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MORE THAN SENSORS, SOLUTIONS

As 2017 progresses more and more challenges are emerging. These challenges are not only about the slow economy and some deep concerns about a number of administrative issues in the nation – but are also about how we react to them.

I was reminded the other day about how, as a nation, we deem to wait for the end of the world. Of course, it never happens. In fact, there are increasing indications that our systems are robust and do effect the corrections that we need.

It is just a pity, some would say, that so much heat needs to be generated before the light emerges.

The issue that remains salient is how we prepare ourselves, as a nation, for the time when we need to really compete internationally.

Think back for a moment to all the times when the world economy surged. We found ourselves lagging behind, in many respects as a sub-continental region – largely because of a skills deficit.

I have been party to discussion about how automation and control can compensate for that – and to some extent it is true. The reality, of course, is that one needs a workforce with a different skills' set. Furthermore, should it transpire that we turn to highly sophisticated systems that make this economy more competitive, an interesting consequence will be economic growth and the need for more skills. Should this not transpire, sustainability will be called into question.

My concern is that few are willing to even imagine that it will transpire!

This sense that an investment into skills is anything but an investment into the future is very poorly considered. There are many needy causes out there. As a company we support some; and as individuals

we support some. But an investment into skills development is by no means a donation to a needy cause. It is a profound investment.

I am of the view that, no matter your industry sector, skills development and preparing the populace for employment into a technologically driven world is probably the single biggest investment you could make into the future of your organisation. That is, providing you want to continue to operate in this part of the world.

My personal view, and the view of this company, is that we live in the most exciting part of the world, and one bristling with opportunities. The way to secure that future is to invest in it. That means making a conscious decision to do just that.

We can be critical of some of the issues relating to the education system, but equally we can make it our business to find out how best we can do this – and to ensure that, when the next global wave of opportunity arises, we are actually poised to take advantage of it.

See Louis Meiring's discussion on technology transfer, training and skills upliftment (page 37).

Ian

Ian Jandrell

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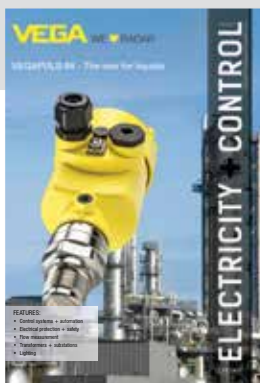
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Cover

The introduction of **VEGA's** 80 GHz radar sensors represents a paradigm shift in liquid level measurement. We take a look at all the things an 80 GHz radar sensor can do. *(More on page 25).*

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SCADA Data Provides Reasons for Failures in Wind Turbines

Pramod Bangalore, Greenbyte AB

A flexible and accurate tool that uses large amounts of SCADA data to obtain actionable information about impending component failures in wind turbines is being developed.

Major failures in wind turbines are often expensive to repair and cause loss of revenue due to long downtimes. With a downward spiral in electricity prices wind turbine owners and operators have started to focus more on methods to predict failures in order to reduce long downtimes and reactive maintenance.

Analysis of measurements, like vibration, has been successfully applied for early fault detection in mechanical components like a gearbox. However, these techniques are limited mostly to the rotating mechanical components in the wind turbine. The wind turbine Supervisory Control and Data Acquisition System (SCADA) records a large number of measurements which represent the current operating conditions in wind turbines. An intelligent analysis of these measurements can allow a fault in wind turbine components to be detected well in advance, so that expensive failures can be avoided by planning appropriate maintenance. However, to extract actionable information from the SCADA data is not a straight forward task. Wind turbines operate in highly variable operating conditions making it difficult to set a baseline behaviour pattern, which in turn makes it difficult to detect the points in time when the wind turbine deviates from its normal operation.

The renewable energy intelligence platform, Breeze, is developing a flexible and accurate tool to use the large amount of SCADA data to obtain actionable information about impending component failures in wind turbines. Development is in the early experimental phases. To predict failures a mathematical modelling tool called Artificial Neural Networks (ANN) is being used. ANN is a powerful method for modelling non-linear real world physical relationships. The ANN models have been proven to work with high accuracy in the Chalmers University of Technology doctorate program and are now being implemented into Breeze. This article strives to answer five questions:

- How does ANN modelling work?
- How good are ANN models?
- What is Breeze doing to improve the ANN method?

- Why should owners and operators of wind turbines be interested?
- Where does Breeze take ANN from here?

How does ANN modelling work?

ANN is based on how a human brain functions in terms of interaction with its immediate surrounding. For example – vision is one of the functions of the brain, wherein an image, input from the retina of the eye, is processed which lets us perceive, understand and interact with the object being visualised. All this processing takes a matter of milliseconds.

The brain comprises millions of neurons connected in a particular manner, the interaction of which in a specific sequence produce the desired results. These connections are established early in life through a learning procedure, commonly referred to as ‘experience’.

The ANN models intend to mimic the structure of the brain in order to model real world non-linear systems. The main similarities between the brain and the ANN is the knowledge acquisition through experience or the learning process and the retention of knowledge with the inter-neuron connections called synaptic weights. Hence, ANN models are trained on data that represent a healthy condition in the wind turbines and the experience of these models is used to detect deviations from the healthy state.

How good are the ANN models?

ANN modelling has its fair share of issues which have been the reason for its limited application as a condition monitoring tool in the wind industry. Prior to implementing ANN into Breeze intensive studies have been performed, as a part of a four year PhD project, which focused on finding the critical issues that arise due to use of ANN models. Various methods were developed to overcome these issues and increase confidence in the output from ANN models.

”

Mathematical modelling tool – ANN – accurately predicts failures in wind turbines.



What are we doing to improve the ANN method?

In order to provide accurate results the ANN models need high quality data from a healthy period of the wind turbine operation. Typical SCADA data is highly inconsistent due to communication interruptions, incorrectly recorded data and missing data due to maintenance activities. With the wind farm installed in Breeze the ANN model is ensured to have consistent data as input. On top of consistent data a robust filtering approach has been developed to make sure the ANN models are not trained on data that does not represent the healthy condition correctly.

In addition to the general filtering that removes data representing non-optimal operation, an advanced multi-dimensional data clustering approach is used to detect those data points, which seem to represent normal operation to the naked eye but should in fact not

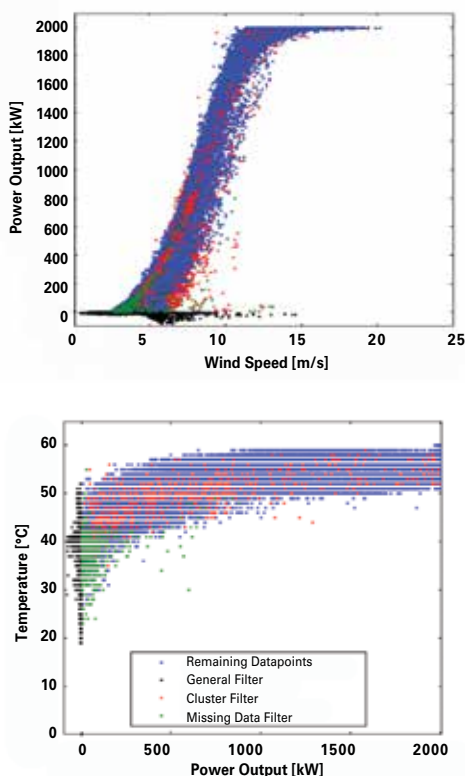


Figure 1: Output from data filters showing discarded data.

be characterised as normal operation. Furthermore, a third filter is used to ensure that continuous data is present while training the ANN model. *Figure 1* shows the output from the data filters, which represents the filtered data points.

With consistent and filter data the next step is to select the correct input measurements for ANN modelling. Inputs are selected so that the model gives accurate results so that it is able to detect abnormal operation in the wind turbine. In order to ensure that the model detects failures at an early stage, the ANN model should have a good generalisation property. This aspect is often not given enough importance during the ANN modelling stage.

A large number of input parameters might improve the accuracy of the model output but might not be able to detect a failure. *Figure 2* shows the result of an incorrect choice of inputs. The ANN model provides accurate results as it is able to estimate the temperature of the gearbox bearing with very small error. However, the model also predicts the high temperature, which is abnormal operation for the said gearbox in the wind turbine. During the doctorate program various combinations of inputs were tested and the best configuration was chosen to provide accurate results and successful early fault detection.

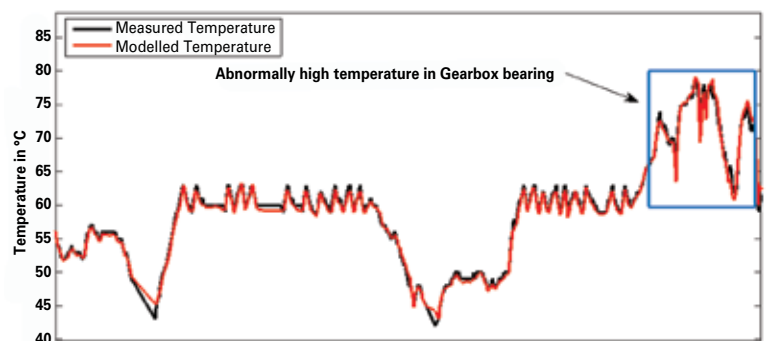


Figure 2: Overestimation from the ANN model due to incorrect input parameters.

Predictions using ANN models is an approach based solely on analysis of data and hence, there is no physics present in these models. This approach is called black box modelling, because the user provides input and gets an output based on statistical models in the black box that are often difficult to conceptualise. The Breeze approach to ANN takes cognisance of the computational capacity

available in the Breeze platform infrastructure and the concepts of statistics to ensure that the anomaly detection from the ANN models is accurate and at an early stage. A unique approach using statistical measures is used to detect failures, where 99% accuracy is ensured in the estimation.

In addition to this the ANN is trained on a large number of models with the same data and take an average over all the models for an output. This eliminates the possibility of having an incorrect output from the ANN models due to randomness in the training process.

Why should you be interested?

The ANN based condition monitoring method has been tested, validated and improved over the past few years and with numerous real world case studies. It has been found to be effective and is able to detect faults as early as three months in advance. With the implementation into Breeze, the focus is on improving the methods further and providing accurate and actionable information about future failures in various components neatly packaged into the Breeze product available to any wind turbine owner.

Figure 3 shows the output from the ANN using SCADA data for a wind turbine with failure in the gearbox. The method is able to detect the fault two months in advance, whereas the vibration based condition monitoring system did not point to any failure.

This information is very valuable to owners and operators who seek to be prepared for a major maintenance in the wind turbine. In addition to this, information prior to the failure allows the opportunity to optimise the maintenance activity thereby reducing the maintenance cost.

Where does Breeze take ANN from here?

The condition monitoring method using ANN has been tested and verified with 10-min average SCADA data in an academic environment applying the models to one wind turbine at a time. With the implementation into Breeze the ANN will be deployed to many thousand wind turbines and available for wind turbine owners and operators all over the world with the objective of increasing profitability for wind turbine owners.

- Major failures in wind turbines are expensive to repair.
- Wind turbine SCADA records a large number of measurements which represent the current operating conditions.
- A flexible and accurate tool is being developed to use this data to obtain actionable information about impending component failures in wind turbines.

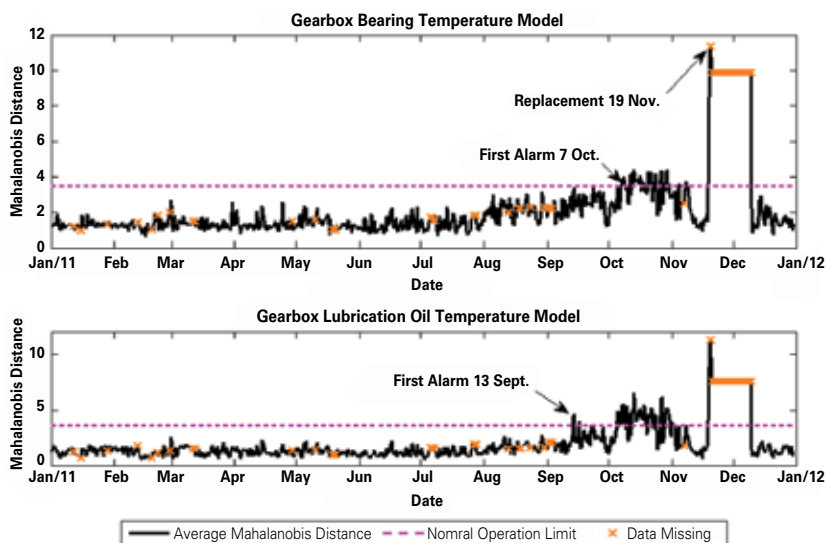


Figure 3: Output from a case study for condition monitoring using ANN models.



Pramod Bangalore has a PhD in Electric Power Engineering (2016) from Chalmers University of Technology, Gothenburg, Sweden. His research had a focus on application of machine learning algorithms for condition monitoring of electrical and mechanical components. His experience includes working as a consultant in both oil and gas industry, and the renewable energy sector. In addition to his expertise in various machine learning algorithms, Pramod also specialises in statistical modelling methods, applied mathematical optimisation techniques and risk and reliability analysis. Currently, he is working as an Applications Expert at Greenbyte AB, in Gothenburg, Sweden. Enquiries: Email caroline@greenbyte.com



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New Approach - Quality Control Calls for Elimination of Human Error

Josh Hodgkinson, Omron

In today's manufacturing environment, the human eye simply cannot inspect Fast Moving Consumer Goods (FMCG) at high speed...

Let alone measure label positions, cap dimensions or read barcode information. That is why a new approach to quality control is needed.

Enter the Omron FH Series Vision Controller (further referred to as the Vision Controller), the best in its class in sensing applications requiring high speed and precision.

It features a high level of programming capability, customisable tools for any industry, high resolution and high-speed cameras. The Vision Controller described in this article is therefore truly revolutionary.

For those unfamiliar with Vision Inspection/Automation Systems (VIS), these comprise a camera, some form of controller, and software to perform the required tasks and Inputs and Outputs (I/Os). A sensor would typically trigger the camera to take an image of the product once it has reached the correct position.

The image would be sent to the controller in the form of binary data, and the data would then be interpreted through the software according to the instructions set out by an engineer. Once a decision has been made by the system, based on the quality of the product, the relevant output is triggered.

The company's complete line-up of cameras is fit for various industry types. These cameras range from high speed and high-resolution to smaller compact cameras and rolling shutters. From a software perspective, we set the standard for customisation and control. The FH Software and remote tool integrate easily into existing systems through their .net capability, or it can be used as a standalone platform to create digital quality inspection templates.

Functionally, the user is able to search for a specific shape or pattern, measure colour, read characters or barcode data, present co-ordinate information to a robot, and even perform custom instructions with macros.

What does this mean?

Essentially, the software can perform any quality or measurement task at speeds and a level of precision that no human can compete with. We have taken the human error element out of quality control, and added the ability to measure a product 'on the fly', while still maintaining high production speeds.

We have developed industry-specific software packages to enhance the features and capability of the Vision Controller. A great example of this is the FlexXpect Pharma package, the ideal answer to FDA 21 CFR Part 11 [1] with regard to VIS. Targeting challenging inspections in the pharmaceutical industry, it offers powerful inspection tools and functionality. The software is compliant with all of the 21 CFR Part 11 [1] requirements for either open or closed systems, including:

- User password protection
- User level authorisation and limitation
- Full audit trail in form of exportable .csv or .txt file
- Program revision history with rollback functionality

For applications that require high-speed precision, without compromising on quality, the Vision Controller is therefore your best option. Essentially, sensing technology for inspection and measurement necessary for automation has been packaged in compact devices.

For applications requiring high speed and resolution, a lens mount camera allows the end user to select the best combination of camera and lens for the application at hand. In addition, a rolling shutter camera has been added to the line-up, in recognition of the fact that these are now once again in favour.

The rolling shutter camera scans the pixels of each line. Despite distortions resulting from moving objects, this allows for high resolution and cost-effective inspection and measurement. An all-in-one camera

FAE	– Field Application Engineer
FMCG	– Fast Moving Consumer Goods
VIS	– Vision Inspection (Automation) System
CPU	– Central Processing Unit
I/O	– Input/ Output

Abbreviations/Acronyms

including the light and lens, it can be integrated into almost any machine. The sensor has a built-in, high-power light capable of evenly lighting across a wide field of view. This provides sufficient lighting, even when the enclosed polarising filter is used. In addition, the focus of the lens can be adjusted to take clear images for the specific field of view and installation distance. Apart from camera installation, the best controller can also be selected to suit the specific requirements. The series also boasts a high-performance bus to transfer images, maximising the specifications of any camera that is selected.

High-precision object detection means low-error position detection, even with blurry images. The secret lies in searching for, and matching, templates at high speed. The end result is the Shape Search III algorithm, which provides advanced robustness for critical FA sites. When measuring lamination of glass or other processes where the distance to the workpiece from the camera varies, there is a possibility of size differences and focal shifts.

Stable searching is possible even under adverse conditions, a frequent occurrence in actual measurement applications. Even if multiple workpieces are in the field of view, searching is still possible, without compromising detection accuracy. Workpieces can also be isolated from background noise, while even shiny workpieces are easily detectable.

The ongoing development of such technology has resulted in search algorithms up to nine times faster than before. Even unstable image conditions – ranging from light interference to overlapping shapes, gloss, and incomplete images – can now be accommodated, without any reduction in speed.

However, it is important to bear in mind that advanced searching requires many parameters that need to be fine-tuned in terms of the application at hand. This poses the additional problem of the person making the setting adjustments being unable to observe the internal process. Traditionally, much time and effort is required to maximise tool performance. In this regard, Shape Search III allows the end user to visualise comparisons between the model data and part of the measurement object, which means quick and easy detection if comparisons are not matched optimally.

An important consideration is that operation interfaces are pre-installed. Operation interfaces can be displayed by simply switching screens, without the need for time-consuming interface development

work. Display messages are even available in nine languages, including English, Chinese, Japanese, and others.

Other benefits include inspection flow design. Processing items can be dragged-and-dropped so as to create inspection and measurement flows. This means that flow creation at production sites, offline flow creations, and simulations are now a cinch. Simplified programming means user-defined macros can be used for complex data processing that cannot be carried out by inspection flows. Such macro-creation is facilitated by the BASIC programming language deployed.

Conclusion

A major advantage of this technology is parallel processing for high-speed inspection, which also allows for in-line external inspection. Significantly, the trigger interval has been reduced by up to 75%. In general, when multiple inspections are carried out simultaneously, there is a time lag until the next inspection can take place. Parallel processing by means of a multi-core CPU not only speeds up the inspection time, but greatly reduces this waiting period as well.

Reference

[1] FDA 21 CFR, Part 11. U.S. Department of Health and Human Services Food and Drug Administration (FDA). Part 11 – Electronic Records; Electronic Signatures – Scope and Application.

- The Vision Controller described represents a new approach to quality control.
- It is considered to be the best in its class in sensing applications requiring high speed and precision.
- In short, this Vision Controller is revolutionary.



”
The software can perform any quality or measurement task with inimitable speed and precision.



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What is IO-Link?

Insights from the experts at Banner Engineering; supplied by RET Automation Controls

IO-Link (IEC61131-9) is an open standard serial communication protocol that allows for the bi-directional exchange of data from sensors and devices that support IO-Link and are connected to a master. The IO-Link master can transmit this data over various networks, fieldbuses, or backplane buses, making the data accessible for immediate action or long-term analysis via an industrial information system (PLC, HMI, etc.). Each IO-Link sensor has an IODD (IO Device Description) file that describes the device and its IO-Link capabilities.

It should be noted that IO-Link is not another fieldbus – but rather a point-to-point communication protocol between a compatible IO system and a field device. Because IO-Link is an open standard, devices can be integrated in virtually any fieldbus or automation system.

5 Advantages of IO-Link

1. Standardised and reduced wiring

A critical benefit of IO-Link for many industries is that IO-Link does not require any special or complicated wiring. Rather, IO-Link devices can be connected using the same cost-effective standard unshielded 3-wire cables as conventional discrete I/O – which helps keep wiring simple. In addition, IO-Link eliminates the need for analogue sensors and reduces the variety of cord sets required for sensors, which saves inventory costs. IO-Link supports a master-slave configuration with passive connection points, which further reduces wiring requirements.

2. Increased Data Availability

Data availability is a powerful advantage of IO-Link that has far-reaching implications. Access to sensor-level data helps ensure the smooth operation of system components, streamlines device replacement, and enables optimised machine maintenance schedules – all of which save costs and reduce the risk of machine downtime.

There are three primary data types made available via IO-Link communication, which are categorised as either cyclic data (data automatically transmitted on a regular basis) or acyclic data (data transmitted as needed or upon request):

Process Data – refers to the information that the device reads and transmits to the master – such as the distance reading on a laser measurement sensor. Process data can also refer to

information that is transmitted to the device from the master (such as messages sent to a tower light indicating which colour segments should be illuminated). Process data is transmitted cyclically in a defined data frame. In addition, value status data – indications of whether or not process data is valid – is transmitted along with process data

Service Data – also called Device Data – refers to information about the sensor itself such as parameter values, model and serial numbers, device descriptions, etc. Service data can be both written to the device or read from the device acyclically

Event Data – refers to notifications such as error messages or maintenance warnings (e.g. device overheating, dirty lens) that are transmitted acyclically from the IO-Link device to the master whenever an event occurs

3. Remote Configuration and Monitoring: With IO-Link, users can read and change device parameters through the control system software, enabling fast configuration and commissioning that saves time and resources. In addition, IO-Link allows operators to dynamically change the sensor parameters from the control system as needed – such as in the case of product changeover – which reduces downtime and allows machines to accommodate greater product diversity. This is especially important in consumer packaged goods applications where the demand for variety in packaging is continually increasing. In addition, the ability to monitor sensor outputs, receive real-time status alerts, and adjust settings from virtually anywhere allows users to identify and resolve problems that arise on the sensor level in a timely manner.

4. Simple Device Replacement: In addition to the ability to remotely adjust sensor settings, IO-Link's data storage capability also allows for automated parameter reassignment in case of device replacement (this functionality is also known as Auto-Device Replacement or ADR). Users can import existing sensor parameter values into a replacement sensor for seamless replacement, getting the new device up and running as quickly as possible.

5. Extended Diagnostics: IO-Link provides users with visibility into errors and health status from each device. This means that users can see not only what the sensor is doing but also how well it is performing – a valuable insight into a machine's efficiency. In addition, extended diagnostics allow users to easily identify when a sensor is malfunctioning and diagnose the problem without shutting down the line or machine. The combination of both real-time and historic data made available via an IO-Link system not only reduces troubleshooting efforts as issues arise but also allows for optimisation of machine maintenance schedules, saving costs and increasing efficiency in the long term.

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Encoders speak BiSS safety

The Safety Communication Layer of BiSS Safety has been confirmed in Europe for suitability for safety related communication up to and including SIL3. As a result of this, Hengstler will now offer this protocol for its rotary encoder portfolio.

Gerry Bryant, managing director of local Hengstler distributor **Countapulse Controls**, says not only will this meet the steady growth for encoders in safety applications, it will also offer the advantage of a continuous data connection to bus participants as well as high transmission rates.

Hengstler encoders have been able to use the open communication standard BiSS C for the past decade, and this extensive experience with the protocol enabled Hengstler to easily roll it out to the full encoder range.

Bryant says that the new BiSS Safety protocol is 100% based on BiSS C and Hengstler can point to numerous successful applications where its encoders have played a vital role in ensuring optimum reliability. There is enormous potential in the field of functional safety

in combination with ever-increasing machine guidelines for this aspect of operation. To facilitate this, the internal system structure of the encoder is expanded by a number of available blocks.

Significantly, the Safety Communication Layer of BiSS Safety has been certified according to IEC 61784-3:2010 and IEC 61508 Part 1-7:2010. This provides assurances for end users that it is suitable for safety relevant communication up to SIL3. BiSS Safety combined with Hengstler rotary encoders offers the

best of both worlds, and will allow users to select a quality engineered encoder that offers a manufacturer independent protocol for secure data transmission. Countapulse Controls is the official distributor of Hengstler products in southern Africa and the company offers industry access to skilled technical personnel that can advise on the application of the products.

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



Africa's first automated container terminal

Siemens' scope of supply for APM Terminals MedPort Tangier includes the electrical and automation systems as well as the engineering and commissioning of 32 automated stacking cranes deployed in 16 intelligent yard blocks, which will be delivered in cooperation with innovative crane manufacturer Hans Künz GmbH, Hard (Austria). Siemens will also supply electrical systems used in 12 remote-controlled double trolley ship-to-shore cranes (STS). This order was placed by the Chinese Zhenhua Port Machinery Company (ZPMC), one of the world's biggest crane builders. The terminal, to be opened in 2019, will be the world's first trans-shipment hub featuring an end loading yard concept.

"Use of simulation and digital twins of the cranes in the yard blocks allow for flexibility, speed and work-through scenarios," explains Christian Koegl, Vice President of Siemens Cranes. "Advanced block management together with various automation modules and integrated safety, e.g. for remote control and collision prevention, will lead to safe and productive operations. "These unique features helped Siemens to be chosen as the preferred electrical and automation partner for this flagship terminal," continues Koegl.

This container terminal is developed by APM Terminals from The Hague in the Netherlands to accommodate Ultra-Large Container Ships (ULCS), which provide capacity for up to 20 000 twenty-foot equivalent units (TEUs).

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Antenna for harshest atmospheres

The Solexy ANH series, available from **RET Automation Controls**, is the go to antenna for the harshest atmospheres. This higher gain solution antenna will take the beating of most process environments. Designed to meet the demands of oil field and off shore rig production sites, the ANH is constructed from proven materials, with highly oil and chemical resistant ABS, nickel plated fittings with gold contacts.

The Solexy J-Pole can provide a higher gain solution, with more stability in a smaller package than a typical Collinear Antenna. Because of the 5/8" connection there should never be another broken antenna. This high performance antenna delivers up to 4,35 dBi gain with a 360 degree spherical radiation pattern for transmitting and receiving in all directions.

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



Relative humidity sensor for tough processes

Michell Instruments, represented locally by **Instrotech** – has on offer their new HygroSmart HS3 sensor, now with I2C communications protocol/slave device (BUS output), that supports a maximum speed of 100 kHz. Each slave on the I2C bus holds an individual 7-bit device address. The address byte is then followed by the op-code and eventually the payload.

Because it is designed to withstand the kind of harsh and demanding conditions found in industrial processes, unlike many 'disposable' probes that have a short life within harsh conditions before needing to be replaced, the HygroSmart HS3 sensor has a polymer tile to give long-term reliable measurements. It has an accuracy of 0,8% RH, making it among the most accurate and reliable RH sensors on the market, as

well as allowing for longer recalibration periods. Also available is the complete HygroSmart HS3 probe that consists of a solid, corrosion-resistant probe body with an interchangeable sensor. The probe offers voltage outputs of 0-1 V, 0-2,5V, 0-5V, 0-10 V and digital output signal Modbus RTU over RS485 2-wire. When recalibration is due, the old HygroSmart HS3 sensor is simply exchanged for a new, freshly calibrated one. This simple procedure takes only a few seconds to carry out with the probe itself remaining installed. Replacing just the sensor, rather than the whole probe, is not only quick and simple, it also saves users money over the lifetime of the probe. In most industrial applications, RH

probes have to withstand vibration, exposure to water, occasional heavy shocks and high levels of electrical interference. The HygroSmart HS3 body is designed to cope with all these environmental factors.

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



One sensing range for all metals

Kplus sensors, available from **ifm electronic**, have the same sensing range for all types of metals. They are for example perfectly suited for the detection of aluminium, where conventional sensors show a considerably reduced sensing range. The high switching frequencies enable the monitoring of fast changing switching states.

The resistant stainless steel sleeve allows reliable use in oil and coolant applications. The wide temperature range as well as the high protection ratings enable universal use of the new Kplus sensors.

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



SMART SENSORS. SMART TECHNOLOGY.

More than 45 years' experience providing specialist sensing solutions across southern Africa has positioned Countapulse Controls as the leading sensor solution provider.

The company's extensive depth and breadth of applications knowledge ensures that customers receive the most appropriate sensor solution for a given application.

All products conform to the highest international standards and product support is available via a 24/7 technical hotline and a well equipped electro-mechanical and electronic workshop.

Environmental management and control with Thermo-Hygrometer

Fluke and HART Scientific have revolutionised environmental monitoring for calibration labs with their model 1620A DewK which offers Ethernet and wireless connections and upgraded LogWare III software.

Accuracy: Two types of sensors are available from Hart (represented locally by the Comtest Group). The high-accuracy sensor ('H' model) reads temperature to $\pm 0,125^{\circ}\text{C}$ over a calibrated range of 16°C to 24°C . Relative humidity readings are to $\pm 1,5\%$ RH from 20%RH to 70%RH. The standard-accuracy sensor ('S' model) reads temperature to $\pm 0,25^{\circ}\text{C}$ over its calibrated range of 15°C to 35°C . Relative humidity readings are to $\pm 2\%$ RH from 20% RH to 70% RH. All DewK sensors come with NVLAP accredited certificates of calibration for both temperature and humidity, complete with data and NIST traceability.

Ethernet and wireless capability: The DewK features built-in Ethernet RJ45 jack and multiple DewKs can be monitored from the same screen using the new LogWare III client-server software. Ethernet also allows for the possibility for remote connectivity over the internet.

Maths and statistical functions: In addition to temperature and humidity, the DewK calculates dew point, heat index, and rates of change for both temperature and humidity. Min, max, and a variety of other statistics are also calculated and can be shown on-screen.

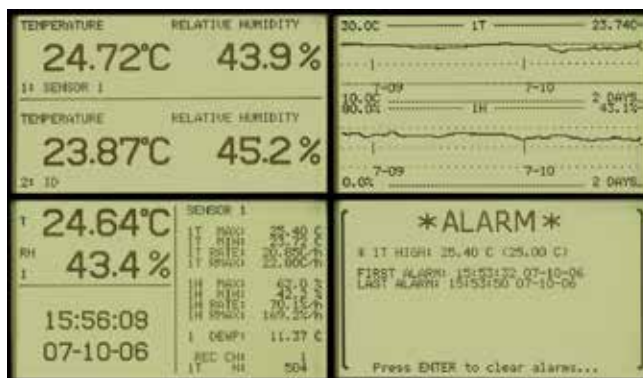
Calibrated sensors: The DewK has inputs for two sensors, each measuring both temperature and relative humidity, so

that the DewK can monitor two locations simultaneously. Both sensors can be run via extension cables to remote locations up to 100 feet away, or one sensor can be directly mounted to the top of the DewK. Each sensor is calibrated for both temperature and humidity at Fluke Calibration.

Memory: The DewK has an impressive memory capacity – enough to store up to 400 000 date- and time-stamped data points (i.e. two years' worth of data for both measurements from two sensors from readings taken at ten minute intervals).

Alarms and battery back-up: Alarm settings are easily made based on temperature, the rate of change in temperature, RH, the rate of change in RH, and instrument fault conditions.

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



Rebranding – new name, same capabilities

Vertiv, the business formerly known as Emerson Network Power, has officially launched under its new branding in South Africa. Vertiv is a global provider of mission-critical infrastructure technologies for vital applications in data centres, communication networks, and commercial and industrial environments. The company, which is headquartered in Columbus, Ohio (USA), has more than 20 000 employees and 28 manufacturing and assembly facilities worldwide. Vertiv will continue to build on the broad portfolio of product and service offerings for power, thermal and IT management capabilities it previously offered as Emerson Network Power,

including its industry-leading flagship brands ASCO, Chloride, Liebert, NetSure and Trellis. Backed by over 255 service centres worldwide, with over 3 000 service field engineers and more than 400 technical support/response people, Vertiv is able to support customers wherever they are across the globe.

"We have been in South Africa for many years and as Vertiv we will continue to support the country's evolving needs in IT and digital infrastructure" added Pierre Havenga, managing director of Vertiv in the Middle East and Africa. "We thrive towards ensuring our technologies fulfill local customer requirements to optimise their operations with the highest levels

of availability and reliability in all market segments, from the public sector to healthcare to finance. At the same time, we are looking at reinforcing our partnerships and growing the local network of technology distributors and resellers.

"South Africa is a key country for Vertiv as it serves as the hub through which products, pre-sales and after sales services flow for the entire sub-Saharan Africa region, and through which all South and East Africa transactions are processed, including the South African Development Community (SADC) for a total of 25 countries," continues Pierre.

Enquiries: Tia Mthethwa.
Email TMthethwa@webershandwick.com

Johan van Wyk, Regional Director (Southern Africa), with Pierre Havenga, Managing Director of Vertiv (Middle East and Africa).



New automation division

The BBE Group, specialists in mine ventilation, refrigeration and energy optimisation engineering, have established a new automation division to extend its services. **BBE Automation** primarily supports the Group's consulting services and turnkey projects, but also provides automation and electrical services to mining and process plants in all commodities.

Launched in November 2016, BBE Automation comprises a team of experts skilled in medium and low voltage electrical systems, field instrumentation and equipment automation in mine ventilation, refrigeration and energy engineering. Other markets include mining process plants, water and waste water systems and the manufacturing industry.

"Automation has always been part of the BBE competency, particularly under our Projects umbrella. BBE Automation division was a natural extension of our business and part of a growth strategy to develop an electrical and automation division, giving us focused expertise and greater capacity," says Deon Nolan, Business Development Manager for the BBE Group. "Energy savings, smart control systems, cost-effective solutions that are the best available in the market, and automating plants in the Big Data and IoT (Internet of Things) era we live in are key services to our customers," says Nolan.

"The new division is a good fit with what we already offer in mine ventilation and refrigeration. Clients can expect the same ex-

cellent service from BBE but also extended to new areas of their mines or plants," adds Christo Visagie, GM of the new division.

Enquiries: Deon Nolan.
Email dnolan@bbe.co.za



E-chainsystem safely guides control devices

More and more companies in crane technology rely on modern cable guidance with energy chains. With the new guidefast control e-chainsystem, the motion-plastics specialist **igus** has developed an energy supply system that can also power a manual control on the indoor crane. Quick and easy to assemble, the guidefast control needs only a small installation space and can be adapted to the most varied conditions, thanks to the largest selection of cables for motion.

While e-chainsystems are increasingly becoming the standard for energy supply on port cranes, they are also being increasingly used in indoor cranes. The advantages compared to pure trailing cables are obvious: the e-chain protects the cables inside them, they are not compressed and are thus safely guided when in motion. This is also the case for the manual control of the indoor crane, where the new guidefast control energy chain system safely transmits signals via control cable. A trough reliably guides the energy chain and cables as well as the moving end arm, even with a short-term high tensile load. As with the guidefast guide trough for the cable guidance of the trolley (lifting gear), the guidefast control can also be installed quickly and easily: in the first step of the assembly, the guide trough is fastened to the side of the crane girder to save space. A welding of consoles is not necessary. It is then hooked and bolted into the support, which saves additional installation time. In operation, the moving end arm can be easily moved and positioned by the control device along the entire crane girder, regardless of the position of the lifting gear thanks to the lubrication-free and maintenance-free xiros polymer ball bearings.

Enquiries: Ian Hewit. Email ihewat@igus.de



Innovative coating process photochromic lenses

The coating technology developed by Shyre makes it possible for large eyeglass retailers or labs to produce customised photochromic lenses made of all kinds of materials for their customers, making the need to keep large amounts of expensive pre-made photochromic lenses in stock a thing of the past. The process developed by Shyre produces photochromic lenses at one-tenth the cost of typical big brand photochromic lenses. The coatings can be applied in all colours and even with gradients, while the classic process produces lenses that turn either grey or brown. "We first saw **Beckhoff's** solutions at the Drives & Controls Show in Birmingham in 2014," recalls founder Lee Gough. "What impressed us initially was the One Cable Technology (OCT) for Beckhoff's servo motors. We had been looking for a compact solution since the drives had to be integrated into the machine. By implementing AM8100 servo motors with OCT we were able to save a lot of space, because the control cabinet needs to be only 20 centimetres deep. Since lab facilities are generally expensive and space is at a premium, this was a decisive criterion."

A CX5120 Embedded PC with an Intel Atom processor running TwinCAT 3 automation software functions as the central controller. A CP2912 multitouch panel is used for operator interaction and 'recipe' control. With IP 65 protection at the front and IP 20 at the rear, the panel is ideally suited for this application. Lee Gough is also thrilled with the control system's flexibility, which allowed the company to upgrade from TwinCAT 2 to TwinCAT 3 still during the design phase.

Enquiries: Kenneth McPherson. Email kennethm@beckhoff.com



Impact testing – IR Windows

Steve Edwards, R&C Instrumentation

There is a great deal of misinformation out there regarding Infrared (IR) windows.

End-users are being fed lots of marketing spin about arc-resistance, IP ratings, environmental stability, etc. all of which on the face of it sound plausible but it's more smoke and mirrors than fact. At a recent meeting an end user was convinced that a crystal IR window was 'arc-resistant'. Why? It is simple, because the manufacturer said it was! I asked this very experienced engineer if he thought that the steel plate that we manufacture the electrical enclosures from was 'arc-resistant'.

He scoffed at me and said: "Of course not, that's why we have different designs of switchgear for different tasks." We now had a common agreement on the fact that steel was not arc-resistant, my next question was, "Do you think that a crystal IR window is stronger than steel?" He looked at me and the lights went on. "Well of course not," he said! My response was simple and very straight forward. "Then how can this crystal be 'arc-resistant' if steel isn't?" He relented and said that it couldn't be and the claims being made by the manufacturer were misleading.

Once we agreed that there was no such thing as 'arc-resistant' IR Windows we started to discuss what standards were actually applicable to IR Windows. We agreed that completing an 'arc containment' test on switchgear is required to confirm that the design meets the IEEE and IEC standards and if IR windows were installed in the piece of equipment that was being tested then, if successful, an IR window manufacturer could make claim that the IR window met the IEEE or IEC 'arc containment' requirements for that particular piece of equipment for that particular test. They couldn't make claims of all

encompassing 'arc-resistance' for the IR window itself, as this would be incorrect and misleading.

The discussion continued on the subject of relevant IR window certifications and I pointed out that whilst there were regulations from UL and CSA on IR windows fitted in electrical enclosures up to 600 Volts, there are no specific regulations from IEEE or IEC on IR Windows. There are, however, IEEE regulations on 'Visual Viewing Panes' that have been in place since the inception of these standards. Like all standards, these standards have evolved with industries ability to provide superior, less expensive materials and manufacturing options.

A common theme for all 'Visual Viewing Pane' testing is Impact and Load Testing. This requires the viewing pane to meet a minimum Impact and Load Test without 'crack-

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There is NO place for marketing spin when dealing with electrical safety.

"There exists a dangerous misconception regarding the 'arc rating' of IR windows or viewing panes. Many reliability and maintenance professionals are under the impression that an IR window will protect them in the event of an arc blast; still others are under the impression that installing IR windows will turn non-arc-rated switchgear or electrical equipment into 'arc-rated' cabinets. Neither are the case and both misconceptions need to be corrected because they present very real safety concerns'.

Extract from: 'Infrared Windows and Arc Ratings – Dispelling the myth of 'Arc-Resistant IR Windows' (by Martin Robinson, Level III Thermographer).

CSA	– Canadian Standards Association
IEC	– International Electrotechnical Commission
IEEE	– Institute of Electrical and Electronics Engineers
IP	– Internet Protocol
IR	– Infrared
UL	– Underwriters Laboratory

Abbreviations/Acronyms

ing, shattering or dislodging' from its housing. Why don't we just insist that all IR and visual windows meet this minimum impact test requirement? Well firstly the IEEE test is required for visual viewing panes mounted in medium and high voltage equipment (>600 V to 38 kV metal clad and 72 kV station type gear).

The specific regulation requires visual viewing panes to withstand Impact and Load per IEEE C37.20.2 Section a.3.6 [1]. Unlike UL this IEEE standard does not differentiate between the types of material or give exemptions to crystal infrared windows. Instead it clearly specifies that any transparent material covering an observation opening and forming a part of the enclosure should be reliably secured in such a manner that it cannot be readily displaced in service and not shatter, crack, or become dislodged when both sides of the viewing panes in turn are subjected to impact and load.

This testing method has been in place for many years and is the accepted testing method for visual viewing panes so why not use the same test for IR windows? Well, the fact is that the fluoride based crystal IR windows cannot pass any form of impact, so the crystal IR window manufacturers lean more towards the UL regulation UL1558 [2] for impact and load testing.

UL 1558 is the impact and load standard for visual viewing and IR window testing. This test is identical to the IEEE C37.20.2 Section a.3.6 [1] test except they doubled the load and impact test. On the face of it, this testing sounds perfect, but unfortunately, unlike the IEEE test, UL1558 [2] has two different test criteria: one for covers fitted and closed on the IR window and one for covers opened or removed from the IR window.

When provided with a cover, results are considered to be acceptable if the assembly prevents insertion of a 13 mm diameter rod at the conclusion of the test. When no cover is provided for the viewing pane, the results are considered acceptable if the view pane does not shatter, crack or become dislodged (as with IEEE test).

Testing IR viewing windows with the metal cover in place is a complete mockery of the intent of the standard. The crystal IR window lens will shatter during the test which renders the IR window 'Electrically Unsafe' because it fails the IP20 requirement which stipulates the largest hole size you can have in your cabinet is 13 mm. However, the window passes the test due to the fact that you cannot pass a steel rod through the metal or plastic cover, which is ridiculous! If this standard is to be used to certify your IR Window, then it is important to demand that the UL1558 testing be completed with the covers open and that it meets the minimum test requirement by not shattering, cracking or dislodging from during or after the test.

Conclusion

At the end of my meeting, the engineer's perception of the minimum test requirements had turned 180 degrees from where we started. We agreed that there really is no such thing as an 'arc resistant' IR window and that there really is NO place for marketing spin when dealing with electrical safety. When it comes to IR windows we need

The Anatomy of an Arc Flash

An arc flash occurs when a phase-to-phase or phase-to-ground fault causes a short circuit through the air. The core of the arc flash can reach temperatures of up to 38,000°F (21093°C); at this high temperature copper turns to a plasma state instantaneously and expands 67,000 times its original volume in a fraction of a second. The heat and resulting expansion cause a pressure wave that carries thousands of pounds of force, a blinding flash of light and molten shrapnel. Differences in the volume (cubic feet) of the switchgear, MCC bucket, or electrical cabinet will affect the amount of force that impacts the cabinet panel/IR window just like the result of an explosive device placed in a mailbox has compared to the result it has if it was placed in the back of an empty train car. Similarly, a cabinet with large amounts of copper available for expansion would be capable of producing an explosion with much more force than the same cabinet with very little copper cable or bus-bar. Other differences, such as use of current limiting fuses or distance and position of the arc flash relative to the panel door/IR window will have a major impact on the force that impacts the panel/window. As a result, arc ratings are given to systems that are able to withstand a blast in a specific model of switchgear with a standard size and configuration.

to be more concerned with the mechanical stability of the windows as a component within the switchgear assembly and that it meets the minimum requirements for impact and load testing.

References

- [1] IEEE C37.20.2 Section a.3.6. 2015. IEEE Standard for Metal-Clad Switchgear: Viewing Panes.
- [2] UL 1558. Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.

- Arc-resistant IR Windows do not exist.
- There are no specific regulations from IEEE or IEC on IR Windows.
- There are IEEE regulations on Visual Viewing Panes that have been in place since the inception of these standards.



Born and educated in Yorkshire, England, Steve Edwards arrived in South Africa 26 years ago on a three-year contract. Involved since an early age in rotating equipment monitoring, he joined AECI (South Africa) in the consulting engineering department, he is now the owner of R&C Instrumentation, providing industries with industrial instrumentation and consulting services and applications design on infrared temperature monitoring and scanning. Enquiries: Tel.+27 (0) 32 946 2805 or email stevee@randci.co.za Enquiries: Email info@randci.co.za

3D Modelling for Lightning Protection Designs

Trevor Manas, *Lightning Protection Concepts*

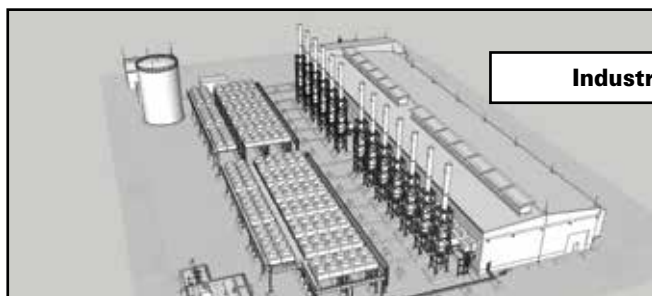
Efficient earthing and lightning protection systems take all parts of the structure into consideration.

Planning complex objects and structures by means of 3D programming allows for the much more efficient designing of the earthing and lightning protection systems while taking into consideration all parts of the structure.

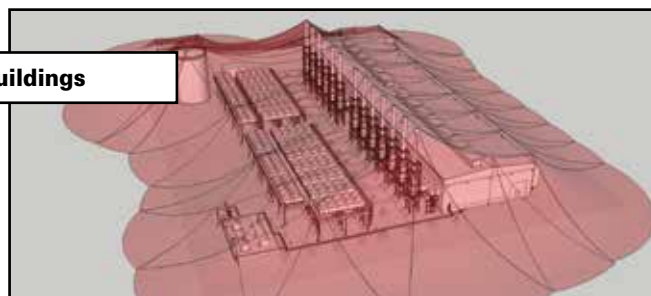
This way, the earthing and lightning protection systems can be installed more effectively than if the 2D AutoCAD method is used. Due to the increasing requirements regarding a building's architecture,

3D planning of the earthing and lightning protection system is an excellent solution for visually representing the protection measures.

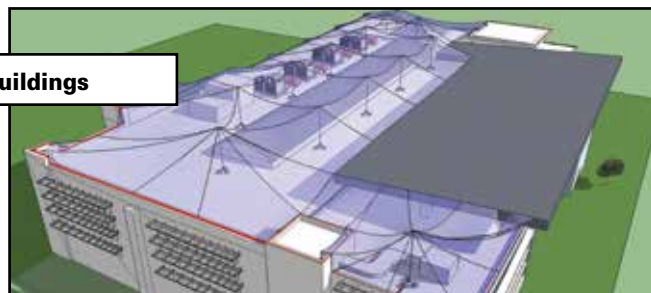
The 3D designs give customers a good idea of how the earthing and lightning protection measures will be integrated into the building's architecture. The biggest advantage of using the 3D design process is the clear visualisation of the protected volume of the air termination system.



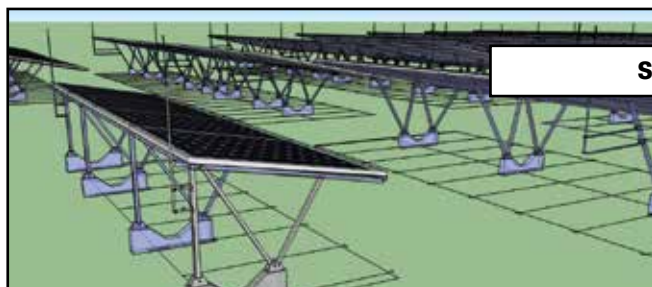
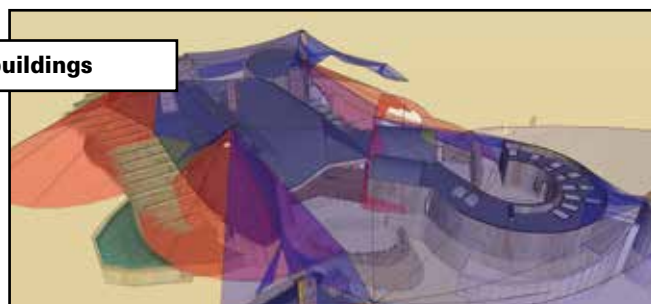
Industrial buildings



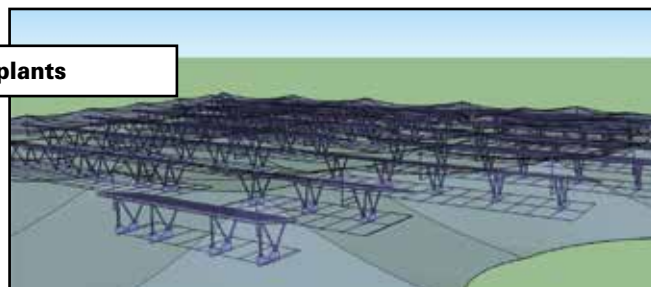
Office buildings



Thatch buildings



Solar plants

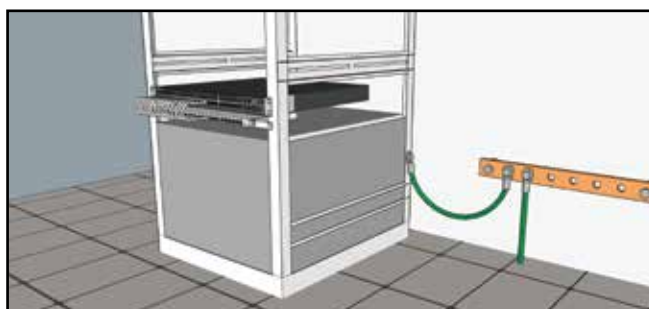
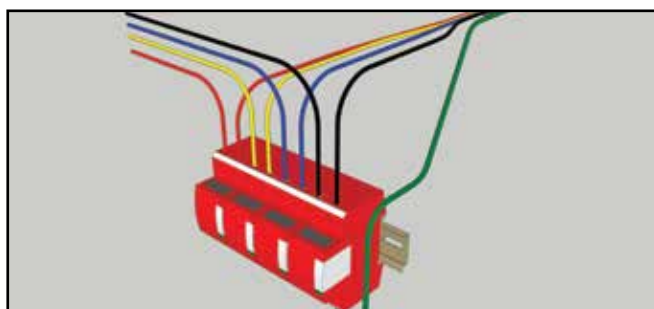
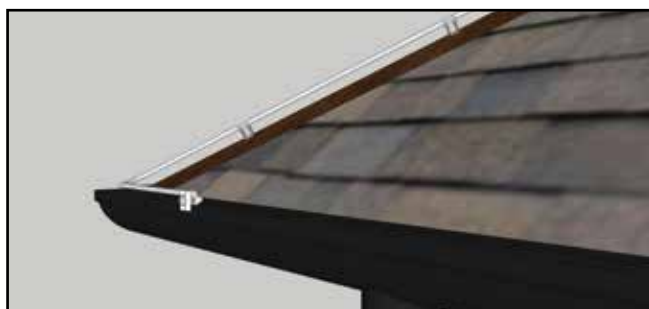
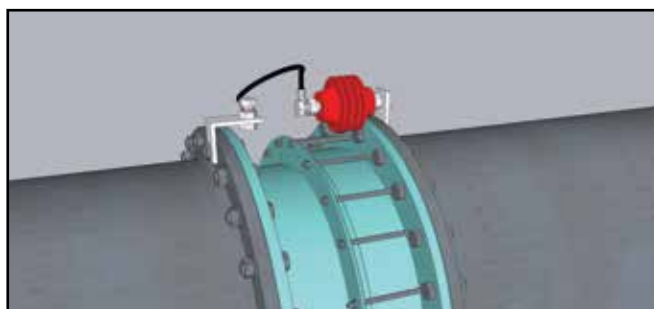
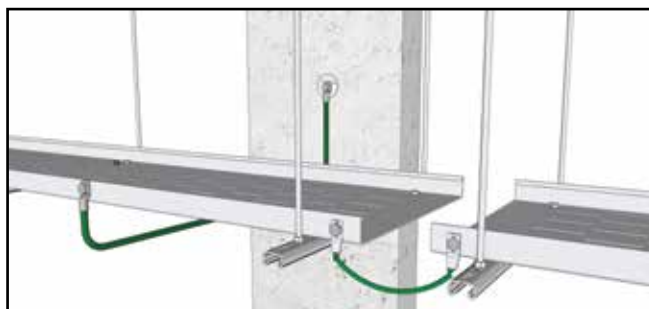
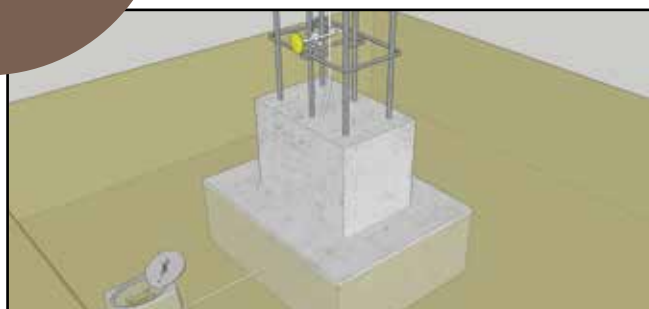
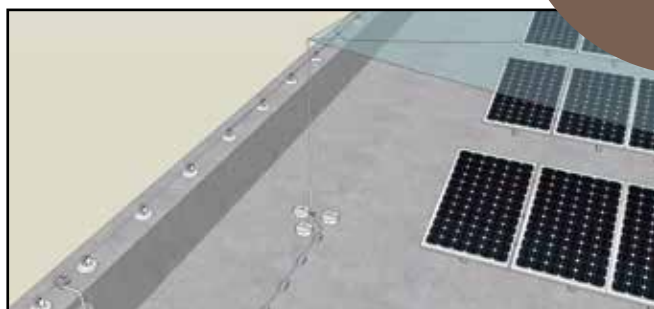


Installation details

The use of 3D modelling enables accurate and precise installation of the various earthing and lightning protection components. This enables the design principles employed by the LPS designer to be easily conveyed to the installation teams. Project specific installation details are compiled to further ensure the accuracy of the lightning protection planning process from the design phase through to the installation.

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3D modelling represents
a large step in the provision
of state-of-the-art lightning
protection concepts.

- 3D programming allows for more efficient designing of earthing and lightning protection systems.
- 3D planning of earthing and lightning protection systems is an excellent solution for visually representing the protection measures.
- The biggest advantage in using the 3D design process is the clear visualisation of the protected volume of the air termination system.



Trevor Manas started his lightning career at Pontins in 1991 as an Installation Technician. He later became Sales Engineer and in 1996, Director in charge of the company's compliance with the earthing and lightning protection codes of practice. He became Managing Director in 1999. A few years later Pontins formed a partnership with DEHN Africa. Trevor left Pontins to form his own consultancy, Lightning Protection Concepts.
Enquiries: Email trevor@lpconcepts.com

Displaying earth leakage current with ELNet LT power-meter

Control Applications, which has set a high standard in precise electrical metering (1 600 samples per cycle), has recently unveiled an advanced multi-meter which allows the monitoring of earth leakage current in an electric panel, alongside all other standard measured parameters of voltage, current, frequency, power-factor, harmonics etc., all accessible through a user-friendly menu, in high resolution colour graphics. Leakage current is your best indicator as a safety check-up of your electric facility. A facility in which measured leakage current is greater than allowed in regulations requires a thorough inspection. Using the ELNet LT, it is possible to constantly monitor leakage current in an electric panel utilising the power-meter function, normally present in every electric panel, all locating the source and magnitude of the leakage at relative ease. Earth leakage

monitoring is usually performed with portable leakage current clamp meters through which all power lines involved are passed, which feature an infamously inaccurate output (inaccuracy up to 15%). These leakage current detectors do not provide any additional measurements as those mentioned above (VIP, PF etc.).

Conversely, leakage current detectors tend to be more expensive than the ELNet LT solution which includes in it all measurable parameters, including earth leakage current. Rather than require external active periodic check-up, the ELNet meter enables your power-meter function, already located in your electric panel, to provide permanent leakage current monitoring as well.

Along scores of features, full Modbus/BACnet supported communication via RS485 and TCP/IP ports, the unit provides all



standard measurements, and includes a digital output (DO), enabling activation of command relays or the activation of an alarm when leakage current exceeds allowed limit. Due to the extraordinarily high sampling rate (1600 SPC), accuracy is maintained also in face of distortions caused by extreme harmonics.

Enquiries: Control Applications Ltd., Israel. Tel +972-3-6474998 or email export1@ddc.co.il



Smart linear guide makes maintenance easy

With the smart plastics **igus** has developed intelligent machine components, which monitor themselves during the operation. An early warning system consisting of sensors and digital communication expands the world's largest modular system

for lubrication-free and maintenance-free linear guides. The smart drylin guide is easy to retrofit and increases the customer's safety against failure. Digitised and networked process sequences in drive technology promise a high potential for reducing machine downtimes, particularly when combined with high-performance plastics for the motion. The smart plastics from igus combine both and expand the customer's ability to provide predictive maintenance. Through continuous measurements and the calculations using the parameters of the system as well as the thousands of test data from the igus test laboratory, it is possible to also reliably predict the smooth function-

ing of the smart plastics in the future while in real operation. Part of this comprehensive range is the intelligent drylin linear guide, which can be very easily retrofitted.

To make the products 'smart', the dry operating drylin bearings are equipped with sensors and a special module, the isense DL.W. This constantly monitors the abrasion of the dirt-resistant and dust-repellent plain bearings and determines the wear limit by which a bearing must be replaced. The status data are passed on via wireless to the user, who is able to intervene at the right time from anywhere. The isense DL.W as a lightweight and robust plastic element is ideally suitable for retrofitting as well as for a variety of moving applications in which linear guides are used, from the packaging machine to the machine tool. Furthermore, the icom module, which collects, processes and relays the data, serves as a central communication unit. The user can take over the monitoring with the terminal device of his choice and can thus always carry out maintenance, repair and replacement at the optimum moment.

Enquiries: Ian Hewat. Email ihewat@igus.de

Server supports redundancy controllers

The PCWorx UA server from **Phoenix Contact** enables you to access all variables of PCWorx programmable controllers via the OPC UA (Unified Architecture) communication protocol. With the release of server version 1.10, redundancy controllers (RFC 460R) are now also supported. In the event of a redundancy switch-over, the server automatically accesses the new controller handling the process without variables being lost. The server is designed for high volumes: it can forward data from up to 200 controllers to a visualisation or production control system. Variables are mapped via the PLCopen profile. The OPC UA server uses the binary protocol for communication, resulting in high data transmission speeds. A security concept based on certificates protects against unauthorized access, tampering, and operating errors. In addition to authentication based on certificates, the server also offers the option of encrypting communication. Detailed diagnostics and easy to understand security configuration were a particular area of focus. Using the supplied configurator, users can easily configure the security settings and diagnose the current communication connections to the clients and the controllers, and they can also do this remotely.

Enquiries: Tel. +27 (0) 11 793 4403 or email sbritz@phoenixcontact.co.za



True RMS value measurement for voltages up to 3 600 Vac

Knick Elektronische Messgeräte is a globally recognised manufacturer of high quality signal, sensor, current and voltage measurement devices for utility, rail, ship, and other rugged environments. With the announcement of their series P42000TRMS, Knick has defined a completely new class of ac/dc transducers for true RMS values.

Input voltages ranging from 10 to 3 600 Vac can be safely measured and converted to standard dc analogue signals (0...20 mA, 4...20 mA, 0...10 V). These robust transducers are available with up to 16 different I/O settings as well as the capability to be customised with fixed input and outputs for voltages anywhere between 10 and 3,6 kVac.

Thanks to internal TRMS conversion even distorted and non-sinusoidal input signals, that usually cause serious measurement errors, are correctly identified and transmitted. The highly accurate true RMS circuit converts signals with a crest factor of up to five

with excellent transmission characteristics. With the high insulation properties required for working voltages of up to 3 600 Vac and following the safety requirements of EN 61010-1 and EN 50124-1, the design is well suited for harsh conditions, such as the powerful electrical systems on ships, rail, land and military vessels. Inter-

nal components are vacuum encapsulated to ensure long-term protection from aggressive environmental influences such as particle ingress and also create mechanical stability for high shock and vibration specifications. Additionally, protective separation of the input, output and power supply provide protection from electric shock up to 1 800 Vac/dc according to EN 61140. P42000 TRMS transducers also come with a five-year warranty.

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

Enquiries:

Tel. +27 (0) 11 2576100 or
email measure@mecosa.co.za



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Top Notch Technology in Flowmeter Verification

Frans van den Berg, Endress+Hauser

The water industry is undertaking great effort to ensure high levels of process reliability, consistent quality and accurate billing of water.

There is an increasing need to prove that operations are economically and environmentally sustainable. State-of-the-art measuring technology is the key to ensuring these values, since it is well known for ensuring highly stable measurement results over a long period of time. Despite this, it is today common practice to inspect quality related measuring points at regular intervals.

Main application segments and related requirements in the water and waste water industry:

<ul style="list-style-type: none"> • Municipal waste water • Potable water • Utility water • Water reuse • Desalination 	<ul style="list-style-type: none"> • Quality related measuring points • Accounting (inlet/outlet) • Billing of water • Regulated by ISO 9001
<p>Periodical, traceable calibration or verification is a must!</p>	

General requirements

The general requirements for accounting and billing of water as well as quality related water and waste water applications are:

- Flowmeters have to be verified in regular intervals
- Verification has to be performed by a qualified third party and with an accepted inspection method based on quality regulations (ISO 9001)
- A test report needs to be provided (documented proof of evidence)

To meet quality regulations verification must be performed by a qualified third party and accepted inspection method based on quality management. In waste water treatment plants inlet and outlet measurement is required to meet environmental regulations.

The generally accepted method of traceable flow calibration with calibration rigs accredited to ISO 17025 is costly and sometimes not feasible at all – mainly due to the logistics involved with removing the flowmeter from the pipeline. For this reason users look for an economical alternative to recalibration. However, any calibration or verification must be traceable to national or international measurement standards and provide process-independent references. A

seamless document trail is required causing the need for detection of any modification to the device and a tamper proof documentation by verification or calibration protocol.

Consequently, in order to serve as a viable alternative to recalibration, verification methods must improve the confidence in flowmeter performance. Therefore verification results must include a declaration of the total test coverage in direct comparison with calibration.

Challenges when calibrating flowmeters

Applications in the Water and Waste water industry often use large line sizes (larger than DN300/12"). Recalibration of these flowmeters is very costly. In some cases a certified local reference standard (calibration rig accredited according to ISO 17025) is not available at all. Additionally in water supplies any interrupt of service or supply is not acceptable.

<ul style="list-style-type: none"> • Requires calibration rigs accredited according to ISO/IEC 17025 	<p>Challenges</p> <ul style="list-style-type: none"> • Complex and costly logistics • Lack of local calibration rigs, especially for large line sizes • Interruption of supply often not feasible
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These challenges are the main drivers for the acceptance of verification solutions as an alternative to calibration or as a means to extend calibration intervals.

Flowmeter verification

Verification can be used to take and store a snapshot of the device status. Verification is used to demonstrate that the flowmeter meets specific technical requirements defined by the manufacturer or customer (i.e.: the process application).

External and internal verification

ISO 9001 requirements also provide the impetus for today's common

”
 With total test coverage in the order of 95%, Heartbeat Technology ensures the flowmeter works within its specified accuracy.

practice of requiring an independent reference system for device inspection through verification.

In practice, reliable verification of flowmeters can be fulfilled in two ways: Either via an external vericator whose references can be traced along the life cycle by re-calibrating the vericator at periodical intervals, or by an internal verification which is based on traceable references that are stable on the long term. Here the factory condition of the device-internal references is captured during factory calibration and securely saved in the flowmeters memory. This reference is the basis for consecutive verifications in the lifetime of the flowmeter.

For electromagnetic flowmeters, verification methods have been established for many years. Since in the past a method to assure the long-term stability of an internal verification system has not been available, it was always required to use a qualified external vericator. Now, with the latest generation of flowmeters, a reliable internal verification technology has become available for the very first time.

External verification

Here the inspection of flowmeters is carried out by an external vericator. This vericator is used as a device-independent reference system and is, as defined by the ISO 9001, considered test equipment that must periodically undergo traceable calibration. During the verification process, the vericator is connected to the flowmeter via test interfaces and a functional test is carried out by simulating calibrated reference signals and observing system response. The reference signals for transmitters are fed in via a simulation box and the reference signals to the sensor by means of a sensor test box. In both cases, electrical characteristics of the system are tested. The results can be compared to the limit values defined by the manufacturer. The picture below shows an overview of how an Endress+Hauser Promag electromagnetic flowmeter is verified by means of a Fieldcheck vericator.

Transmitter and sensor signals are simulated automatically and independently from each other. The response from the flowmeter is measured and automatically interpreted by the vericator: If it is within the factory limits, the algorithm produces a ‘pass’ statement.

The status of verification and created data are subsequently used for documenting the results in a verification report. Modern verifica-

tors like FieldCheck from Endress+Hauser carry out the entire process automatically by controlling the flowmeter, simulating the measured values and documenting the results for further processing.

Despite this, external verification is a very complex procedure that requires access to the measuring point in the field. During verification, the transmitter is opened to input external signals using a special testing adapter. Verification is carried out by a skilled technician and requires approximately 30 minutes. The process requires specific knowledge and relies on the assembly and maintenance of infrastructure. This is why external verification is usually implemented in the form of a service, e.g. as part of a service contract.

- The water industry is making an effort to ensure high levels of process reliability, consistent quality and accurate billing of water.
- There is a need to prove that operations are economically and environmentally sustainable.
- State of the art measuring technology is the key to ensuring these values.



Evolution to internal verification – state-of-the-art technology

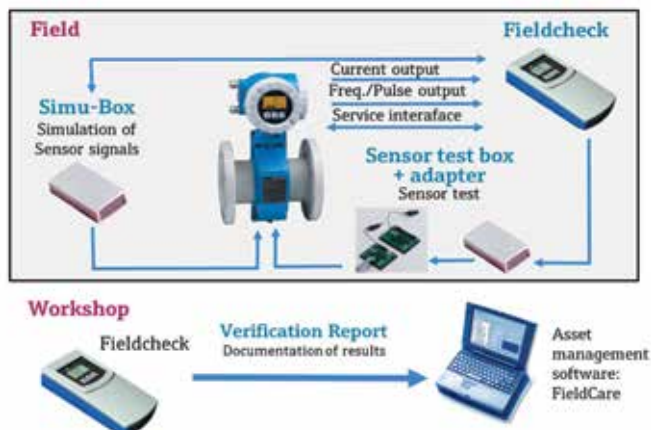
Internal verification is based on the ability of the device to verify itself based on integrated testing, which is carried out on demand. By now, individual device manufacturers have integrated diagnostics, monitoring and verification functions in the flowmeter so that they can be used in a uniform manner for the entire installed base. An example for this is the Proline flowmeters from Endress+Hauser with integrated self-monitoring by Heartbeat Technology.

During flowmeter verification, the current conditions of secondary parameters are compared with their reference values, thereby determining the device status. Heartbeat Verification produces a ‘pass’ or a ‘fail’ statement, depending on whether the assessment is positive or negative. The individual tests and test results are automatically recorded in the flowmeter and used to print a verification report.

Reliability of internal verification methods

A traceable and redundant reference, contained in the verification system of the device, is used to ensure the reliability of the results. In the case of an electromagnetic flowmeter, this is a voltage reference, which provides a second, independent reference value.

<ul style="list-style-type: none"> • Integrated self-monitoring with high Total Test Coverage (TTC) • Internal flowmeter verification on-demand • High reliability due to factory-traceable redundant references 	<ul style="list-style-type: none"> • Proven electromagnetic flowmeter technology and components with high long-term stability • Traceable factory calibration of flowmeters (ISO/IEC 17025)
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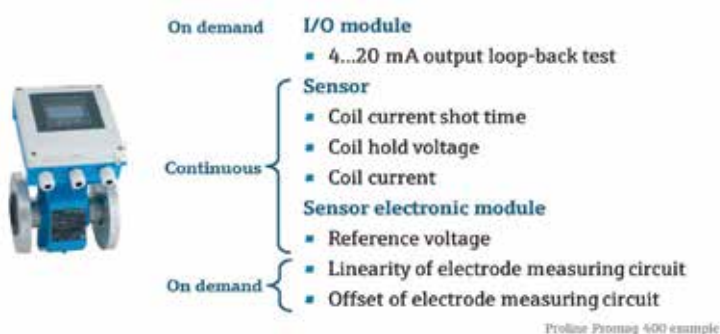


Integrated self-monitoring replaces the need for external test equipment only if it is based on factory traceable and redundant references. The reliability and independence of the testing method is ensured by traceable calibration or verification of the references at the factory and the constant monitoring of their long-term stability during the lifecycle of the product. By eliminating additional components for inspection and preventing errors during handling, internal device inspection proves to be more reliable than external inspection in practice when viewed as a whole.

Test coverage

The question about test coverage can be best answered using a specific example: A requirement for high test coverage is a consistent product design in which self-testing has been developed as an integral constituent of the device from the beginning. The device function that makes this possible is Heartbeat Technology, which was developed together with the Proline devices. This concept embeds additional diagnostics tests in all electronic modules of the device. The example illustrates the test groups for a Proline Promag electromagnetic flowmeter. The entire signal chain from sensor to output modules is included in the flowmeter verification.

While most of the tests operate continuously during regular measurement operation, additional tests are added when the flowmeter is verified on demand (example Proline Promass W 400).



Tests that are part of the continuous self-monitoring are used for flowmeter diagnostics. They provide an immediate diagnostics event which allows it to react quickly and targeted to a device defect or an application problem. The on demand verification allows for tests which briefly interrupt flow reporting. These additional tests increase the over-all test coverage within the flowmeter. The new Endress+Hauser Proline devices implement this concept so that the resulting test coverage is comparable to or higher than that of external verification. The crucial factor for this is the TTC, which indicates how efficient the tests are. The TTC is expressed by the following formula for random failures (calculation based on FMEDA as per IEC 61508):

$$TTC = (\lambda_{TOT} - \lambda_{du}) / \lambda_{TOT}$$

λ_{du} = Rate of dangerous failures (dangerous undetected)
 λ_{TOT} = Rate of all theoretically possible failures

Electronics failures labeled 'dangerous' are those, which, when they occur, would distort or interrupt the measured value output. The integrated self-monitoring of Proline flowmeter generally detects more

than 95% of all potential failures (TTC > 95%). This test coverage is relevant for the documentation of tests in quality-related applications. With total test coverage in the order of 95%, Heartbeat Technology ensures the flowmeter works within its specified accuracy.

Additional advantages of integrated verification

The results of internal verification are the same as with external verification: Verification status (pass/fail) and the recorded raw data. However, since verification is now a part of the device technology, data acquisition and interpretation are also done in the device. This has the advantage of making the functionality available for all operating interfaces and system integration interfaces.

The verification procedure depends on the sensor can last anywhere from a few seconds up to approximately ten minutes. The true time saving, however, comes from the ease of use, since no complex interaction with the device is necessary to carry out the verification. This reduces the time for maintenance and increases plant availability.

Devices with internal verification should be capable of storing multiple verification results in the transmitter. This is the case not only for the verification status (pass or fail), but also for the measured data. This has the advantage of making the data available for later documentation and makes it possible to create verification reports offline for quality documentation. Furthermore, by comparing the data of multiple consecutive verifications, trends can be detected and systematically tracked during the lifecycle of the measuring point.

Conclusion

In order to fulfill the prerequisites of the most widely varying applications and requirements in the lifecycle of a measuring point, all three features are needed. The modularity of the solution makes it possible to adapt the functions to the demands of the application in a targeted manner. The consistency, ensured for a wide variety of devices through uniform functionality, supports ease of use. Since Proline with Heartbeat Technology is now making a solution for the entire installed base available for the first time in the field of flow measuring technology, customers can optimise their operational workflows through standardisation. This leads to reduced complexity for the customer and makes additional cost savings possible in engineering, operation, servicing and maintenance.

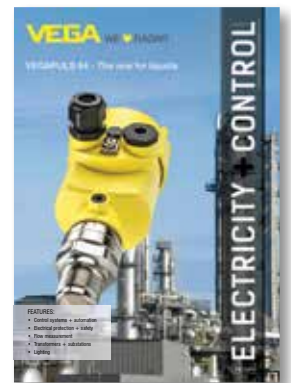
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SHARE IT.



Frans van den Berg started 16 years ago with Endress+Hauser as a Project Engineer. After obtaining his technical diploma in Electrical Engineering, he started his career with African Explosive and Chemical Industries (AECI) as a technician and eventually progressing to a Project Manager. Currently he is employed as a Product Manager for Flow where all aspects of flow measurement from product marketing and technical support as well as application consultation and product selection is handled by him.
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VEGA

Get Focused: Why 80 GHz radar sensors are the future of liquid level measurement



The introduction of 80 GHz radar sensors represents a paradigm shift in liquid level measurement. Let's look at all the things an 80 GHz radar sensor can do.

Focused beam avoids obstructions: Increased focus of the beam angle is the principal benefit of 80 GHz radar instruments; the one improvement that makes all the rest possible. In every process, focus is crucial to accurate level measurement, and these new instruments emit the most focused signals on the market.

With an antenna of the same size, 80 GHz gauges emit a beam angle of only 3°. This allows them to be used in vessels with internal installations or heavy build-up on the walls; the focused microwave beam simply avoids these obstacles as if they aren't even there. This is welcome news in chemical and food production, where obtrusive internals are the norm and space is at a premium.

An exciting benefit of increased signal focusing is the performance of 80 GHz radar sensors when mounted on ball valves. Historically, attaching a 26 GHz radar gauge to a ball valve and receiving an accurate level measurement has been a significant challenge. Ball valves contain many interior surfaces that reflect radar signals. To make matters worse, they are often used in combination with a bleed ring that can create even more signal noise. All of these reflections make it difficult to discern which signals are generated by the valve and which are from the product. This confusion forces operators to turn to instrumentation manufacturers for help, but the best solutions

are often difficult to implement and may require periods of trial and error despite the best efforts of plant technicians. Before long, the manufacturer's tech is on site servicing the 26 GHz radar.

Small antennas take radar where radar has never gone before: Amping up a radar sensor's focus has an opposite effect on its antenna – its size decreases as transmission frequency increases. An 80 GHz sensor, therefore, does not require a large horn to focus its beam at the measured material. The signals take a narrow beam all on their own. The saved space makes a huge impact, particularly as it applies to retrofitting.

There's a trend in the pharmaceutical and chemical industries toward batch production. Batching allows operators to produce seasonal and low-volume products with less financial investment. Small batches are produced in small vessels, where conventional wisdom says using radar is impossible due to small process connections. Thanks to the compact antenna of 80 GHz radar sensors, that is no longer true, and operators no longer have to sacrifice accurate measurement in the name of space.

Enhanced resolution measures to the last drop: When the level of liquid in a vessel gets low enough, 26 GHz radar is unable to distinguish the signal returned by the remaining product from that of the tank bottom, and the user rightly thinks the vessel is empty when it isn't. This is the same as the action-movie computer whiz being unable to 'enhance' surveillance footage. Limited resolution presents a natural handicap to process efficiency. Ultra-focused 80 GHz devices measure liquid down to the last millimeter in the tank, giving users accurate data they can use to optimise their processes. It won't thwart a terrorist attack or prevent an elaborate heist, but the enhanced resolution of 80 GHz radars sensors helps users avoid waste.

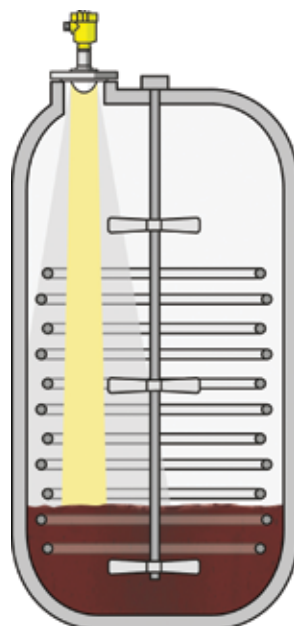
The focused beam (yellow) of 80 GHz radar sensors avoid internal agitators that contact the 26 GHz radar beam (gray).

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VEGA

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What is electrochemistry?

Electrochemists use electrical signals (dc voltage and current) to control and study chemical processes, hence the term electrochemistry. Placing a controlled signal on a chemical solution enables the chemist to determine the nature and concentration of an analyte (solid or liquid) or how the electrodes are responding in the chemical process.

Potentiostats are popular instruments used for electrochemical studies using 3-electrode systems (Counter, Reference, Working) for investigations of reaction mechanisms related to the transfer of electrons between chemical species and other chemical phenomena. The system functions by maintaining the potential (voltage) of the working electrode at a constant level with respect to the reference electrode by adjusting the current at an auxiliary or counter electrode. Modern potentiostats are designed to interface with a personal computer and operate through a dedicated software package.

Keithley, represented locally by **Comtest**, has expanded their Potentiostat family of products, by introducing the new 2461-EC Potentiostat to the growing family of graphical touchscreen potentiostats.

Similar to the 2450-EC and 2460-EC, the 2461-EC is a versatile instrument particularly suited for research and development in fundamental electrochemistry, characterising the next generation of materials and electrolytes, new energy storage devices, and cutting-edge sensors. In addition, the

instrument can also be used in organic semiconductor materials research.

The new EC-UPGRADE will enable existing users of the 2450, 2460, and 2461 source-measure units to upgrade to the potentiostat capabilities which includes scripts to run common electrochemical measurements. Lastly, the electro-chemical scripts in all 24xx-EC instruments have been updated for easier test set-up and results.

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



Measuring volumetric flow by means of oscillation

KOBOLD, represented locally by **Instrotech**, offers their DOG range of flowmeters that use the unique oscillation principle to measure dry or humid gases even in low pressure applications.

In this measuring procedure, a partial stream of the medium is led into the measuring cell by means of a bypass. In the measuring cell, the medium flows through a chamber with two flow channels. A gate allows the stream to flow through either the left or the right channel. The flow creates over-pressure on one side and under-pressure on the other. The difference in pressure directs the media stream to the other side. This results in the stream between the two sides oscillating, which sets the medium in the connecting channel into vibration. The frequency of the oscillation is directly proportional to the flow speed. A detector determines the oscillation in the connecting channel and converts it into an electrical signal. The signal is processed further in the downstream electronic unit and then displayed or output in another form.

The devices within the DOG flowmeter family are designed for tough industrial use. They are offered in flange or intermediate flange versions up to nominal widths DN 200 in stainless steel. This means that the equipment can be used for many different applications, such as compressed air, natural gas, biogas, fermentation gas, propane, hydrogen gas and many more. Approval by the European ATEX guideline and IECEx also means that explosive gas streams can be safely measured.

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

Vane-tech flowmeter

The Vane Technology Principle, a method of measuring and monitoring the flow of different media through piping, has been proven worldwide. Kobold flow meters work with this proven principle. KOBOLD, represented locally by **Instrotech**, has on offer a new rotating vane flowmeter, the equipment of choice whenever traditional impeller technology is to be used for the measuring or monitoring of volumetric flow rates.

The DFT completely fulfils the requirements of industry for efficient and low-cost production methods. Due to the option of a PTFE housing users get a resistant and highly reliable measurement system for operation in aggressive media.

The wide measuring range of 0,2 – 2,0 L/min up to 3 – 60 L/min means that DFT rotating vane flowmeters can be used for a wide variety of applications. With a maximum operating temperature of 80°C and a maximum pressure of 16 bar (if the brass housing is used), this device can be used for almost all process conditions.

The heart of the Kobold impeller is a securely embedded ring magnet which is hermetically sealed against the respective medium. It transfers the rotation of the impeller to a Hall sensor fixed to the housing with a space-saving attachment. This sensor in turn transforms the rotational movements into a frequency signal in proportion to the

volumetric flow. Typical applications are in cooling water monitoring; general mechanical engineering; waste water treatment; all heavy goods industry and in the chemical industry.

Enquiries: Instrotech on 010 595 1831 or sales@instrotech.co.za



A perfect view - even with condensation!

The future is 80 GHz: a new generation of radar level sensors

For the latest generation of radars, condensate on the sensor is not an issue. Totally unaffected by condensation or buildup on the antenna, VEGAPULS 64 accurately detects the liquid level. With the smallest antenna of it's kind and exceptional focusing, it delivers outstanding performance every time. Simply world-class!



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Effective flow measurement leads to leakage detection

Information from ABB

Losses attributable to water leakage are a major concern in any water network.

Even a small leak could potentially result in the loss of thousands of litres of water if left undetected. Given that each litre of this wasted water has been treated and energy has been expended pumping it around the network, such losses also represent lost revenue for water operators.

DMAs – a key weapon against leaks

District metering is an ideal starting point in the war against leaks. A District Metered Area (DMA) is a defined area of the dis-

tribution system that can be isolated by valves and for which the quantities of water entering and leaving can be metered. The subsequent analysis of flow and pressure, especially at night when a high proportion of users are inactive, enables leakage specialists to calculate the level of leaks in the district. This can be used to determine not only whether work should be undertaken to reduce leakage, but also to compare levels of leakage in different districts and thereby target maintenance in those areas where it will have the greatest impact.

Easy access

Installing and accessing DMA meters can be difficult, especially in busy urban areas where the ground is already crowded with an array of underground assets, or where a pipeline runs under a major road. Conversely, meters in remote areas may be nowhere near a potential power supply. Thankfully, today's battery technology means that meters such as ABB's AquaMaster 3 can be sited pretty much anywhere, without having to worry about the availability of power supplies or the need for frequent access. It offers zero pipe diameters upstream or downstream with no loss of accuracy making it the perfect flow meter for installations with limited space.

Accessing the data is the next challenge, but the latest technology can help here too. The transmitters have flow and pressure measurement capabilities, integral data loggers with possibilities of one minute logging and GSM text messaging, so that leakage managers can collect all the flow and pressure data from the comfort of the office.

Conclusion

Water utilities have been making do with an accuracy of $\pm 2\%$ on mechanical flow meters. By using the electromagnetic meter with an accuracy of $\pm 0,5\%$ (or even better at $0,25\%$), the meter pays for itself within less than a month simply by measuring and charging the water more accurately. Further increased revenue come from the maximum and minimum flow rates, or operating range, of an electromagnetic meter compared with that of a mechanical meter. Its unique low flow rate capability enables previously unrecordable minimal night flow rates to be properly metered, which could double the saving potential. ABB has a wealth of experience and expertise in water management issues.

Enquiries: Tel. +27 (0) 10 202 5000 or email instrumentation@za.abb.com



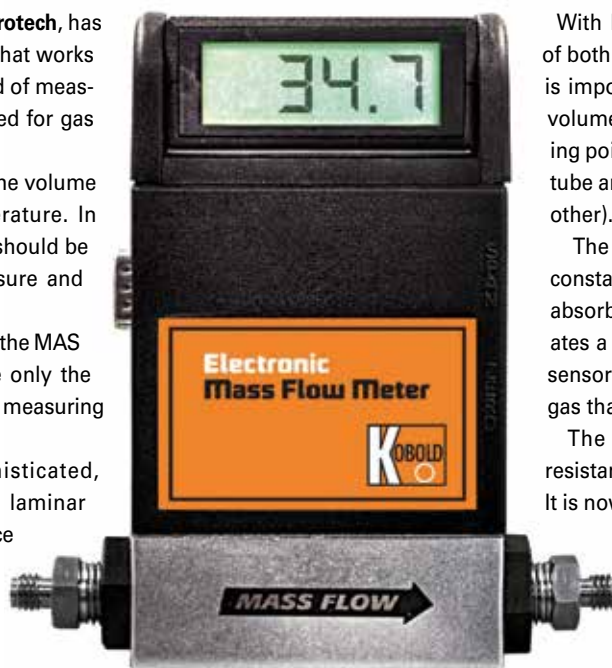
Mass flow measurement of gases

KOBOLD, represented locally by **Instrotech**, has on offer type MAS mass flowmeter that works according to the calorimetric method of measurement, and was specially conceived for gas flow measurement.

Since gases can be compressed, the volume changes with pressure and temperature. In practice this means that calibration should be done for a particular working pressure and temperature.

This conversion is not needed with the MAS electronic mass flowmeter, because only the mass flow of the gas is determined by measuring the heat transfer.

The gas is led through a sophisticated, laminar-flow-bypass that gives it a laminar stream. Due to the pressure difference that arises, a small quantity of gas branches off into the measuring pipe.



With laminar flow, the distribution ratios of both gas quantities remain constant. This is important for the calculation of the flow volume. There are two temperature measuring points (RTD elements) in the measuring tube arranged in sequence (one behind the other).

The gas flowing through is subjected to a constant amount of heat. The gas molecules absorb that heat and carry it away. This creates a temperature difference between the sensors that increases with the amount of gas that flows through.

The temperature difference creates a resistance difference in the RaTD elements. It is now only necessary to convert the temperature difference into the standard mass flow.

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

First technology qualification certificate for fiscal metering

Emerson's Daniel 3415 and 3416 Dual-Configuration Gas Ultrasonic Meters have received the industry's first Technology Qualification (TQ) from DNV GL for fiscal gas meters, a risk-based assessment that evaluates meter performance in real-life operational environments to ensure the technology meets the highest fiscal measurement standards. The TQ verifies the meter's ability to meet the industry's fiscal and contractual requirements when operating under field conditions where dust, liquids, build-up, drift and pulsations are common. It also authenticates the ability of the meter's advanced diagnostics to detect and compensate for process disturbances and provide early warning of fouling to ensure greater meter integrity and measurement accuracy. Furthermore, the TQ confirms the robustness and reliability of the new Daniel Ultrasonic Meters in minimising financial risk and provides evidence to support extending calibration intervals to reduce operating costs. "Current international gas measurement standards for fiscal flow meters

focus only on the design and installation of the meters and don't cover meter performance under field conditions," said DNV GL's oil and gas senior vice president, Liv Hovem.

The Daniel Dual-Configuration 3415 and 3416 Gas Ultrasonic Meters, which are already certified to the stringent OIML R137 1&2 Accuracy Class 0.5, are the only ultrasonic meters on the market today that have undergone DNV GL's rigorous field testing and demonstrated field robustness. The DNV GL assessment process is built upon scientific research and is recognised by regulators, insurers, and major clients throughout the world.

Enquiries: Rob Smith.
Tel. +27 (0) 11 451 3700 or
email Rob.Smith@emerson.com



Valve feedback systems for quarter-turn actuators

Available from ifm electronic, this unit contains two inductive sensors in a potted and sturdy housing with protection rating IP 67. It signals two end positions. It is equipped with a solenoid connection replacing the additional cable to the solenoid valve. The actuator interface is optionally equipped with a standardised M20 x 1 gland. The spacious terminal chamber allows quick and easy wiring. Since the terminal block can be removed, no new wiring is required if the sensor is replaced. A UL approval for this product is currently in progress.

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



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Evolution of MV Power Cables and Accessories up to 36 kV: Part 3

Patrick O'Halloran, City Power Johannesburg

Concluding an interesting discussion – in three parts – on the evolution of MV power cables over the last century.

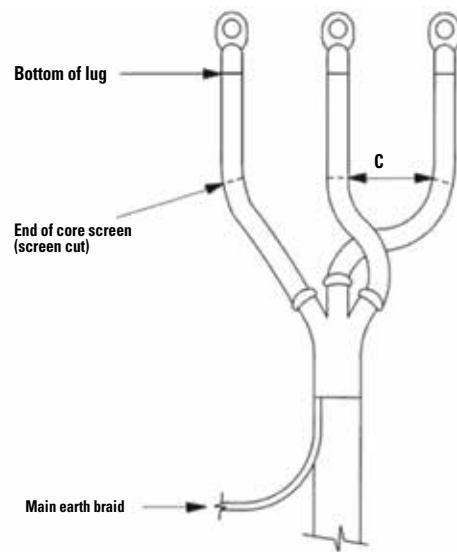
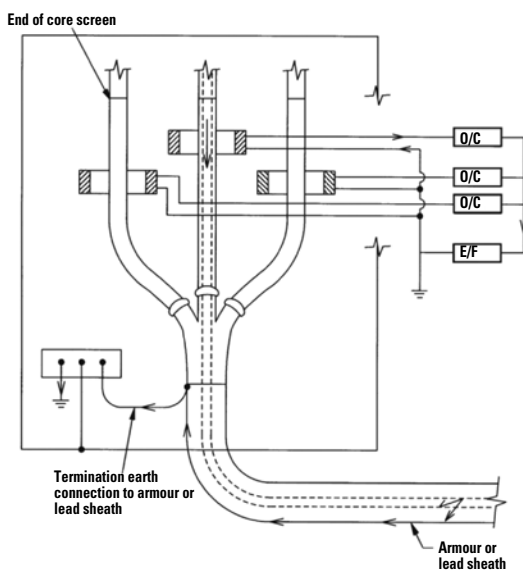


Figure 14: Illustration of the correct earthing for ring type CTs on each cable core used for overcurrent and earth fault detection.



Figure 15: Example of a cable termination where the core crossing is made below the end of the core screen.

Core crossing for phasing within MV cable boxes

Core crossing for correct phasing within MV cable boxes is not recommended, however many crossed terminations exist in our networks. The risk with crossed cores in side unscreened type terminations is that adequate clearances become reduced, and this leads to increased electrical stress and partial discharge.

SANS 1332 [6] requires all terminations be done with a top down principle. In Figure 16 the strip back dimensions can be seen. If the top down principle is followed, the screened metallic area is increased and core crossing can be done easily without any risk of partial discharge. However with a belted design cable, there is no metallic screen and core crossing is very risky.

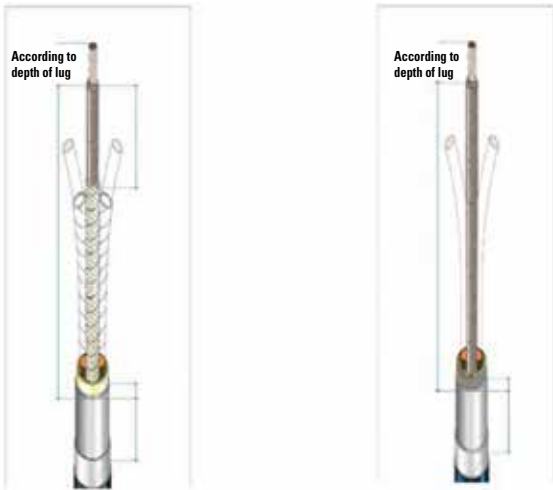


Figure 16: Example of screened and belted PILC cable termination prepared from the top down principle.

Figure 17 clearly shows the extra base which needs to be supplied with compact switchgear in order to ensure the correct three core cable height is attained. This would not be the case for three single core cables. The evolution of MV Power cables, switchgear and cable accessories, has made it possible to considerably reduce the size of cable boxes. The bending radius of three core cables has to be considered and in the picture below special removable front covers of the RMU and plinth have been designed to make the jointers life easier. Implementing this will hopefully reduce jointer errors.



Figure 17: Example of SF6 RMU with an additional raising plinth and removable front sections.

Figure 18 shows a clever way of terminating the core XLPE MV power cables into small, compact switchgear. By performing a tri-furcating termination in the duct or ground, three single core cables is achieved. Terminating single core terminations in such small cable boxes is recommended. This small cable box has two cables terminated in it and there is no risk that a failure could occur. Core crossing is done under the cable box in the duct or ground. Special attention should be paid to using the right single cable clamps and gland plate material.

“
The evolution of MV power cables, switchgear and cable accessories, has made it possible to reduce the size of cable boxes.”



Figure 18: Example of tri-furcating termination into compact MV switchgear.

Figure 19 is a good example of where things have gone wrong in the past. The SF6 insulated ring main unit was installed with additional metering, LV and protection Current Transformers (CTs). This often happens and it is all because the wrong products were ordered, or because end users have not understood the new technologies, or wanted to stay with old technologies. We were able to locate this problem before a failure occurred by using the EA Technologies handle-held UltraTev Plus detectors. These tests are non-intrusive and should be done on line. No interruptions of supply are required.



Figure 19: Example of incorrect and correct termination into compact MV switchgear with LV CTs.

The installation should have been done with type 4 terminations and single core XLPE cables. Instead a type 3 termination was installed and the CTs were installed over the unscreened areas of the termination. This installation would have failed if nothing had been done. PD takes a long time to cause a failure in terminations, but it is guaranteed to fail one day.

Testing to ensure reliability

Most end-users still use direct current (dc) cable pressure test equipment, which gives no diagnostic results. This type

of equipment has been available for many years, is portable and is affordable. The test method involves applying a high dc voltage on the cable cores for a predefined period. If nothing trips during the test, the cable is declared healthy to energise. This is referred to as 'Go or No go' testing. Why then do failures of the cable, joint or terminations still occur after energising?

The answer is well documented; dc testing only tests the resistivity properties of the cable system. However, when energised with alternating current (ac) at 50 Hz, the cable system permittivity properties of the components are stressed. To ensure that future cable system failures are avoided, and to make an informed decision on the remaining life with regard to possible replacement of the faulted or aged MV power cable, we need to do our testing differently. With the improved technologies available in testing voltage sources, we are able to test the permittivity properties of the cable system, and simulate the same stresses as in service with ac system conditions. The following alternative test waveforms exist:

- Very Low Frequency (VLF)
- Damped Oscillating Waveform Test Voltage (DOWTS)
- Ac @ power frequency

A diagnostic test should also be conducted before energising a new cable, or after a repair has been made to a failed cable system. Off-line Tan Delta (TD) and Partial Discharge (PD) results can be taken during the pressure test. The results are available on site, and an informed decision can be taken with regard to the health of the MV Power Cable system.

TD test results will give an overall cable system condition result. It will not isolate the problem area. PD test results will give the distance to the source of the pd (potential failure point). Because new XLPE insulated MV power cable is PD free, if PD is detected it is typically in the joints or terminations where jointers have made errors. This now means that these joints need to be identified and corrected, prior to energising. We all know that PD will never go away and it will just intensify and eventually lead to a failure. These results provide us with a fingerprint of the current condition of the MV power cable system, and when future diagnostic tests are conducted, the results can be compared, and the cabling aging rate confirmed. The proposed revised SANS 10198-13 [7] code of practice for MV power cable testing, now recommends integrated voltage withstand and diagnostic testing. These tests do not take any longer to perform, since they are now all integrated in the available new test equipment.

Conclusion

MV Power cables have definitely evolved over the years. The new third generation XLPE-insulated MV power cables are now reliable and make it possible to connect into the new compact switchgear, which is currently being installed. The following recommendations need to be considered in the future to ensure improved reliability of MV cable systems:

- Install screened rather than belted designed PILC cables
- Select and specify the corrected termination types up-front since it makes no sense to install the wrong terminations from day one
- If three core cables are installed, ensure that the switchgear is suitably design as per SANS 876

- If three single cores are installed, there is reduced risk of termination failures; Tri-furcating terminations are perfect to convert three core cables to three single core cables
- It is also possible to install a tri-furcating transition joint from three core PILC to three single core XLPE
- Ensure clearances are kept at all costs if screened terminations are not installed,
- Ensure jointers are well trained in installing the MV power cables and accessories, to prevent unnecessary failures
- If PILC insulated cable are installed, always test for the presence of moisture, and cut out affected sections
- If XLPE insulated cable is installed, utilise the correct screen removing tool
- Consider using single core cables instead of large 3 core cables
- Always perform combined voltage withstand and diagnostic testing, so that the actual condition of the cable system is known, and future faults can be avoided

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- [5] SANS 876. Cable terminations and live conductors within air-filled enclosures (insulation coordination) for rated ac voltages from 7,2 kV and up to and including 36 kV.
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- Core crossing for correct phasing within MV cable boxes is not recommended.
- Many crossed terminations exist in our networks.
- The risk with crossed cores in side unscreened type terminations is that adequate clearances become reduced which leads to increased electrical stress and partial discharge.



Patrick O'Halloran worked for Schneider Electric as the MV product manager and Tyco Electronics as the regional sales manager for Africa. He is presently employed by City Power as the Chief Engineer, Plant Condition Monitoring, responsible for advising City Power on best ways to detect Partial Discharge and prevent future failures.

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Test Systems Next Generation of Technology

Sascha Heinecke, GE

Testing is crucial to innovation. While many new ideas are born every single day, not all can successfully make their way into the field.

Key to understanding which ideas are economically viable is R&D test systems, and never has this been more crucial than in the manufacturing industry. Through using the test system, manufacturers can tailor products to specific performance requirements before installation and commissioning, helping to enhance performance in the field. They can also help to prove R&D and deliver lifecycle results, which are invaluable for developing new innovations.

Without test systems, manufacturers cannot ensure the quality and lifespan of products, nor can they understand the limitations of the components. When you consider, on average, that a wind turbine can cost more than 5% of the initial investment (excluding the cost caused by loss of production) or that a single equipment failure may shut down an entire power plant and cause a city-wide black out, safeguarding such investments is crucial.

By testing products at the research and development phase, as well as re-testing before product delivery, so called end-of-line testing, operators can significantly reduce the probability of running into problems out in the field. This practice helps accelerate the development cycle, improve productivity and cost efficiencies and plays a crucial role in bringing the next generation of technology to life.

Much like the power generation industry, test requirements are changing as technology evolves. In the past, test systems were mechanical, but today, an electrical approach is favoured within the industry because it results in higher performance and quality of testing due to the wider scope of testing scenarios it allows. With this in mind, manufacturers should seek out the companies with vast electrical and mechanical expertise that can act as trusted partners in testing products and innovations.

Testing solutions for your long-term success

It does take time to accumulate knowledge, experience and insight into how to set up the most efficient and lasting test systems. Having been in the test industry for over 30 years, GE provides turnkey projects and takes care of the full lifecycle of the benches. Today we have more than 2 500 test-benches installed globally across various industries such as marine, renewables, automotive, power generation and oil and gas. At the heart of its practice is leveraging the company's extensive electric engineering experience to provide a qualified test



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Test requirements are changing as technology evolves.

system with an optimised variable and flexible turnkey approach. Considering the ever-changing demand on electrical drive systems within test systems, GE's Power Conversion is using its expertise to the most customised and flexible test system solutions. The company closely collaborates with customers throughout the lifecycle of a test system and avoids a 'one-size-fits-all' approach: each test system is designed to be bespoke and is best suited to test the specific product. This is key, since a test system must be reassembled on demand to adapt to the requirements and environments for testing new equipment.

As such, a good test system must be broad in scope, flexible and variable while allowing the customer to tailor performance of product, providing space to imagine and create the next generation of innovation. The test systems solutions are highly robust, capable of sustaining thousands of hours of mechanical and electrical stress. By simulating the extreme environment conditions or worse-case scenario, it will push the boundaries of the new equipment to the highest standard of reliability.

Conclusion

The company has world-record test system solutions in the renewables industry. It partnered with the Lindoe Offshore Renewables Centre on one of the world's most advanced facilities to test wind turbine nacelles with an output power of up to 10 megawatts. In doing so, it aims to build a test system that will support the wind industry as a significantly safer and reliable supplier of renewable energy. By thoroughly testing all components and products in the development cycle, operators can create robust structures that support power generation globally. In fact, to maintain our way of life and the economic development of our society, we require access to sustainable and affordable energy, and this is why test system solutions for all significant industries remain important.

- Without test systems, manufacturers cannot ensure the quality and lifespan of a product.
- Nor can they understand the limitations of the components.
- A good test system must be broad in scope, flexible and variable.



Sascha Heinecke is the test bench segment leader of GE's Power Conversion department. Enquiries: Visit www.gepowerconversion.com/industries/testing-solutions-services

Dc voltage transducers



VTD-BD Series voltage transducers (from NK Technologies) are high-performance transducers for sensing voltage in dc powered installations. Applicable for use on circuits to 600 Vdc, VTD-BD voltage transducers provide a fully isolated +/-5 Vdc or +/-10 Vdc output signal in response to dc voltages that change polarity. Housed in an easy-to-install DIN rail or panel mount case, the VTD-BD Series comes in a variety of ranges to suit many primary voltages.

Voltage transducer applications

Voltage Monitoring

- Detect below normal or 'brown out' voltage conditions protect against possible motor overheating
- Identify conductor loss conditions by detecting voltage reduction in one motor lead
- Monitor over voltage conditions associated with regenerative voltage to help in diagnosing/avoiding motor drive issues
- Detect voltage conditions that may cause stress in or damage to soft starter components (SCRs)

Enquiries: Denver Technical Products. Tel. +27 (0) 11 626-2023 or email denverttech@pixie.co.za

Switchgear assemblies for Liqhobong

JB Switchgear was awarded a contract by projects company DRA Global for the design, manufacturing and supply to the Liqhobong Diamond Mine in Lesotho for a comprehensive range of low voltage switchgear assemblies which included containerised motor control centres, outdoor kiosks, distribution boards, PLC panels, remote I/O boxes, field isolators and junction boxes. In addition to this, JBSS supplied a large number of variable speed drives and soft starters. Some of the motor control centres were skid-mounted to facilitate mobility on the mine site. The electrical equipment was supplied by Rockwell Automation, and the communication protocol was Ethernet. Starter sizes range from 0,55 kW up to 220 kW, with an operational voltage of 525 V, and a fault level of 50 kA.

MD, Johan Basson says the manufacturing programme is now nearing completion, and praised the DRA project team for the way this multimillion Rand project was handled. Likewise, he added that the Liqhobong team were also on top of their game, and that it was another good project for JBSS. The company supplied their highly-regarded and popular 'Eagle Series' of motor control centres. This design carries comprehensive type test certification for compliance with IEC 61439-2 and IEC TR 61641. Basson says that around 31 000 tiers of this robust and user-friendly design has been supplied to destinations throughout Africa and abroad.

Enquiries: Email johanb@jbswitchgear.co.za



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- Contamination of transformer oil by water or dirt needs to be closely monitored as contaminants may cause grave transformer problems.
- Environmentally, transformers should be tested and retested every time oil is cleaned or changed to monitor cross-contamination and ensure it is PCB-free.

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Moving heads at ACTOM

Mervyn Naidoo has been appointed Group CEO of **ACTOM** with effect from 1 March 2017. Naidoo, formerly Divisional CEO of ACTOM's LH Marthinusen division, succeeds Mark Wilson, who has held the Group CEO post since 1996. Wilson, who has been Chairman of ACTOM since 2008, retains the Chairman position. In announcing Naidoo's appointment as Group CEO, Wilson also announced the appointment of Andries Tshabalala as Deputy Chairman with effect from 1 March, 2017. Tshabalala previously held the post of Group Executive Director.

"The Board and I would like to take this opportunity to wish Mervyn and Andries well with their new responsibilities and look forward to working together in growing and developing the ACTOM Group in the upcoming years," Wilson commented.

Tshabalala's main responsibilities as Deputy Chairman will be to assist both Naidoo and himself with strategy, customer liaison and empowerment, Wilson added.

Naidoo was appointed Divisional CEO of LH Marthinusen (LHM) in mid-2014. He was previously Divisional CEO of Reid & Mitchell (R&M), which he was appointed to in 2012, following ACTOM's acquisition in early-2012 of the former Savcio Group, to which LHM, R&M and a number of other leading businesses operating in

the electrical rotating machines and transformers repair markets belonged. At the time of the acquisition Naidoo was an Executive Director of Savcio Holdings and the group's Business Development Executive. An electrical engineer by profession, he has also held senior management posts in several other local electrical rotating machine repair companies during his 25-year career.

Enquiries: Email andries.tshabalala@actom.co.za



Andries Tshabalala, appointed Deputy Chairman of ACTOM.



Mervyn Naidoo, newly-appointed CEO of ACTOM.

SA – First recipient of IE3-compliant DRN motors

A major wastewater treatment project in the Vaal Triangle has become the first recipient in South Africa of the new IE3 compliant DRN motors from **SEW-EURODRIVE**. The new energy-efficient motors were introduced at Electra Mining 2016. The initial order is for ten complete units, with gearboxes and motors (six 45 kW motors and four 55 kW motors), Head of Projects Rudi Swanepoel comments. These specific units will be used for aerator applications.

"With aerator and mixing applications, our projects and engineering teams have to double check all of the loads and bending moments. These loads are supplied to us by the client, based on their designs. We then

have to ensure that the gearboxes that have been selected are suited to the application at hand," Swanepoel explains.

"Our calculation program has been designed specifically to determine if the gearbox selection is adequate, based on the loads and bending moments. This is particularly important when it comes to aerators and mixers. Thus these are not off-the-shelf products, but have been selected specifically for the system in question."

SEW-EURODRIVE also had to comply with stringent specifications in terms of these motors, due to the arduous conditions on-site in the wastewater treatment plant. These included the addition of aux-

iliary instrumentation such as PT100s (to measure temperature) and thermistors (a cut-out failsafe when the motor temperature reaches a set high point). Other additional accessories included strip heaters for colder conditions, and rain canopies.

Enquiries: Email JKlut@sew.co.za



World's most accurate power analyser dedicated to transformer testing

The new **Yokogawa WT3000E** Transformer Version is the world's most accurate precision power analyser dedicated to testing the power transformers used in the power utilities' transmission and distribution sectors. With an accuracy of 0,5% at power factors as low as 0,01 at 100 V and 1 A, the WT3000E Transformer Version is

ideally suited to the precision testing of transformer losses, allowing transformer manufacturers to avoid potential fines imposed by power authorities that could run into thousands of euros.

"When every kilowatt lost beyond specified limits can cost thousands of dollars in fines, it is vital to have confidence in the measurement of power losses, particularly under no-load conditions and at power factors as low as 0,01," says Terry Marrinan, Vice-President, T&M Business Unit, Yokogawa T&M Europe and Asia Pacific: "To address this challenge, the WT3000E

Transformer Version is calibrated at power factors of 1, 0,5, 0,05, 0,01 and 0,001 to enable engineers in transformer testing to accurately capture and measure any drift outside the limits described in the IEC60076-8 Standard." As a result, the WT3000E Transformer Version further exceeds the requirements for accuracy in the standard at a power factor of 0,01 and is now also specified down to a power factor of 0,001. The WT3000E Transformer Version maintains high levels of accuracy over a wide range of power factors.

Enquiries: Email noora.kulmala@nl.yokogawa.com





Commitment to Africa – not just about money

When companies invest in Africa by setting up production facilities here, they contribute far more than just finances, buildings and equipment; they offer their host countries a shortcut into the global mainstream, opening the doors to trade and development on an unprecedented scale.

According to Louis Meiring, CEO of the Johannesburg-based Zest WEG Group, by far the most important aspects of foreign investment are the access to global operations, the transfer of technology, and the ongoing training and skills upliftment. Zest WEG Group is part of the global WEG Group, whose commitment to Africa is evident in its ongoing financial investment in local manufacturing operations.

“WEG initiated a programme to uplift the Zest WEG Group facilities to become world class,” says Meiring. “This puts our local manufacturing facilities onto an international platform so our products can be considered for international markets, including the existing WEG network of operations worldwide.”

He says **Zest WEG Group** will use the WEG world network as a source for enquiries, to create business opportunities and bring much-needed international business to South Africa.

“This is all perfectly feasible through technology transfer, as we have the resources to skill and train our people,” he says. “Once again, however, there is more to technology transfer than just training.”

While technology transfer does include the upliftment of people’s ability to design or engineer products, it is also about the benefit of lessons learnt in the process of research and development (R&D).

“These lessons, which have been learnt by the WEG Group through decades of experience, will have an immeasurable impact on our local operations, due to the high levels of R&D already conducted,” says Meiring. “This technology is then transferred to the local operation without us having to incur the cost or the time to develop it.”



Louis Meiring, CEO of the Johannesburg-based Zest WEG Group.

This process includes the vital aspect of how to produce the product using best practice methodologies, such as lean manufacturing, so special skills must be transferred and developed in South African industrial facilities.

Zest WEG Group has long been an active player in skills upliftment, with a reputation for the quality of its training centre and training programmes; all of which are accredited by the relevant authorities for the provision of continuous professional development (CPD) points.

“We conduct training not only for our own staff but for our customers too,” Meiring says. “We see this as vital in addressing the skills void in various segments of the electric motor sector; created during the late nineties and early 2000s when the role of artisan was not considered to be a career of choice.”

He says that, as a committed partner and the leading manufacturer of electric motors worldwide, WEG has continued the training ethos long established by Zest WEG Group. Its training interventions extend beyond South Africa to other African countries, with the training officer regularly travelling across the continent to ensure that the relevant technology is shared wherever necessary.

“As an African nation, we need to be able to access to the necessary skills sets locally, so that we become less dependent on foreign nationals to provide critical skills,” says Meiring. “As a modern economy, we also need to maintain the costly capital equipment installed in many sectors of South African industry and the lack of these skills can play havoc.”

He emphasised the importance of skilled and regular maintenance to extend the life cycle of any equipment, arguing that industrial inefficiencies are, more often than not, the result of poor maintenance or no maintenance at all. “Part of the investment in skills is to educate those who operate and oversee equipment about the critical nature of proper maintenance,” says Meiring. “When this change in mindset occurs, we will know we are on the correct path to economic success.”

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

One of the most welcome benefits of economic investment is the creation of jobs directly within the new manufacturing facilities created; and indirectly.

Lighting Solutions Support Lean Manufacturing in Pharmaceutical Industry

Insights from the experts at Banner Engineering; supplied by RET Automation Controls

A big trend in the pharmaceutical industry, Lean principles emphasise using time and resources as efficiently as possible in order to reduce waste and focus on value-added activities.

However, there are many ways in which time and resources can be wasted in the pharmaceutical factory. For example, ineffective error proofing and quality inspection procedures can result in product contamination and recalls, leading to both material waste as well as wasted production time. In addition, communication throughout the factory can expend significant time and resources unless a there is solution in place to streamline messages.

A long-term solution to the challenge of waste must allow manufacturers to not only increase efficiency in the short term but also learn from inefficiencies and make data-driven adjustments for continuous improvement. The following are four examples of how lighting solutions can help increase efficiency by addressing common sources of wasted time and resources in pharmaceutical manufacturing.

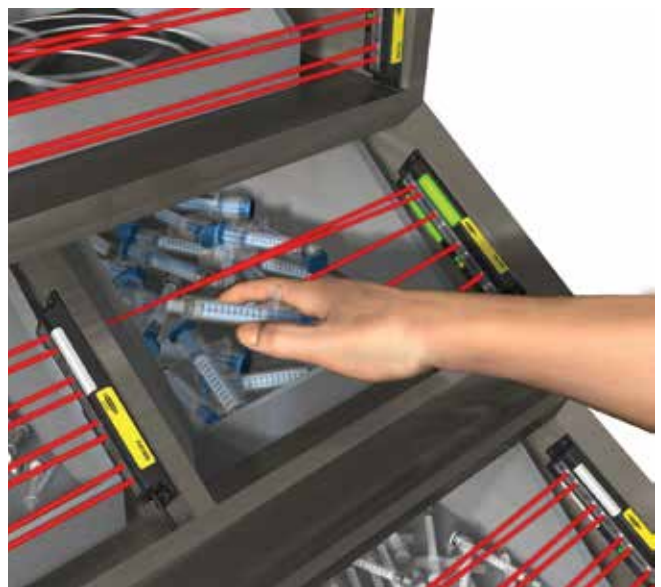
Inspection lighting helps reduce wasted materials and production time

Reliable manufacturing of pharmaceutical products requires comprehensive inspections. It is extremely important to identify particulates or foreign substances of any size to avoid contamination and product recall. Often this is accomplished by human visual inspections since automated inspection systems are not always feasible. But even manual inspections are prone to error, especially if lighting conditions are not ideal for visual verification.

Since many of the particulates are extremely minute, it is important to have bright and highly uniform illumination in inspection stations so operators can effectively verify the quality of products (for example, confirming there are no contaminants present on an IV bag or glass vial). Fluorescent bulbs tend to flicker from changes in intensity, which could compromise inspection accuracy, and must be changed frequently. In contrast, bright, uniform LED lights allow operators to detect minute particulates reliably and efficiently, improving quality control and reducing the risk of wasted time and materials.

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There are many ways in which time and resources can be wasted in the pharmaceutical factory.



Pick-to-light sensors reduce risk of error in assembly

Assembly processes can also be streamlined with the use of light. For example, in kitting applications, it is important to include all of the correct parts in each kit, and errors can occur if there are many different parts to remember or if an operator becomes distracted.

To reduce the risk of error (such as skipped or duplicate parts), pick-to-light sensors can be interfaced with a process controller programmed with the correct assembly sequence in order to guide the assembler to the correct parts in the correct order.

As the assembler takes a part in sequence and breaks the beam, the sensor detects that the part was removed and it sends an output signal to the controller. The controller then verifies if the correct part was taken, and the controller signals the pick-to-light sensor of the next bin in the pick sequence to light up. If the assembler reaches into a bin out of sequence, the system can also be configured to signal the assembler that an incorrect pick has occurred.

A pick-to-light system increases task efficiency by simplifying job training, increasing quality control (no skipped parts), and reducing the need for rework and inspections. It also speeds the resumption of work after breaks and other distractions.

- IloT – Industrial Internet of Things
- LED – Light Emitting Diode
- OEE – Overall Equipment Effectiveness

Abbreviations/Acronyms

Indicator lights streamline communication in the Visual Factory

Communication across the pharmaceutical factory can also be a source of wasted time, and the Visual Factory allows for communication to occur seamlessly. For example, indicator lights can be used to indicate environmental status information for clean rooms like current temperature and humidity. For example, green indicates the room is within normal limits, yellow indicates near the threshold, and red indicates the room is outside the control limits. This allows employees to immediately identify rooms that need attention.

Indicator lights can similarly be used as visual guidance when assistance is needed on machines. For example, lights can be configured to indicate when a machine requires an action (such as replenishing labels). The use of indicator lights simplifies communication of problems and allows issues to be addressed quickly so normal operation can resume.

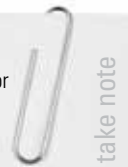
Wirelessly-connected lights enable OEE

In order to ensure efficient processes throughout the pharmaceutical factory, machine operators must quickly and easily determine the status of machines. Tower lights equipped with wireless communication capabilities display a visual indication of an event for immediate action; plus, they can transmit wireless alerts to operators outside

of the visual range. This helps ensure that operational problems are identified and addressed immediately, regardless of whether machine operator is physically present to see the visual indicator.

In addition, the wireless transmission of machine data can then be stored or long-term data logging and analysis, a critical capability of the IloT. In other words, not only can operators respond to alerts quickly as they occur, but a history of alerts can also be stored and analysed offline for use in OEE (Overall Equipment Effectiveness) calculations. This data can also be used for predictive maintenance, further saving costs and time.

- Manufacturers need to learn from inefficiencies.
- Manufacturers need to make data driven adjustments for continuous improvements.
- Lighting solutions can increase efficiency by addressing wasted time and resources in pharmaceutical manufacturing.



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Introducing a Unique Balance in Window-Blind Automation

Avi Klein, Control Applications

A novel controller for full automation of window blinds.

Double-Skin Glass Façade buildings are becoming a fixed feature of the contemporary urban skyline. This trend, which involves an architectural shift to glass-based exteriors, considerably hastens the completion of building projects as well as providing energy-efficient solutions required for modern structures [1].

This efficiency is due to full exploitation of the natural sunlight and the isolation provided by the air sandwiched between the two glass layers which helps keep out the heat or cold. During winter time, not only is insulation provided, but the sandwiched air, warmed up by the sun, is thrown back into the facility's ventilation system [2].

This double-skin layout is typically designed for hosting motorised window-blind systems, providing superior climate control, by letting in sunlight, while blocking direct radiation. However, proper use of these blinds is at the mercy of users inside the offices or living spaces. When unattended, these blinds might, one morning, inadvertently remain in the up position, enabling the ingress of unwanted direct solar radiation or might be left down in the evening, preventing needed sunlight the next morning.

Wouldn't it be nice if we could have ultimate control over the aperture of our blinds, optimising at any given moment the delicate balance between access of the desired indirect sunlight and blocking unwanted direct radiation; and as an automated solution, to boot?

We – at Control Applications – are proud to inform you that such a solution exists.

Sunlight tracking shade control

Taking advantage of its extensive experience in the design of DDC controllers and control systems for Building Management Systems (BMSs) in a broad range of fields and industries, from common HVAC systems to pharmaceutical clean rooms, Control Applications has decided to pick up the gauntlet and address this challenge, with the design of the unique Sun Light Tracker (SLT) controller. The SLT is a controller designed for motorised window-blind automation which, as suggested by its name, 'tracks the sun'. Sun-tracking is accomplished by means of programming the controller with the precise location coordinates and bearing of each of a building's facades.

Using these parameters, thus factoring the building's position as a point on the globe, the SLT's advanced algorithm, running Cartesian equations, calculates the exact angle at which the sun strikes each side of the building at any given moment of the day. This of course allows us to determine the optimal aperture needed for the window-blinds system.

Utilising extraordinarily precise motors, rather than being limited to open/closed modes or to crude intervals, the SLT enables an infinitesimal level of precise control over aperture, allowing the full utilisation of the SLT's smart algorithm. Notwithstanding the automatic solution, users can manually override the control at any specific window. Equipped with a standard RS485 communication port, the SLT is integrated into the BMS infrastructure, supporting Modbus and BACnet protocols.

”

The SLT is a controller designed for motorised window-blind automation which 'tracks the sun'.

Ultimate Energy Efficiency

Green construction and energy efficiency are not just strong buzzwords in today's world of depleting resources. Costs spent on climate-control and lighting, especially in public and industrial facilities are significant, and solutions which optimise economising on both simultaneously are rare. The SLT is designed to do just that: To block the direct sun on hot summer days, saving significantly on HVAC expenses [1], while at the same time making sure to allow in the optimal amount of natural, indirect light.



- DDC – Direct Digital Control
- HVAC – Heat, Ventilation, Air-Conditioning
- LED – Light Emitting Diode
- SLT – Sun Light Tracker

Abbreviations/Acronyms

Three birds with one SLT

Beyond the obvious economical considerations discussed, having an entire building exterior operate automatically affords a few additional bonuses, one of which is within the realms of aesthetics. Instead of a building’s façade being a hodge-podge of open and shut blinds, an automated system gives a clean and neat appearance of aesthetic uniformity. An extra perk. Our third bird is the one of external illumination: Having this integrated controllers present nearby every few motorised blinds on a building’s façade has an extra upshot: fully, detailed control infrastructure for the layout of external LED illumination of a building’s façade.

Conclusion

It has become quite popular to illuminate a building’s façade with layouts of LED lighting, allowing the creation of intricate patterns,

- Double-skin glass facades entail shade systems which require control.
- The SLT controller, developed by Control Applications, uses a unique control algorithm, providing optimal aperture for window-blinds and infrastructure for LED lighting control.
- This optimal aperture provides energy efficiency and aesthetics.



or at times even shapes and text. Utilising the SLT’s wiring layout provides a built-in infrastructure for the control layout of such LED lighting, eliminating the need of extra wiring and installations.

References

- [1] Gelesz A, Reith A. Energy Procedia 2015, 78, 555-560
<http://www.sciencedirect.com/science/article/pii/S1876610215024674>
- [2] Poirazis H. Report on Double Skin Facades for IAE and SCH
http://www.ecbcs.org/docs/Annex_43_Task34-Double_Skin_Facades_A_Literature_Review.pdf



Avi Klein (M.Sc.) leads the international sales division at Control Applications, manufacturer of products for BMS control and energy management and power metering. Prior to his positions in sales and marketing, Avi held a research position at Chemada Fine Chemicals.

Enquiries: Control Applications Ltd., Israel. Tel +972-3-6474998 or email export1@ddc.co.il

ROUND UP

LIGHTING

Shining brightly after 50 years of innovation

Celebrating its 50th anniversary this year, **Nordland Lighting** is continuing its strong tradition of local innovation by launching its first Zone 2 LED luminaires for mining, oil and gas and petrochemical applications.

The industrial and hazardous lighting specialist is also making these new luminaires available in stainless steel for specific requirements, in addition to launching die-cast aluminium bulkhead Zone 2 LED luminaires.

“There is a definite move towards LED technology in industrial and hazardous lighting, due mainly to the cost-saving and increased safety benefits,” Nordland Lighting Engineering Manager Eben Fer-

reira comments. “There has been a dramatic decrease in the cost of LEDs, which means it is better to invest in the latest technology than in cold cathode fluorescent lamp (CCFL) systems, which are anticipated to be phased out completely over the next ten to 15 years,” Ferreira explains. Commenting on what gives Nordland Lighting the leading edge, Sales Manager Johann Lamprecht comments: “We offer good reliable products with an affordable pricing structure. We look after our customers’ needs, ensuring we supply the best suitable product for their direct requirements, all in a highly competitive market.”

The manufacturer also has a dedicated lighting-design team, including a qualified Lighting Practitioner accredited by the Illumination Engineering Society of South Africa (IESSA). Nordland Lighting also offers an applications engineering service. (See *Social Engineers*, page 43).

Enquiries: Email johann@nordland.co.za



Lighting becomes sustainable

In recent decades, there has been a notable increase in pollution and energy consumption. The commitments to reducing consumption and emission levels relate to lighting too. The aim is to produce optimised lighting systems, with the light efficiently produced and effectively used. This encourages the use of energy-saving sources and at the same time, favours the production and use of lighting devices that exploit the primary flux in the most efficient way possible. In other words, to produce ergonomic lighting that offers good performance and visual comfort, it's not enough just to use high-efficiency sources. The flux must be directed and shared out to create a bright environment that's compatible with the physical and physical needs of people's sight.

In this regard, the most recent technical writings (CIETR 205/213) focus on qualitative aspects of indoor lighting: LED lighting cannot be evaluated solely on basis of quantitative parameters because the visual comfort aspect plays a fundamental role in work environments. This means that average illumination and uniformity are not sufficient for defining the performance of an indoor lighting system.

GEWISS Smart [4] system

To meet these needs, **GEWISS** (represented locally by **ACDC Dynamics**) has launched a range of products that take full advantage of the particular features of LED technology, ensuring excellent energy savings and optimum visual comfort. Smart [4] by GEWISS is the revolutionary, totally green lighting system for commercial and industrial contexts. Smart [4] is innovative technology enclosed in a minimalist sharp, linear style with a definite Italian feel. The design aim, in fact, was to emphasise the typical characteristics of LED lamps: lightweight, small, practical and robust. These features

were transferred to the end product, providing it with unequalled performance levels. The use of power LEDs with high colour performance, high efficiency optical system (high bays and lenses) and availability of multiple configurations make Smart [4] an ideal instrument for minimising costs (for operation and maintenance) and maximising lighting performance.

Designed for upgrades

Recent statistics show that most lighting systems in industrial and commercial environments are based on technologies and regulations that are now obsolete. In the case of existing systems though, the current technologies can only be adopted if the hardware is intrinsically flexible. Obtaining a good upgrade means using products that adapt to the pre-existing situation.

The distance (longitudinal and transversal) between the lighting devices can't usually be modified without reconstructing the supply lines and/or junctions. The preservation of the existing geometries necessarily requires devices with:

- A series of photometric curves (e.g. with rotational symmetry - with different beam widths - asymmetric and elliptic)
- Several nominal fluxes, that can be selected according to the illuminations and uniformity you want to produce on the surfaces
- Anti-glare devices for installation at lower heights

The use of Smart [4] meets the most advanced needs in the field of industrial and commercial lighting for indoors and outdoors. It guarantees:

- Energy savings of between 50 and 80%
- Lighting quality and visual comfort
- Easy, quick replacement of devices installed in existing systems (upgrade)
- Notable savings as no routine maintenance is needed
- Investment pay-back in 18-36 months

Enquiries: Nelen Govender, ACDC Dynamics. Tel. +27 (0) 10 202 3300 or email neleng@acdc.co.za





Endress+Hauser Level Seminar

On 7 March a level seminar was held at the Endress+Hauser South Africa head office in Sandton. The seminar was presented by Jan Gerritsen from Endress+Hauser South Africa; Dietmar Haag and Florian Palatini, level measurement product managers from Endress+Hauser Germany. It was emphasised that Endress+Hauser offers a choice of different level measurement instruments and has the right solution for the application. Micropilot FMR10 and FMR20 are non-contact radar level measurement devices for the water and wastewater industry and utilities across all industries. A useful feature is that commissioning and maintenance is possible remotely using the SmartBlue app and this was demonstrated. The Heartbeat Technology which enables a cost-effective and safe operation of the plant during its entire lifecycle was also demonstrated.

Enquiries: Email Suanne.Willemse@za.endress.com



Endress+Hauser's Dietmar Haag; Jan Gerritsen and Florian Palatini.

ISO 9001:2008 Re-certification

East Rand based switchgear systems manufacturer, JB Switchgear Solutions, recently passed the ISO 9001:2008 re-certification with flying colours through SGS.

Enquiries: Email info@jbswitchgear.co.za



JB Switchgear's Managing Director, Johan Basson and Gordon van der Merwe, the company's Governance Manager.

50 Years in Lighting

Celebrating its 50th anniversary this year, Nordland Lighting is continuing its strong tradition of local innovation (see page 41).



Nordland Lighting's Johann Lamprecht and Eben Ferreira.

JB Switchgear



Craig Combrinck,
Cost Control Officer



Duncan Farquhar, Design
Engineer

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Smart Buildings & Infrastructure

24 May
(Africa Summit in Sandton, Johannesburg)
15 August
(Western Cape Summit, Cape Town)
Enquiries: Visit www.smart-summit.com

Domestic Use of Energy (DUE) Conference 'Energy efficiency in the home'

3 - 5 April 2017
Cape Town campus,
Cape Peninsula University of Technology (CPUT)

Prospective delegates may register for the conference by contacting. Delegates are also invited to present papers at the conference.
Enquiries: Nadia Cassiem.
Email cassiemn@cput.ac.za
Visit <http://energyuse.org.za/du/>

Securix 2017

30 May - 01 June 2017
Gallagher Convention Centre,
Midrand, Johannesburg
Securix is Africa's leading security and fire exhibition. The exhibition enjoys the support of a number of industry associations, a fact that underlines the credibility of Securix as Africa's leading security and fire exhibition.

AOSH EXPO 2017

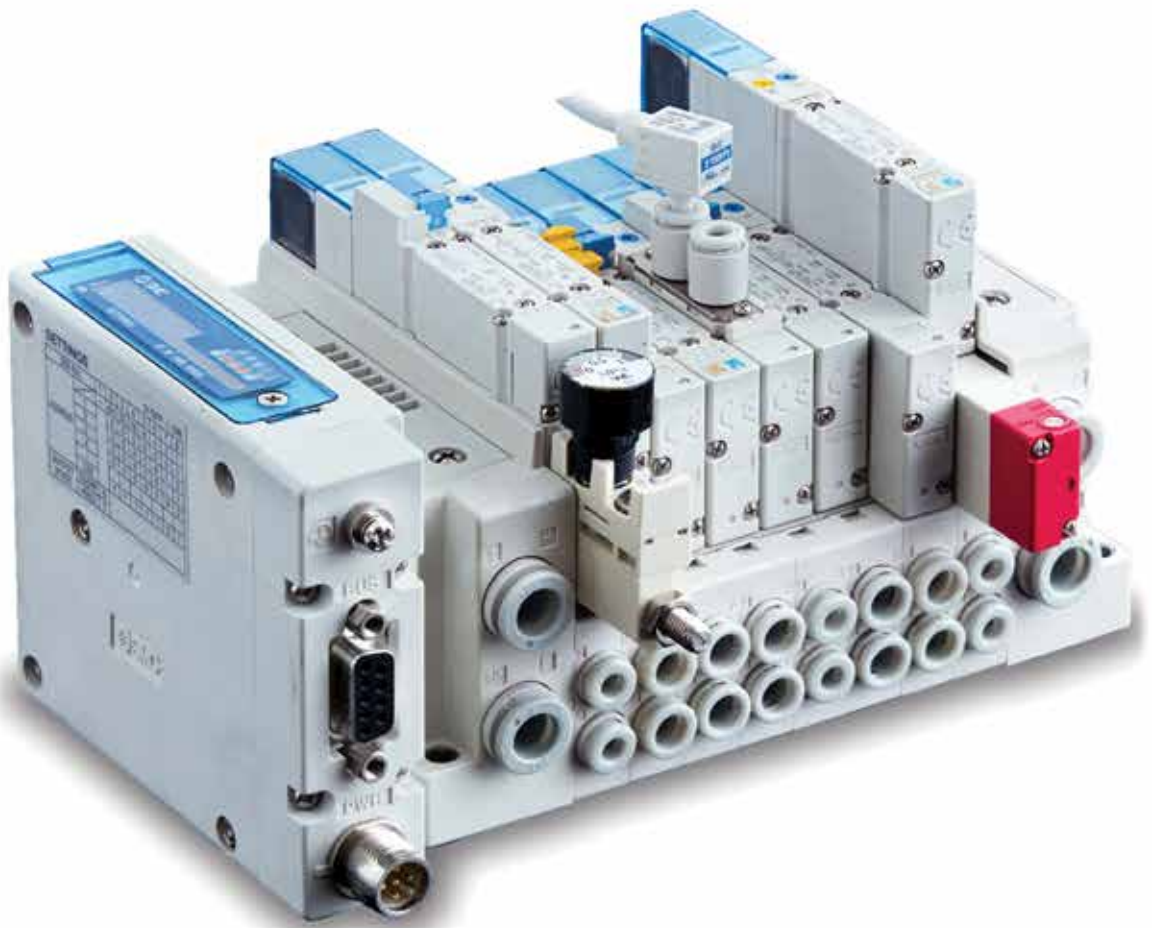
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Midrand, Johannesburg
Africa's leading OSH exhibition.
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Email leighm@specialised.com

POWER-GEN & DistribuTECH Africa 2017

18 - 20 July 2017
Sandton Convention Centre,
Johannesburg
Sustainable power generation and distribution in a constrained market is a top of mind issue across Africa.
Enquiries: Leigh Angelo.
Email leigh@tradeprojects.co.za

Industrial and Commercial Use of Energy (ICUE) Conference

14 - 16 August 2017
Cape Town campus, Cape Peninsula University of Technology (CPUT)
Enquiries: Nadia Cassiem.
Email cassiemn@cput.ac.za



Keeping it local

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TRULY SUSTAINABLE LIGHTING



Industrial environments



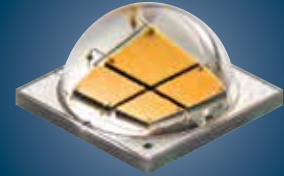
Logistic Centers



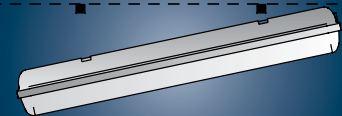
Shopping Centres



Tunnels



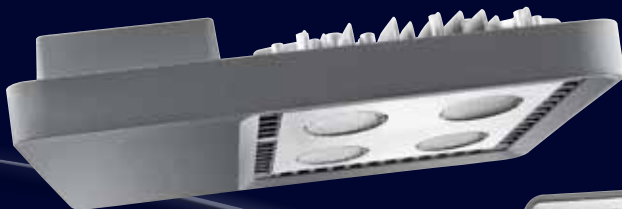
Innovative POWER LED system



Ease of installation and replacement



Comprehensive lighting solution



Smart [4]

LED SYSTEMS FOR INDUSTRIAL LIGHTING AND PROJECTION



SMART[4] is the new Gewiss lighting range that can be used as a floodlight, high-bay or ceiling light, offering different photometric characteristics depending on your installation requirements. With the unmistakable Italian styling, you are ensured of an easy and effective installation with a vertical or horizontal installation option. SMART[4] delivers you energy efficiency, cost savings, superior light quality with fast and easy installation.

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