cummins Power Generation in Southern Africa. Enquiries: Tel. 011 321 8700 or email nalen.alwar@cummins.com

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ROUND UP

CDE South Africa keeps it clean

CDE Global is the largest wet processing equipment manufacturer in the world and works with its customers to maximise their return on investment and gain significant competitive advantage while minimising environmental impact. The company has established an office (CDE South Africa) in South Africa and appointed Nicolan Govender as Regional Manager for Southern Africa. The African continent has high infrastructural demands and the materials washing solutions CDE develops are ideal for quarrying and mining sectors supplying the construction market. By using CDE equipment, the environmental benefits are significant, not the least of which is that up to 90% of the water is recycled when a wet processing washing plant is combined with a CDE AquaCycle water recovery system. A typical sand washing operation uses a minimum of a hundred thousand litres per hour, which is basically clean water being converted into waste water and then pumped or piped away into a settling dam, at which point it exits the washing system. With a CDE AquaCycle, 90% of this waste water is recycled for immediate reuse by the customer. This does not only minimise water consumption, but also aids businesses to show compliance when reapplying for water licences.

Enquiries: Visit www.cdeglobal.com

Find leakage currents without taking equipment offline

Fluke, represented locally by **Comtest**, has launched the Fluke 368 and 369 true-RMS leakage current clamp meters that help users detect, document, record and compare leakage current readings over time as a means of preventing unplanned downtime, and identifying intermittent GFCI (Ground Fault Circuit Interrupter) and RCD (Residual Current Device) trips, all without taking equipment offline.

The Fluke 368 has a large (40 mm diameter) jaw for work with large conductors. The clamp's jaw is fully shielded to accurately capture very small leakage signals, and to minimise external electromagnetic interference. The device allows users to track changes in leakage current over time, helping to identify potential problems before they turn into major failures. Designed specifically for industrial electricians and facilities maintenance technicians, the 368 and 369 are invaluable for general purpose electrical maintenance, as well as preventative and predictive maintenance and fault troubleshooting. Specific applications include maintenance tests on motors and transformers and current leakage measurements for installation tests.

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

World's smallest absolute multi-turn encoder

Modern industrial applications demand innovative designs featuring high performance, precise information and smaller component footprints. SCANCON, represented locally by Instrotech, has developed the world's smallest absolute multi-turn encoder with SSI interface. Based on new advanced electronics and mechanics, this high quality, technically sophisticated encoder was developed by Scancon's engineering team and represents the first step into a new world of automation possibilities. Scancon designed this encoder to provide a compact, high performance solution for motion control applications where space is critical and features a 24 mm diameter size with multi-turn SSI capability. No other encoder on the market offers this solution. Encoder Model 2RMHF – SSI absolute multi-turn features:

- Ø24 mm footprint
- SSI interface
- Multi- or single-turn
- Hollow blind end or shaft Ø3 mm to Ø6,35 mm
- Preset of ZERO position
- Choice of counting direction
- Enclosure rating IP64 to IP67
- Cable or connector version

Potential applications include automated machinery, pitch and yaw control, small ac motor feedback, wind turbines, packaging machines, robotics, ROVs and AGVs, solar trackers and automated doors.

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

New switched-mode power supply – large power reserve

These power supplies provide an excellent power reserve of 50% for up to four seconds to cope with short current loads. Instead of an inrush current limitation with a simple NTC element, charging the capacitors of the new ifm switched-mode power supplies is micro-processor controlled. This ensures an ideal start-up of the voltage supply. The voltage supply is ensured for several milliseconds if the mains voltage briefly fails, e.g. caused by switching operations in the supply network. The ifm switched-mode power supplies provide the specific nominal power across the entire temperature range. Derating only has to be taken into account above an operating temperature of 60°C. All 24 V switched-mode power supplies are equipped with double terminals. This simplifies wiring and provides more clarity in the control cabinet. Innovative technology means the new **ifm** power supplies require considerably less space in the panel, as compared to common cabinet power supplies.

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

Non-contact **Temperature Measurement** in the Glass Industry

Information provided by OPTRIS

To prevent wrong measuring results due to increased ambient temperatures, the infrared thermometer compensates the influence of ambient temperatures beforehand.

The transmissivity of air strongly depends on the wavelength. Strong flattening alternates with areas of high transmissivity – the so-called atmospheric windows.

The transmissivity in the longwave atmospheric window (8 – 14 µm) is constantly high whereas there are measurable alleviations by the atmosphere in the shortwave area, which may lead to false results. Typical measuring windows are 1,1 ... 1,7 µm, 2 ... 2,5 µm and 3 ... 5 µm.

Additional influences can arise from heat sources in the environment of the measuring object. To prevent wrong measuring results due to increased ambient temperatures, the infrared thermometer compensates the influence of ambient temperatures beforehand (as e.g. when measuring temperatures of glass surfaces in heating areas whereby the walls are hotter than the glass surfaces). A second temperature sensing head helps to generate accurate measuring results by automatically compensating the ambient temperatures and a correctly adjusted emissivity.

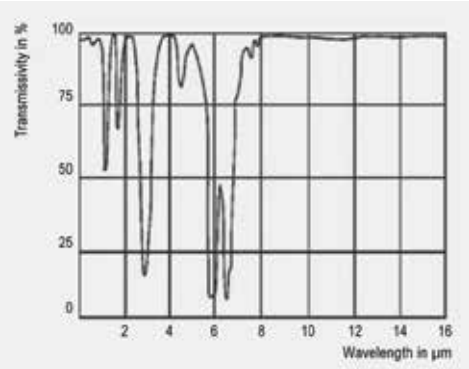

Figure 1: Spectral transmissivity of air (1 m 32°C, 75%, r.F.).

Dust, smoke and suspended matter in the atmosphere can pollute the optics and result in false measuring data. Here air purge collars (which are installed in front of the optics with compressed air) help to prevent deposition of suspended matter in front of the optics. Accessories for air and water cooling support the use of infrared thermometers even in hazardous surroundings.

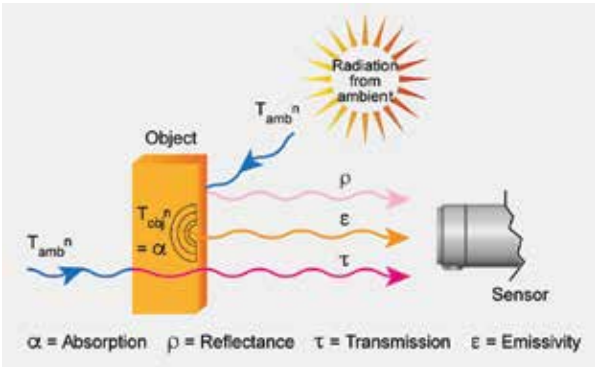

Figure 2: Compensating ambient influences.

Emissivity and temperature measurement

For the accurate measurement of temperatures, emissivity is a key factor. It is dependent on various influences and must be adjusted according to the application. Emissivity theoretically depends on the material, its surface quality, wavelength, the measuring angle and, in some cases, even the applied measuring configuration.

Glass usually exhibits an emissivity of 0,85 in the longwave range (8 – 14 µm). In processes with higher temperatures glass surfaces are measured with 5,0 µm or 7,9 µm because in those spectral ranges the emissivity is ≥0,95. The main advantage of 7,9 µm is the lower angle dependency of the glass surface reflection in this wavelength range. This means that the surface temperature can be measured independently of the reflection even at an inclined viewing angle.

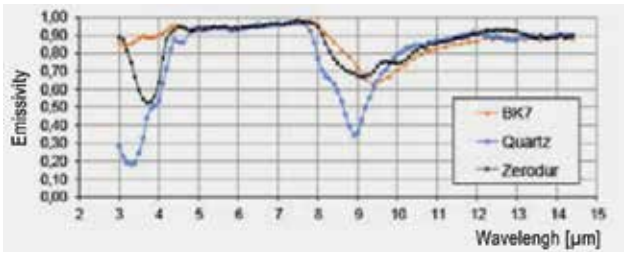

Figure 3: Spectral emissivity of glass.

LSG – Laminated Safety Glass
PVB – Polyvinyl Butyral
SPSG – Single Pane Safety Glass

Abbreviations/Acronyms

Temperature measurement of glass

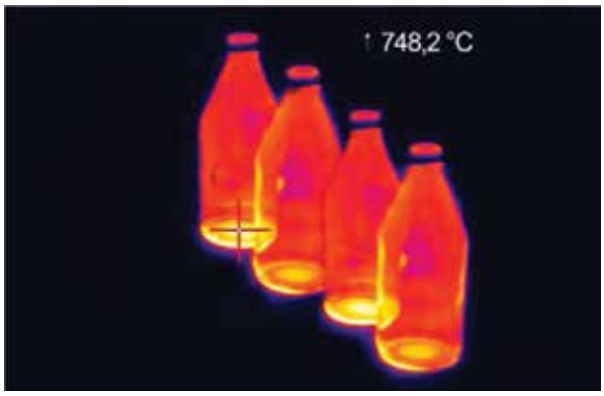

Figure 4: Hot spot detection at glass bottle production.

If you measure temperatures of glass with IR thermometers or the special IR camera optris PI G7 it implies that you take care of reflection and transmissivity. A careful selection of the wavelength facilitates measurements of the glass surface as well as of the deeper layers of the glass.

Wavelengths of 1,0 µm, 2,2 µm or 3,9 µm are appropriate for measuring deeper layers whereas 5 µm are recommended for surface measurements. If temperatures are low, you should use wavelengths between 8 and 14 µm in combination with an emissivity of 0,85 in order to compensate reflection.

For this purpose a thermometer with short response time should be used as glass is a bad heat conductor and can change its surface temperature quickly.

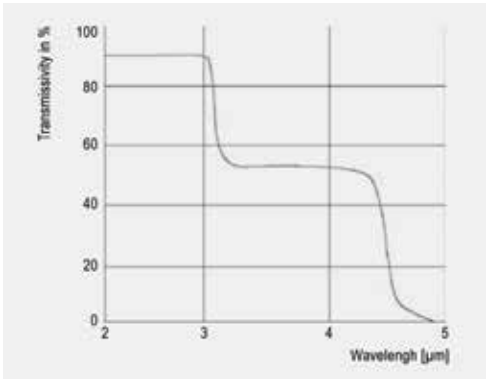

Figure 5: Spectral transmissivity of glass.

Production optimisation in the float glass process

After the tin bath, the flat glass band has a temperature of about 600°C; the first infrared camera in line-scan mode is applied for temperature monitoring at the transition to the cooling zone. The glass is transported through various cooling ranges in the cooling zone. Between the cooling ranges, infrared cameras are also installed in the cooling ranges for temperature monitoring, in order to guarantee optimal quality.

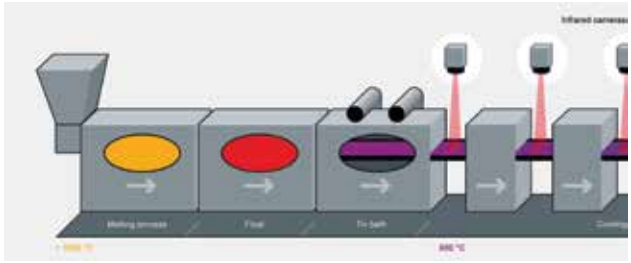

Figure 6: Measurement areas at float glass production.

Continuous control during the production of container glass

Container glass, meaning for example bottles in all sizes and forms, must be multiply monitored for its process relevant temperature during the production process. When the molten glass exits through the feeder, the glass strand is cut. The thereby resulting molten glass drops must have a temperature of about 1 000°C to ensure quality. Temperature measurement was previously only possible with point-measuring infrared thermometers due to the high velocity. The innovative Optris PI 1M enables this measurement via surface measurement with an image rate of up to 1 000 Hz.

During the forming process, which takes place at temperatures of over 500°C, infrared sensors are also used for monitoring. Since the process only takes a few seconds, the reaction of the sensors is

of critical importance here. The thermal measurement of the glass can be influenced by direct measurement of the glass surface or indirect measurement of the surface of the forming tool for both the forming of the parison shape as well as during finishing of the mould.

> *For the accurate measurement of temperature, emissivity is a key factor.*

To complete the finishing process, another temperature control to reduce tension takes place in the containers. The glass is heated again and subsequently gradually cooled in a cooling tunnel over a period of up to 30 minutes. When the containers exit the heating zone, the cooling process is supported and controlled by temperature measurement.

Single-pane safety glass production

For the production of Single-Pane Safety Glass (SPSG), the cut and processed flat glass is heated in a furnace under continuous movement at over 600°C. During the transport of the heated glass in the pretension zone, an infrared camera monitors the temperature distribution on the glass surface in line-scan mode. During the pretension process, where the glass is shock-cooled, inhomogenities can be compensated. The quality of the SPSG mainly depends on a homogeneous thermal treatment, which is ensured by the application of temperature measurement technology.

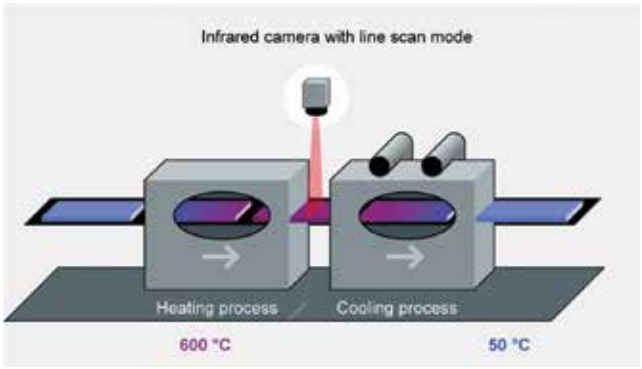

Figure 7: Measurement areas at SPSG production.

Ensuring the quality of laminated safety glass

Laminated Safety Glass (LSG) consists of at least two flat panes of glass, which are laminated in a clean room with a sheet of PVB film between them. The temperature of the film can be monitored with infrared thermometers. In the pre-lamination furnace, the glass panes are heated in order to melt the film and simultaneously press the 'sandwich' together, to prevent air pockets. During the transition to the autoclaves, the temperature distribution is monitored with an infrared camera, in order to adjust the heating elements in the pre-lamination furnace for subsequent panes, when necessary.

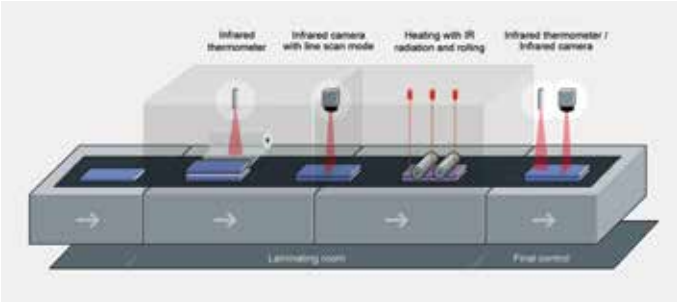

Figure 8: Measurement areas at SPSG production.

Conclusion

Optris infrared cameras are equipped with license-free PI Connect software. The software enables the cameras to operate as line scan cameras. Line scanners are traditionally used in the glass industry for various measurement procedures. In these devices, a point detector is coupled with a rotating mirror to consequently generate a linear optical scan of the object. These devices are bulky and expensive. When using an infrared camera as a line scanner, an arbitrary line is selected from the detector array. In addition to the more compact construction and the lower price, there are two significant benefits: the line to be scanned can be positioned anywhere using the software and the user receives a complete IR image quasi as additional information – these are important advantages, especially during system set-up. The cameras can accurately measure surface temperatures of moving measurement objects using minimal apertures. This function is of particular significance in the glass industry, since the glass temperature has a direct impact on the quality.

take note

- Dust, smoke and suspended matter in the atmosphere can pollute the optics and result in false measuring data.
- Accessories for air and water cooling support the use of infrared thermometers even in hazardous surroundings.
- Infrared cameras can accurately measure surface temperatures of moving measurement objects using minimal apertures…of particular significance in the glass industry.

Information supplied by OPTRIS - German manufacturer of non-contact temperature measurement equipment. Their product range consists of portable and stationary infrared thermometers and online infrared cameras for thermographic real time analyses. Contact Instrotech for local support and information on the Optris Non-Contact Temperature Measurement in the Glass Industry. Enquiries: Instrotech. Pieter Deysel. Tel. +27 (0) 10 595 1831 or email sales@instrotech.co.za

Configure and read instruments via app and smartphone

With the new CPG1500 precision digital pressure gauge from **WIKA**, customers can now communicate with it via smartphone. The corresponding mobile app, 'myWIKA device', can be downloaded free of charge from the Google Play Store. Via the app and the WIKA-Wireless connection, the CPG1500 can be conveniently configured for test and calibration tasks via mobile phone. During the pressure measurement, the measured value is shown on the display in the desired unit. Moreover, users can access further parameters such as temperature and pressure change rate and also additional instrument information via the WIKA website. The app enables the configuration, control and storage of log operations. Since the app also communicates with the WIKA-Cal software, the logged data can be transmitted wirelessly for further processing on a suitable computer. The new mobile app is currently available for smartphones with Android operating systems. For the time being, its functions relate only to the CPG1500 - however, versions for other WIKA calibration instruments are already planned.

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

Compact chilled mirror hygrometer for sintering processes

Michell Instruments, represented locally by **Instrotech**, has on offer a new S8000RS chilled-mirror hygrometer which offers an accuracy of ±0,1°C, with a wide measurement range of -90 to +20°C dew point, ideal for moisture control in sintering (a process where powdered metals are bonded together to form light and strong products, from filters to machine parts. For sintering carried out at 600°C, maintaining a constant dew point of –60°C in the furnace is necessary and the gas is sampled at several points in the process. A fast-responding moisture analyser is essential so that action may be taken quickly if moisture levels rise above acceptable limits. Michell's S8000RS uses the fundamental chilled mirror technique to measure moisture, which ensures long-term accuracy to ±0,1°C dew point as well as reliability and a fast response. The measurement range of –80 to+20°C dp is ideal to ensure consistent monitoring at –60°C with confidence in the accuracy.

The S8000RS is the smallest hygrometer on the market which is able to reliably reach dew points of –80°C.

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

Ultra-thin ferroelectric material for next-generation electronics

Scientists at the **Tokyo Institute of Technology** have demonstrated the potential of a new, thin-film ferroelectric material that could improve the performance of next-generation sensors and semiconductors.'Ferroelectric' materials can switch between different states of electrical polarization in response to an external electric field. This flexibility means they show promise for many applications, for example in electronic devices and computer memory. Current ferroelectric materials are highly valued for their thermal and chemical stability and rapid electro-mechanical responses, but creating a material that is scalable down to the tiny sizes needed for technologies like silicon-based semiconductors (Si-based CMOS) has proven challenging.

Now, Hiroshi Funakubo and co-workers at the Tokyo Institute of Technology, in collaboration with researchers across Japan, have conducted experiments to determine the ferroelectric properties of an inorganic compound called hafnium oxide (HfO_2) for the first time. Crucially, the crystal structure of HfO_2 allows it to be deposited in ultra-thin films, meaning it may prove invaluable for next-generation technologies.

Ferroelectric properties stem from the shape and structure of the crystal used. The team knew that an 'orthorhombic' crystal of HfO_2 would likely exhibit ferroelectricity. Funakubo's team wanted to pinpoint the material's spontaneous polarisation and the Curie temperature (the point above which a material stops being ferroelectric due crystal re-structuring). To do this, they needed to grow a carefully-ordered crystal on a substrate, a process known as epitaxy, which would give them well-defined data on an atomic scale.

The researchers found that one particular epitaxial film, labelled YHO-7, exhibited ferroelectricity with a spontaneous polarization of 45 μC/cm and a Curie temperature of 450°C. The experimental results confirm earlier predictions using first principle calculations.

From a scientific and industrial point of view, a Curie temperature of 450°C is of great interest, because it means the material could fulfil functions for future technologies. In contrast to many existing ferroelectric materials, the new thin-film exhibits compatibility with Si-based CMOS and is robust in miniature forms.

Background

Ferroelectric materials

Ferroelectric materials differ from other materials because their polarisation can be reversed by an external electric field being applied in the opposite direction to the existing polarization. This property stems from the materials' specific crystal structure. Ferroelectric materials are highly valuable for next-generation electronics. While a number of ferroelectric materials are known to science and are already used in different applications, their crystal structure does not allow them to be scaled down to a small enough, ultra-thin film for use in miniaturized devices.

The material used by Funakubo and co-workers, hafnium oxide (HfO_2), had previously been predicted to exhibit ferroelectric properties through first principle calculations. However, no research team had confirmed and examined these predictions through experiments. Funakubo's team decided to measure the properties of the material when it was deposited in thin-film crystal form onto a substrate. The precise nature of the crystal structure enabled the researchers to pinpoint the material's properties in full for the first time.

Their discovery of a particular epitaxial thin-film crystal of HfO_2 that exhibits ferroelectricity below 450°C will be of great significance in the field.

Implications of the current study

Funakubo's team is hopeful that their new thin film ferroelectric material will have applications in novel random-access memory and transistors, along with quantum computing. Their material is also the first ferroelectric material compatible with silicon-based semiconductors (Si-based CMOS).

Enquiries: Email funakubo.h.aa@m.titech.ac.jp

Bearing condition monitor

The BCM-1601 is designed as a cost effective solution to measure the temperature and vibration levels of mission critical installations. Both the temperature and vibration indicators are fully programmable as far as range, alarm and signal re-transmit are concerned. The vibration and temperature sensors are integrated in one stainless steel housing and the M8 mounting stud ensures a secure connection to the equipment. Local display of vibration level, temperature and alarm make it easy for operators and inspectors to determine the condition of the equipment being monitored.

Enquiries: R&C Instrumentation.
Tel. +27 (0) 011 608 1551 or email info@randci.co.za

How natural gas is converted into methanol at room temperature

Twenty years after the technique was developed, a collaboration between scientists at **KU Leuven (University of Leuven)**, Belgium, and **Stanford University** has revealed the mechanism behind the direct conversion process of natural gas into methanol at room temperature. This discovery will have major for the future use of methanol in various everyday applications. The findings were published in 'Nature'.

Methanol is among the 20 most commonly used substances in the chemical industry. It's used to produce antifreeze, fuels, and solvents, but also in various kinds of plastic that we use every day. The substance is made from natural gas (methane). The large-scale conversion of methane into methanol currently involves various steps under high pressure and at a high temperature, making it a process that requires a lot of energy.

In the nineties, therefore, scientists developed a more direct method to produce methanol – a process that even produces extra energy. However, scientists didn't really understand the process. It was a kind of 'black box' into which they inserted methane, with a big chance that methanol would come out at the other end.

Twenty years later, postdoctoral researcher Pieter Vanelderen from the Centre for Surface Chemistry and Catalysis at KU Leuven (University of Leuven), Belgium, has unravelled the mechanism behind the process in collaboration with chemists from Stanford University.

The chemical reaction involves adding a specific substance known as a catalyst. Many catalysts consist of zeolites – minerals with a porous framework – containing a specific atom. For the direct conversion of methane into methanol, this catalyst is a zeolite with added iron. Professor Bert Sels: "We found that the iron needs to bind to the zeolite in a flat, bound orientation" (see Figure 1).

"We have provided the first exact definition of what the iron atom looks like that is needed to convert methane into methanol at room temperature. Furthermore, we can describe why this conversion method is so successful," explains Pieter Vanelderen. This discovery may revolutionise the production of methanol and, by extension, all its derivatives that we use in our everyday lives.

"This breakthrough has happened because we were the first chemists to join forces with biochemists to work on this topic," says Vanelderen. "Our colleagues at Stanford are specialised in the use of enzymes as catalysts in chemical reactions. Using methods initially developed to study iron-containing enzymes, they managed to take a 'picture', as it were, of what it is that happens to this iron-containing zeolite during the conversion of methane into methanol. This information allowed us to determine which specific iron atom was doing the work and to find its exact location in the zeolite."

Now that scientists know exactly what the catalyst looks like, they can start imitating and optimising it in the lab. This opens up quite a few possibilities for the future. For one thing, the production of the methanol needed to produce plastic will become a lot cheaper. The catalyst is also useful for the conversion of nitrogen oxides. It could be used, for instance, to clean the exhaust fumes of cars.

Enquiries: Email katrien.bollen@kuleuven.be

Iron needs to bind to the zeolite in a flat, bound orientation.

Stay cool in flow monitoring

Nowadays, almost all air conditioning, conveying or exhausting systems need monitoring of gas flow. Gas flow monitors are required to have high reliability and minimal pressure loss. KOBOLD, represented locally by **Instrotech**, has on offer to all users, an optimal solution with the flow monitor of the KAL-L series.

The KAL-L works according to the calorimetric principle. The sensor is heated up to a few degrees above the medium temperature. When the medium flows, the heat generated in the sensor is transferred to the medium, i.e., the sensor is cooled. This cooling process is a measure of the flow velocity.

A second sensor measures the medium temperature. The compact mounted electronics compares the resistance of both sensors by means of a Wheatstone bridge circuit, and switches an output relay if the actual value drops below the set switching value.

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

Increased Freedom in Lighting Design

Henk Rotman, Philips Lighting

Adding value using the unique features of LEDs is the way to go for the lighting industry.

Although the transition to LED lighting is in full swing and the lighting industry is increasingly implementing this technology in the products and services it offers to the market, we are still learning to use the benefits of this digital technology and translate them into value added offerings. One of the benefits is the fact that LEDs can be operated with different operating currents to allow a tailor made project solution for light levels and energy consumption. A characteristic of LEDs is that the operating current determines the light output as well the efficacy, with a lower operating current generating a lower light output but with a higher efficacy, while a lower operating current has a positive impact on lifetime.

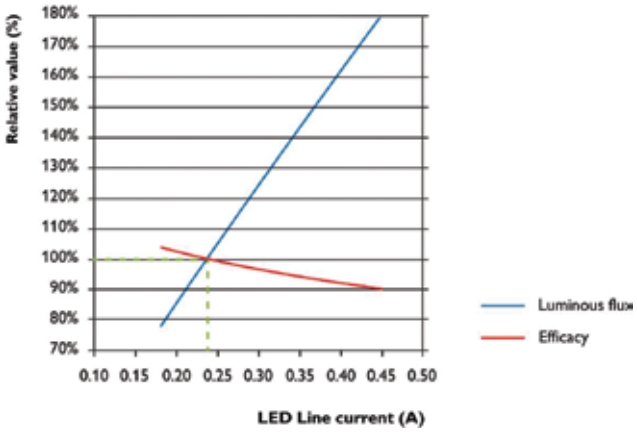

Figure 1: Current versus flux and efficacy.

In a sense, LEDs can be compared to cars: you can drive a car at different speeds; however, if you drive your car at the highest speed possible, your fuel consumption and wear and tear will be high. If you drive the same car at a moderate speed, your fuel consumption and wear and tear will be significantly lower. The same principle applies to LEDs; changing the operating current of an LED has an impact on light output and efficacy (see *Figure 1*) and the impact of operating current on lifetime is clear (see *Figure 2*).

The fact that LEDs are operated with different operating currents is what offers flexibility in the design of luminaires and projects. This flexibility did not exist with traditional lamp technologies and was often a constraint in lighting design when designers found themselves in a position where the design proposal just fell short of meeting the main design requirements, such as light levels and uniformity. They

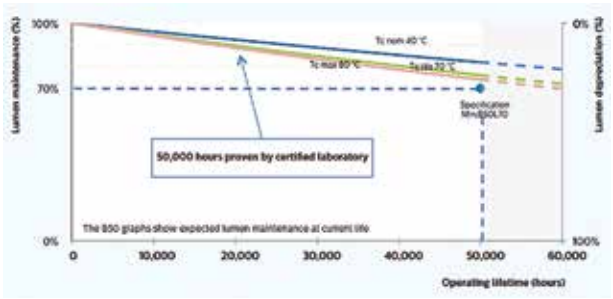

Figure 2: Temperature versus lumens and lifetime.

were then frequently forced to look at more efficient (and often more expensive) luminaires, increase the number of luminaires or choose a luminaire with more lamps or lamps of a higher wattage (e.g. from a 2 x T5 28 W to a 3 x T5 28 W, or from an HPS 150 W to an HPS 250 W), thus pushing up energy-use.

LEDs, however, offer the option of increasing the light output of the luminaire in situations where light levels are not met. Or, the light output can be decreased when light levels are too high thereby reducing energy-consumption, an important factor where the requirement is for a certain installed W/m^2. This all can be done by changing the operating current of the LEDs. For lighting designers, the major benefit of this characteristic of LEDs is increased design freedom; it allows lighting designs to be much more closely aligned to project requirements such as light levels and energy-consumption.

Programmable LED drivers

In order to have the option of changing the operating current, so called 'programmable LED drivers' must be used. Programmable drivers (also known as 'window drivers') are able to operate the LEDs within all points of a so-called operating window. Adjusting the current of a programmable driver can be done in various ways. Two of them are via a resistor used outside the driver or via dip switches at the driver. Both options have advantages and disadvantages.

> *The technology around programmable drivers is evolving fast.*

Using dip switches is the easiest method and one advantage is that the settings can be altered at a later stage. The major disadvantage of using dip switches is that only a limited number of settings is available and it is important to ensure, during installation, that the settings cannot be changed by non-authorised persons as this could lead to non-compliance. The optimal way of programming is to use a software tool. This offers the widest selection of settings and (depending of the type of programmable drivers) it offers more possibility for differentiation, e.g., Xitanium outdoor Full Programming drivers from Philips offer the option to program:

- Dimming schedules (allowing dimming in the quiet hours of the night, an additional way to reduce energy use for outdoor lighting)
- Constant light output (compensating depreciation of LEDs over their lifetime by slightly increasing the operating current)
- Adjustable start up time (light output of luminaires will increase gradually after switch on ['soft start'])
- Module temperature protection, this ensures protection of the LED system against over-heating (prevention of early failures) and increases overall reliability

Luminaire producers gain a number of benefits by using programmable drivers. A major one is that they can use the same hardware (luminaire) for different projects, simply by changing the operating current.

take note

- A characteristic of LEDs is that the operating current determines the light output as well as the efficacy.
- A lower operating current generates a lower light output but with a higher efficacy.
- A lower operating current has a positive impact on lifetime.

Latest developments in programmable drivers

The technology around programmable drivers is evolving fast. The latest innovation is wireless programming, where the operating current of the LED drivers, in addition to other settings, can be programmed via a technology called 'Near Field Communication', where the driver can be programmed (or re-programmed) simply by placing a special device close to the LED driver. This makes programming during production more time-efficient, and allows the drivers to be re-programmed in the field (where the driver is accessible). This is especially convenient where the use of a space changes, e.g., where an office space is converted into a pause area where people can have a coffee or tea break and where the required lighting level is significantly lower.

Re-programming the LED driver ensures that the lighting level is aligned with the use of the space while minimising energy-use. Another example where late programming or re-programming can be beneficial is last minute changes in an office, such as the colour of the walls or carpets. Lighting designs are based on assumed reflection factors linked to use of certain colours and a major last minute change in used colours can result in significant deviations in realised lighting levels. Late- or re-programming of LED drivers can be an option for re-aligning light levels with requirements.

The first 'sensor ready' LED drivers are available. These will allow LED drivers to be (re-) programmed via build-in sensors in the luminaire. This gives the opportunity for the 'last minute' programming of LED drivers, e.g., when luminaires are already installed in an office and after the furniture etc., has been moved in. It also allows for easy re-programming of already installed LED luminaires.

Conclusion

Programmable LED drivers are evolving fast and making use of the unique features of LED technology to offer many benefits to luminaire producers, lighting designers, specifiers and architects alike.

Acknowledgement

This article appeared in Lighting in Design, August/September 2016.

Originally from the Netherlands, Henk Rotman moved to South Africa in 2010 to work for the local Philips Lighting sales office. Currently, he is responsible for the sales of Philips lighting components to local producers.
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Retrofilling Transformers: A Financial Perspective

John Luksich and Kevin Rapp, Cargill Inc

Retrofilling mineral oil filled transformers with Envirotemp FR3 fluid should deliver a positive return on investment.

One of the top three causes of power transformer failures is cellulose insulation failure (the others being On Load Tap Changer and bushing failures). Cellulose insulation may be the weakest link of the transformer, because aging (degradation) of the cellulose insulation is irreversible. Following robust maintenance programs can detect and address the other potential failure modes prior to failure.

Many mineral oil filled transformers are being pushed to carry load beyond nameplate rating even though the exact condition of their cellulose insulation is unknown. Such practices accelerate the aging of the paper insulation, potentially reaching end of life. Fortunately, replacing the old, outdated mineral oil (retrofilling) with new FR3 fluid is a cost effective way to slow the thermal aging rate of cellulose insulation enabling increasing load-ability of transformers. Retrofilling also upgrades the transformer's fire safety and lowers the environmental risks associated with failures of aged transformers.

Financial incentives for retrofilling transformers

To assure reliability, transformers should be regularly maintained. Because expenses associated with maintenance require spending a company's profits, many companies have transitioned from annual maintenance schedules to condition based maintenance.

On 17 February, 2011, Federal Energy Regulatory Commission (FERC) ruled that utilities may capitalise all costs incurred to retrofill a transformer with bio-based Envirotemp FR3 fluid [1]. The ruling is based on FR3 fluid's ability to extend transformer insulation life and improve transformer performance.

Capitalising costs impacts Federal tax liability; reviewing normal accounting procedures reveals:

Revenue
– Costs
Gross Profit

Gross Profit
– Depreciation expense
Earnings before Interest and Taxes

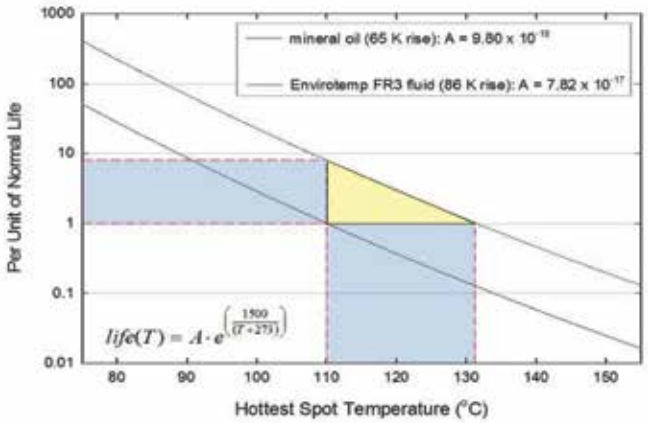
Earnings before Interest and Taxes
– Interest
Taxable Earnings

Capitalising the costs associated with a retrofill means adding those costs to the depreciation expense instead of taking them from the maintenance budget, thus potentially reducing earnings before taxes (EBIT). Lower earnings may equate to fewer taxes owed and higher profits.

Fire Mitigation Systems: Envirotemp FR3 fluid is an Approved Less Flammable fluid. FM Global designates less flammable fluids to be both an equivalent safeguard and suitable substitute for water deluge systems and fire barriers [2]. Retrofilling transformers containing 10 000 gallons or less with Envirotemp FR fluid allows users to remove older, maintenance-intensive reactive fire safety systems, saving operating expenses while lessening long term liability. Envirotemp FR3 fluid has a flawless fire safety record, as no Envirotemp FR3 fluid-filled transformer failure has ever resulted in a dielectric coolant pool fire.

Spill Remediation: The US Department of Agriculture has published a design guide for complying with EPA regulations related to oil spills. Reviewing this design guide, bio-remediation is an effective remediation tool [3].

Envirotemp FR3 fluid is 'Ultimately biodegradable' using the EPA's test methods. As outlined by the EPA, Cargill recommends using bioremediation to remediate ground spills of Envirotemp FR3 fluid [4]. To accelerate the process, Cargill advocates adding biomass consuming mirco-organisms to the site by spreading active yeast over a spill site and adding water to activate the micro-organisms contained in the yeast. The micro-organisms will consume the Envi-



rotemp FR3 fluid, thereby effectively removing it from the environment.

This process will cleanse the site as effectively as the 'age old' mineral oil remediation process of excavating and disposing of soil and replacing with new uncontaminated soil, but at a much reduced cost. Additionally, in water spills, the US Department of Agriculture recognises that biological degradation is an effective remediation tool. Since Envirotemp FR3 fluid does not create an iridescent sheen, bio-remediation may also be used in water spills.

Overload Ability: Envirotemp FR3 fluid/TUK (thermally upgraded Kraft) paper insulation systems have been proven to withstand heat better than mineral oil/TUK paper insulation systems. Retrofilling transformers with Envirotemp FR3 fluid increases overload capability without exceeding the insulation aging rate observed for mineral oil filled transformers [5]. (Refer to IEEE C57.91 for guidance before overloading power class transformers.)

> *Users will see an immediate reduction in risks when retrofilling transformers with Envirotemkp FR3 fluid.*

take note

- One of the top three causes of power transformer failure is cellulose insulation failure.
- To ensure reliability, transformers should be regularly maintained.
- FR3 has the ability to extend transformer insulation life and improve transformer performance.

Good candidates for retrofilling with this product

From the oldest to the newest (and including those purchased in the future), nearly all non-free breathing, non-silicone oil filled transformers are potentially good candidates for (retro) filling with Envirotemp FR3 fluid! Assessment should include a review of the maintenance records and status of the unit, and should incorporate unit proximity to environmentally sensitive areas or where the risk of fire is greatest.

Fiscal responsibility

Envirotemp FR3 fluid is a renewable technology that in many categories is proven to be a superior dielectric coolant to mineral oil, including automatic moisture control, dielectric strength retention, fire ignition resistance, electrical contact stability, environmental profile, carbon footprint (life cycle CO_2 generation), and many others. Financial incentives exist that promote immediate action to take advantage of Envirotemp FR3 fluid's unique value proposition. Users will see an immediate reduction in risks when retrofilling transformers with Envirotemp FR3 fluid. Additionally, throughput of the transformer can be increased.

Conclusion

Consider the following:

- The costs associated with the retrofill might be capitalised instead of expensed, reducing a company's Federal tax obligation
- Fire mitigation equipment can be removed from service, eliminating some maintenance expenses
- Costs incurred to remediate future spills may be reduced
- Additional 21 tolerance provided without accelerating normal insulation system aging rate (achieved through additional loading)
- Reduced risk of dielectric failure caused by bubble formation during overload
- Collateral damage to other equipment by not incurring dielectric pool fire

References

[1] Docket No. AC11-2-000, Federal Energy Regulatory Commission, February 17, 2011

[2] Transformers, Property Loss Prevention Data Sheet 5-4, FM Global.

[3] Design Guide for Oil Spill Prevention and Control at Substations, Bulletin 1724E302, Rural Development Utilities Programs, US Department of Agriculture.

[4] EPA Bulletin EPA 542-F-96-007, April 1996.

[5] Cargill paper ageing studies.

John Luksich received a B.Sc. in Chemistry in 1980 and M.Sc. in Materials Engineering in 1990, both from the University of Wisconsin. He is currently a Principal Engineer with Cargill Industrial Specialties group of Cargill Inc. Prior to Cargill, he spent 15 years as Senior Engineer in the Dielectric Fluids group of Cooper Power Systems. In addition to dielectric fluids, his engineering career includes thin film materials development at the McDonnell Douglas Space & Physics Laboratory and sensor development for Johnson Controls.

Kevin J. Rapp graduated from the University of Wisconsin-Parkside with a B.S. in Chemistry after completing undergraduate research in Lipid-Cellulose Interactions Chemistry. Kevin began his career at the Thomas A. Edison Technical Centre. The laboratory became part of Cooper Power Systems in 1985. In June 2012, the Envirotemp FR3 Fluid, which Kevin co-invented, became part of a new dielectric fluids business unit at Cargill, where he is currently Senior Chemist. Enquiries: Louis Blom. Wilec. Tel: +27 (0) 11 629 9300 or email louisb@wilec.co.za

Electrostatic discharge protection

SD flooring is a hardwearing homogeneous contact sheet or tile floor covering engineered specifically for ESD (electrostatic discharge) protection. SD floor coverings are treated chemically to discharge static electricity. They must be applied in a controlled environment with a relative humidity of more than 40%. Typical applications range from electronics to medical, manufacturing and mining, which all have different conductivity requirements.

Altico is rolling out Polyflor's SD (Static Dissipative) ESD flooring in a flagship project for electronics repair chain iFix Repair Specialists. The project has covered 14 stores countrywide to date, from 20 m^2 to 40 m^2, with another five in the pipeline, notes Nicholas Sibanda, technical sales manager. Altico is both the preferred supplier and installer of the Polyflor ESD range in South Africa.

The floor preparation involves laying down an initial screed. An aluminium grid is then laid down, followed by the Polyflor tiles themselves, which are affixed using a conductive adhesive. Finally the electrical earthing of the building is connected to the floor.

Enquiries: Kevin Klaff. Email kevin@actum.co.za

Flexible snap-on trunking

"**Legrand** keeps abreast with global electrical and digital trends in residential and commercial buildings, with the introduction locally of the latest products and systems," says Marius Labuschagne, Legrand's technical and solutions manager. "Legrand's modern DLP-S ECO snap-on trunking – designed for the efficient integration of power and data sockets in new installations and refurbishment projects – is suitable for high and low current applications in all building sectors, including domestic, office, commercial, banks, hospitals, computer centres and industry.

"A key feature is the combination of this versatile trunking system with Legrand's Arteor wiring devices. This flexible snap-on trunking assembly allows quick connections for normal and dedicated power, low voltage applications, telephone systems, computers and dedicated sockets. An important benefit is that all power and data is distributed in one system."

Legrand's DLP-S trunking is available with white covers that retain colour quality, maintain original shape and have resistance to flame propagation and mechanical shocks.

Enquiries: Email legrand.south-africa@legrand.co.za

Product selection … save time

Bosch Rexroth recently launched its integrated LinSelect selection and sizing software tool, enabling design engineers to find optimal linear axes and actuators from around 100 000 possible Bosch Rexroth product variants for their application in just five steps.

LinSelect delivers an integrated digital engineering process, from selection right through to configuration and electronic order at the Bosch Rexroth eShop. Selecting complete axes and actuators extends beyond the mechanical considerations; it also encompasses suitable Bosch Rexroth motors and drive controllers.

LinSelect does not just simplify design and procurement for experienced engineers; even inexperienced users are guided intuitively through the selection process, without the need for laborious training and familiarisation. In just five steps, the software narrows down the number of possible variants based on individual needs.

In addition to a pure calculation of mathematical parameters, the software developers have also integrated algorithms with comprehensive application-specific know-how of linear motion systems. Beyond pure mechanicals, the tool also suggests suitable Bosch Rexroth motor and drive controllers.

Enquiries: Kevin Lombard. Tel: 011 971 9400 or email kevinl@tectra.co.za

Triumphant at 2016 SAICE & SAFCEC National Awards

Projects of **Royal HaskoningDHV** came out triumphant once again at the South African Institution of Civil Engineering (SAICE) & South African Federation of Civil Engineering Contractors (SAFCEC) Annual National Awards held at Emperor's Palace on the 13th October, winning 4 awards in the Technical Excellence, Water Engineering and Community based Projects categories.

In the category for Technical Excellence the Ashley Drive Break Pressure Tank project for eThekwini Department of Water & Sanitation received a commendation while the Ingula Pumped Storage Scheme for Eskom was announced as the overall winner. The Ingula Pumped Storage Scheme was also the winner in the Water Engineering Division category. The Hlambanyathi Development Project for the Department of Transport received a Commendation in the Community based projects category. The SAICE & SAFCEC Awards are held annually to honour individuals, projects, community-oriented initiatives as well as various institutional departments of SAICE and SAFCEC. The annual awards function gives these companies, individuals and departments a unique opportunity to showcase their deserving projects and work to the Civil Engineering industry.

Enquiries: Kizito Lundu. Email Kizito.Lundu@rhdhv.com

Reinvent... to beat economic pressures

To maintain its position and competitive edge as one of South Africa's leading players in sheet metal manufacture, the management team of **World Power Products** recently completed an inspiring three-year journey of transformation. Director Jan Görtzen explains: "To effectively meet tough economic pressures and industry challenges we reinvented ourselves by analysing every aspect of the business and identifying what processes could be streamlined, where we could work smarter and improve efficiencies and where we could save time and money so that we could offer our customers the best value for their money. We continue to deal with every uphill head on and while some challenges have been tough, we have embraced them and implemented them carefully and intelligently making sure that it is to the advantage of the company to ensure a future for all our employees. When we see opportunities we seize them." Employee training and upskilling are high on the company's priority list and Görtzen confirms that empowering employees to work smarter and safer has a direct and positive impact on the company's productivity. "A confident worker is a safe worker and produces high quality work."

Enquiries: Samantha Hedley. Email shedley@wpp.co.za

Environmental risks to Angola's hydropower revolution

Chris Dalgliesh and Sharon Jones, SRK Consulting

Hydro-electric schemes along Angola's Kwanza River could double the country's power generation capacity within the next five years, but this infrastructural boon could have severe environmental impacts if not carefully managed. While hydropower is a popular renewable resource globally, it is not without its environmental and social impacts. Not least among these are the consequences of water inundating large areas to create the dams to feed the hydro-electric turbines.

SRK has been contracted by financial institutions to conduct the environmental and social due diligence for three of the dams, to ensure compliance with Good International Industry Practice (GIIP). The plans for Angola's hydro projects are ambitious and far-reaching for the country's development, requiring substantial investment of some $10 billion for the first tranche of projects.

The Kwanza River drops some 1 000 metres over about 200 kilometres of its middle course as it nears the coastline and discharges into the sea south of the capital, Luanda. It has been estimated that this head of water could be harnessed to generate 7 000 to 8 000 MW of energy from up to seven hydropower schemes along this reach of the river. The three proposed dams are in an advanced stage of planning or execution, and could generate 5 000 MW of electricity by 2021.

Compliant with best practice: In addition to assessing the projects' ESIAs, SRK is conducting annual compliance reviews through construction and into operation to ensure that both these phases are compliant with best practice. In the case of the three projects, the area to be flooded is about 230 square kilometres. This will impact on terrestrial biodiversity and on a magnificent river environment that includes numerous sets of rapids over the affected areas. The cumulative impact of the projects may also be substantial, as the seven schemes are being considered in relatively close proximity to each other. The area is not highly populated so very little resettlement will be required.

Flow impacts: The dams will alter flow regimes in the river, which in turn will affect the levels of sedimentation; the sediment is usually deposited onto surrounding land in the floodplain during the annual flooding of the river, and this will now be less likely to occur. Other concerns are that dams are physical barriers that tend to restrict the migration of fish species, and flooding of rapids will destroy those particular habitats which might be particular to certain species.

To help balance Angola's electricity demands with environmental protection, there are innovations that can be considered. For instance, most habitats and species are unable to tolerate the daily changes in water levels and flow from a hydropower facility operating in 'peak mode' – releasing extra water at certain times each day to satisfy peak demand. A dam operated as a base-load facility, on the other hand, would release a more constant volume of water with fewer fluctuations, reducing impacts. Where a number of dams are in operation on the same river, as is the case on the Kwanza, there is the opportunity to operate at least some of them in base-load mode, and to limit the peak flow operation to as few dams as possible.

Baselines: The relatively short history of baseline environmental assessment in Angola meant that many areas were not well documented in terms of natural species and their prevalence. When studies are carried out for ESIAs, therefore, it is not uncommon that species new to science may be encountered. It can be difficult to establish whether or not the species are common or rare, as little may be known about their occurrence in other parts of the country.

Labour: These projects employ substantial numbers of employees, and standards must be applied regarding a range of issues including: health and safety; the rights of workers to organise; the accommodation they are entitled to; and the terms of their mobilisation and demobilisation.

Enquiries: Visit www.srk.co.za

Chris Dalgliesh, SRK Consulting

Sharon Jones, SRK Consulting

Smarter power at Telecoms exhibition

Cummins will exhibit its Smarter Power telecom genset at the continent's leading telecoms platform, AfricaCom 2016, from 15 to 17 November at the Cape Town International Convention Centre. Cummins has established a permanent presence in the telecoms industry by providing reliable back-up power solutions for cellphone towers and data centres, for example. The Cummins range of diesel and gas generators and engines is geared towards small to medium and large applications, ensuring continuous critical loads for various applications including telecoms and banking. "The benefits of security of power for these sectors far outweighs the cost of investing in a back-up power system from Cummins," notes Eric Flechet, Director Vertical Segments. Cummins will showcase its 20 kVA telecom-specific diesel genset for the telecoms industry, which boasts an increased fuel capacity and an extended oil-change interval for proactive maintenance and fuel efficiency for a particular sector, and also to reduce maintenance costs," Flechet says.

Enquiries for AfricaCom. Visit https://tmt.knect365.com/africacom/

Cummins stand D9, Hall 3

ABB research award presented

Dr. Jef Beerten, of the University of Leuven (KU Leuven) and EnergyVille, postdoctoral fellow of Research Foundation – Flanders (FWO), Belgium, is the first recipient of the **ABB** Research Award in Honor of Hubertus von Gruenberg. At a ceremony in front of more than a hundred international researchers, Dr. Beerten was recognized for his doctoral thesis, "Modeling and Control of DC Grids." He was chosen from 69 applicants from leading institutions around the world, representing a wide range of disciplines. Dedicated in honor of former ABB chairman Dr. Hubertus von Gruenberg, the award recognises outstanding academic work in energy and automation and is accompanied by one of the highest research grants of its kind. It will be given every three years.

"As the pioneering technology leader and global digital champion, we're happy to support path-breaking research connected to the Energy and Fourth Industrial Revolutions," said ABB CEO Ulrich Spiesshofer. "I congratulate Jef Beerten, whose work stands out for its applicability to real-world problems in the field of power and automation."

Enquiries: Shivani Chetram. Email shivani.chetram@za.abb.com

Desiccant dryer ensures consistent gas purity

In the business of industrial gas production, consistent product quality is an absolute requirement. To ensure this consistency is maintained, raw gas from production facilities is tapped off their main supply lines for analysis. However, this gas is often saturated with water, which hampers reliable analysis. RTS Africa Engineering, a Tshwane-based engineering solutions provider to industry's toughest challenges, has come up with an innovative solution in the form of the RTS Africa desiccant dryer. "Our desiccant dryer ensures reliable analysis and, consequently, stable and consistent quality for users of industrial gases," points out Ian Fraser, Managing Director of **RTS Africa Engineering**. In some applications, moisture in gases used in industry can cause serious damage to plant and loss of production.

Enquiries: Tel. +27 (0) 12 433 6335

Bizz Buzz

Rockwell Automation acquires MAVERICK Technologies

Rockwell Automation has acquired systems integrator MAVERICK Technologies to expand domain knowledge and help deliver innovative control and information solutions to customers in industries, such as chemical, food and beverage, and oil and gas. The acquisition significantly strengthens Rockwell Automation's expertise in key process and batch applications to help its customers realise greater productivity and improved global competitiveness through process control and information management solutions.

Enquiries: Michelle Junius. Email mjunius @ra.rockwell.com

Eskom exceeds second quarter electrification targets

Eskom has exceeded its electrification target for the second quarter of this financial year. "We have achieved 101 067 connections, with 99 991 connections energised, which means that people are already using electricity against a target of 97 513 year-to-date," says Mongezi Ntsokolo, Group Executive for Eskom Distribution. "At this rate, we are moving towards our target of 207 332 connections by the end of this financial year. A special focus is on the Eastern Cape, Limpopo and KwaZulu-Natal, in order to address backlogs, thus making life easier for our people," adds Ntsokolo.

Enquiries: Email mediadesk@eskom.co.za

Innovative Smart Parking

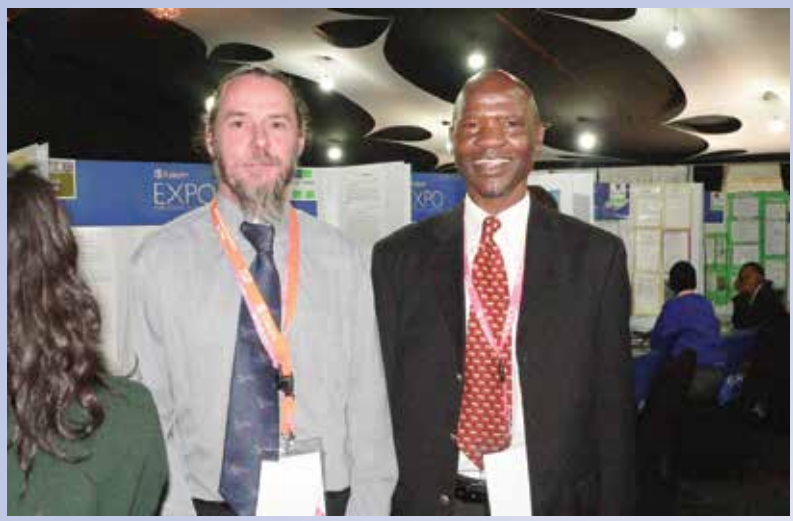
Czech Republic **SPEL** and **Paradox Engineering** recently completed an innovative Smart Parking project in Kolin, Czech Republic. The town aimed at improving urban mobility by facilitating parking search and making a more efficient use of available parking facilities. SPEL offered the community an integrated Smart Parking solution based on Tinynode's technology. Tinynode is a Paradox Engineering company specialising in wireless vehicle detection systems for parking-related applications. Integrating Tinynode's parking technology, vehicle detection sensors and safe wireless network with an open communication protocol, a quick and secure architecture was enabled to feed the information system of the City.

Enquiries: Silvia Vergani. Email svergani@pdxeng.ch

Young, creative and energetic

The best time of year for the Electricity+Control team is when the Eskom Expo for Young Scientists takes place. This year, it took place at the Birchwood Conference Centre in Boksburg in early October. The Expo is a Science Fair, where students have a chance to display and discuss their explorations. Students discuss their work with judges, teachers and students from other schools, with parents and with other interested people. By participating, students increase their awareness of the wonders of Science and Engineering.

Enquiries: Email admin@exposcience.co.za



Ken Nixon (Expo judge) and Andries Tshabalala (Group Executive Director, ACTOM).

Leo Dlamini, Acting Group Executive: Transmission and Sustainability, Eskom; SA Tlhabane, Chief Director, Department of Basic Education; Pieter Pretorius, Chairman of the Board Directors, Eskom Expo for Young Scientists; Ian Jandrell, Dean of Engineering and the Built Environment, Wits; Bersan Lesch, Deputy Director: Science Promotion, Department of Science and Technology (Deputy Chairman, Eskom Expo for Young Scientists); Nto Rikhotso, Eskom Media Desk Manager; Freddy Ndou, Divisional Executive, Office of the Group Chief Executive, Eskom.

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