

KoCoS

11/2022



METES 3.5

METER TESTING

State-of-the-art, on-site energy meter calibration system!

KoCoS

A FRIEND OF ENERGY

www.kocos.com



Check us out!

FEATURES:

- Control systems + automation
- Drives, motors + switchgear
- Sensors + switches
- Plant maintenance, test + measurement

ELECTRICITY + CONTROL

CROWN PUBLICATIONS

Condition Monitoring is at the heart of machine reliability



WearCheck, Africa's leading condition monitoring company, specialises in a range of sophisticated condition monitoring techniques which help to boost the availability and reliability of machinery, thereby helping our customers to operate more efficiently and save money on maintenance costs.

Machines speak, we listen, you save!

- +31 700 5460
- support@wearcheck.co.za
- wearcheckafrica
- WearCheck
- www.wearcheck.co.za



Brochure

**WEAR[®]
CHECK**
Condition Monitoring Specialists

Testing and Analysis | Lubricant-Enabled Reliability | Asset Reliability Care



The METES 3.5 is a portable, three-phase energy meter calibration verifier, designed for the verification of electronic and Ferraris energy meters in the growing pre-payment energy meter sector.

(Read more on page 3.)

Editor: Leigh Darroll

Design & Layout: Darryl James

Advertising Manager:

Heidi Jandrell

Circulation: Karen Smith

Editorial Technical Director: Ian Jandrell

Publisher: Karen Grant

Deputy Publisher: Wilhelm du Plessis



Audited circulation Quarter 2 (April-June) 2022
Total print and e-editions 12 562

Published monthly by:

Crown Publications (Pty) Ltd
Cnr Theunis and Sovereign Sts,
Bedford Gardens, PO Box 140,
Bedfordview 2008

Printed by: Tandym Print

Telephone: +27 (0) 11 622 4770

E-mail: ec@crown.co.za; admin@crown.co.za

Website: www.crown.co.za/electricity-control

CROSS PLATFORM CONTENT INTEGRATION:

* Electricity+Control Magazine * Online Edition

* Weekly e-Newsletter * Website * LinkedIn



Electricity+Control is supported by



The views expressed in this publication are not necessarily those of the publisher, the editor, SAAEs, SAAE, CESA or the Copper Development Association Africa

The immeasurable value of meeting face to face

It is seldom that I would choose to address the same topic two months in a row. But I have not yet received a suggestion not to do so!

I mentioned last month the then upcoming International Conference on Lightning Protection (ICLP) – which took place in the first week of October.

The reason I do want to mention it again – noting too that it followed so closely on Electra Mining Africa 2022 – which also was an on-site event – is the remarkable chemistry that emerges when folk actually get together.

The ICLP was attended by representatives from more than 40 countries, with over 170 registered delegates on site. It was very well supported by local and international industry partners and was, by all accounts, a successful event. It was also heartening to see a very good turnout of local delegates.

I mention this because the previous edition, scheduled to be held in 2020, was delayed to 2021. This was a difficult decision taken by the International Scientific Committee in the hope that the pandemic would be over – and that we could all meet in Sri Lanka. As it turned out, the 2021 conference was held in a virtual mode. It ran well – but it was different.

We had the good fortune, as a country, to have won the bid to host the ICLP in 2022 – and this was a decision made almost a decade earlier. How could we ever have imagined what was to follow?

It was indeed quite incredible to be able to host a face-to-face event (with an online option available to those who could not travel).

Apart from being delighted to see so many people joining us in Cape Town and

in South Africa, the most significant aspect was to see how much we need to sit down with, shake hands with, and look into the eyes of our fellow human beings.

It was a profound moment in the scientific community.

We learned during the pandemic that so much can be done virtually with great success – perhaps more than we ever imagined to be possible.

We learned that for many, working from home could be a productive alternative to working at the office; cutting out commute times made more working hours available. In parallel, we saw multiple online meeting platforms emerge. We saw the digitisation of a multitude of business and industrial processes accelerate to enable virtual operations – and we saw connectivity escalate to enable remote management and maintenance of industrial plants. These changes – and many others too – will, no doubt, stay with us. But what we have now also realised, is how very important face-to-face interaction is – and perhaps especially when one is engaging in learning and sharing of knowledge and experience.

Personally, I will forever remember that the virtual environment is far more powerful than we thought – and is likely to become even more so in time and with changes in technology; but equally, I will remember the absolute importance of being physically together, sharing and truly engaging with our colleagues, friends, families and fellow travellers.

One wonders how many more such crises will befall humanity in our lifetimes – and what lessons they will teach us.

Ian

Ian Jandrell

PrEng IntPE(SA), BSc(Eng) GDE PhD,
FSAAE FSAIEE SMIEEE



CONTENTS

FEATURES

CONTROL SYSTEMS + AUTOMATION

4 Fast and flexible automotive test bench technology
Stefan Ziegler, Beckhoff Automation

6 Products + services

DRIVES, MOTORS + SWITCHGEAR

10 Engineering electrical and C&I solutions offsite
Johan Basson, JB Switchgear

13 Products + services

SENSORS + SWITCHES

18 Fine tuning temperature sensors to handle new plastic packaging
Omron Industrial Automation

20 Maximising safety in working with cobots
ID TechEx

21 Products + services

PLANT MAINTENANCE, TEST + MEASUREMENT

24 Inspecting solar panels to maintain optimum performance
Gerrit Barnard, Comtest

26 Designing reservoir level control systems
Peter Telle, Ultra Control Valves

27 Products + services

REGULARS

1 Comment
The immeasurable value of meeting face to face

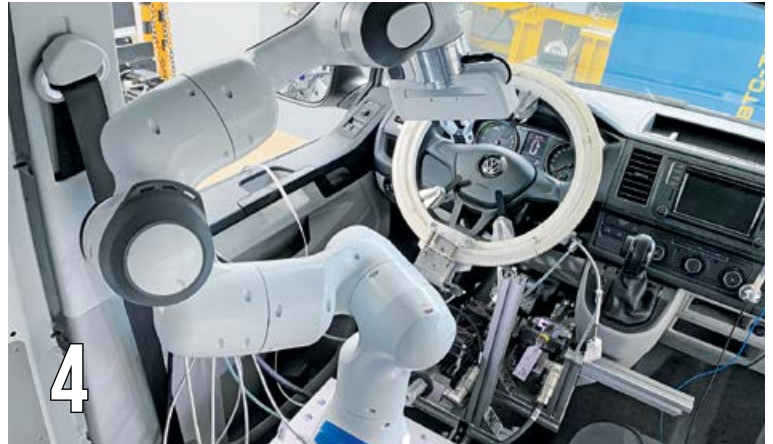
3 Cover article
METES meter testing: a new development at KoCoS

29 Reskilling, upskilling + training
'Next-generation' technology and training

30 Cybersecurity
Virtual CISO services – an option for SMEs

31 Engineering the future
Engineering an offshore wind-to-hydrogen demonstrator project

32 Write @ the back
Green hydrogen: now is the time to act



METES meter testing: a new development at KoCoS

As a follow-up to its flagship Metes 325, KoCoS, based in Cape Town, South Africa, has developed the METES 3.5 which is aimed at the middle and lower order portable energy calibration test equipment market. Maybe lower order, but suitable for a potentially larger number of units in the market and at a price versus performance ratio that is unrivalled.

The METES 3.5 is a portable, three-phase energy meter calibration verifier. It is primarily intended for the verification of electronic and Ferraris energy meters, specifically aimed at the growing pre-payment energy meter industry in developing and first-world countries. It provides full functionality for energy meter verification of calibration errors with direct percentage error read-out.

The unit measures and displays the system Voltage, Current, Angle and Power quantities. (W, var and VA) per phase and total quantities. It also displays voltage and current vectors and power vectors.

The unit is supplied complete with three current clamp-on sensors for easy integration into the power network. The current clamp-on sensors have larger than usual installation maximum conductor diameter capability of 15 mm. The unit has a 3.5-inch colour touch display and provides a measurement accuracy of 0.2% (typically 0.1%) for power /energy.

The METES 3.5 has on-board memory that allows the user to save all readings and test results in a database for later downloading with PC software for report printing and archiving. Customer, Site and Test results information is stored. METES 3.5 has an optional Bluetooth printer for on-site printing of the test results. It is powered by a rechargeable battery.

As shown in the photograph, the enclosure has sufficient storage space for the current sensors and voltage leads, which makes for a single unit without additional bags. The enclosure is also IP67 rated.

Similar functionality is also available in a single-phase unit with the METES 1.5 model. □



The METES 3.5 portable, three-phase energy meter calibration verifier is supplied with current clamp-on sensors and voltage leads.

For more information contact KoCoS Measurement & Control (Pty) Ltd.

Tel: +27 (0)21 982 0016

Mobile: +27 (0)82 376 1216

Email: herwin@kocos.co.za

Visit: www.kocos.co.za

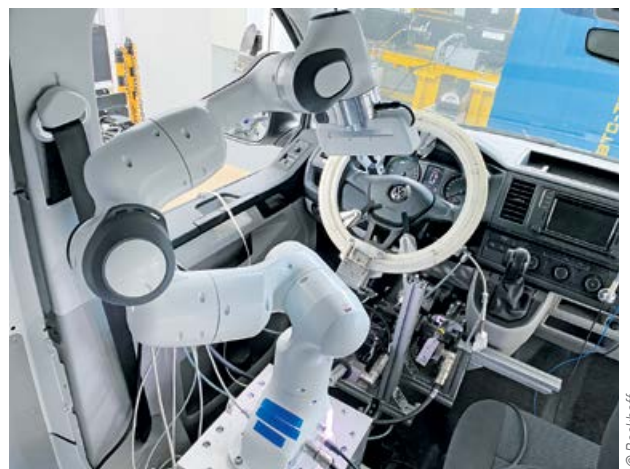
Fast and flexible automotive test bench technology

For small-series producers and manufacturers with a wide range of vehicle variants, being able to count on comprehensive test bench technology that is fast, flexible and cost-effective is important. Kempten University of Applied Sciences has implemented such a test bench for ABT e-Line GmbH, enabling it to perform tasks such as testing Volkswagen (VW) vans that have been converted to electric drives. Stefan Ziegler of Beckhoff Automation highlights PC-based control technology from Beckhoff as the central feature of the standard industrial components used.

The test bench at Kempten University of Applied Sciences (HS Kempten), in Kempten im Allgäu, Germany, is used primarily for testing vehicle functions. It was developed in the Laboratory for Control Engineering and Vehicle Systems at HS Kempten, which examines applied research and development topics from the automotive and automation sectors. The lab was originally founded in 2016 to test components, and its range of activities has since expanded to include complex complete-system test benches as well as teaching in addition to research.

The test bench is intended to test new vehicles and new functions as quickly as possible, and to examine how individual functions influence each other. It also offers the advantage of allowing for vehicles to be tested in their original roadworthy condition rather than having to be modified, as is the case for most conventional test benches.

Florian Zerbes, a research assistant at the Allgäu Research Centre at HS Kempten, outlines the scope and process of a test: "In the case of an electric vehicle, the aim is to test whether the HVAC systems, which both draw their power from the high voltage battery, have an influence on the vehicle's most important functions, such as switching on, switching off and driving. This involves specifying a test cycle that repeatedly starts, stops and accelerates the vehicle. The state of the vehicle changes as a result – that



Inside a test vehicle with robot and linear motors in place for vehicle operation.

is – the HVAC system is switched on or off and the battery charge level is varied. With the test bench at HS Kempten, this test can run completely independently over several hours or even days. The process involves continuously recording the data from the test bench and the vehicle so it can be analysed and transferred into the final test result."

Structure of the test bench

The output motors flanged to the vehicle wheels provide resistance to the propulsion of the wheels, which is intended to simulate driving on a road. A robot inside the vehicle turns the ignition key, moves the gearshift, and operates various buttons, such as those for interior climate control. Linear motors on the pedals press the accelerator and brake pedals, while a steering motor turns the steering wheel. A second robot outside the vehicle plugs and unplugs the various charging cables into and out of the charging socket.

Measurement technology is used to gather the currents and voltages in the vehicle's wiring harnesses for subsequent analysis. The Beckhoff control platform – a C6030 ultra-compact Industrial PC with TwinCAT – communicates with the individual components and the vehicle (via the CAN bus). This central control unit coordinates the individual components and controls them accordingly. A range of different tests can be implemented, all with different procedures. The seamless integration of



On the test bench at HS Kempten – a VW van converted to electric drive by ABT.

the CAN devices in the EtherCAT control system is provided by nine EL6751 EtherCAT Terminals, 1-channel communication interfaces that integrate any CAN and CANopen devices.

During the test procedure, the vehicle faces driving conditions like those it would experience on a real road. For this purpose, a drive test bench moves the wheels according to the simulated torques and can also accommodate steering movements. The simulation is so close to reality that the vehicle does not 'realise' it is on a test bench. Even the driver's actions are simulated by corresponding actuators. Industrial robots perform most of the actions to facilitate as many different actions as possible. The surroundings are also simulated along with how the vehicle communicates with the environment – via GPS, for example.

In addition to developing the real test bench, HS Kempten has created a digital twin of the system. This facilitates pre-commissioning of the test bench and provides for comprehensive visualisation and monitoring of the system.

Reducing costs and increasing flexibility

A major consideration when developing the new test bench was how to make the system as cost-effective as possible. This was achieved by using standard industrial components such as converters, motors and controls. Another consideration was to ensure the system could be installed in and removed from the vehicle quickly, and essentially irrespective of the vehicle model in question. The test bench therefore had to be easy to adapt.

With this in mind, Dr Andreas Stiegelmeyr, Professor of Mechanical Engineering at HS Kempten, describes the requirements and implementation of the system. "We developed a test bench that is capable of testing most vehicle functions using standard vehicle interfaces. This makes it possible to test functions with a high degree of connectivity with minimal effort, regardless of the vehicle type. What we have created is therefore a great alternative for vehicle manufacturers with a wide range of vehicle variants and for manufacturers of small series in particular."

Florian Zerbes adds: "We chose the central control system from Beckhoff because it already offers many different interfaces to industrial components. What's more, the control technology can be easily expanded by adding EtherCAT Terminals, and can be distributed optimally throughout a space due to the freedom of the EtherCAT topology. The volume of hardware and software products available means many measurement and control tasks can be completed with minimal effort. And importantly too, PC-based control from Beckhoff offers a clear cost advantage over systems from the automotive sector."

A toolchain to determine test sequences

The test sequences are written in Structured Text (ST) using a specially developed toolchain and generated with MATLAB®/ Simulink®. This makes it possible to use TwinCAT and Simulink® together effectively. Describing the toolchain, Zerbes says, "Blocks that already contain the information for the hardware links can be generated automatically in Simulink®. When compiling the respective model, the corresponding hardware links are automatically set by the TwinCAT Automation Interface and a link layer is created between the model and the hardware."

The new toolchain offers the following capabilities:



The Beckhoff system (centre) – in this case, the C6030 ultra-compact Industrial PC, seven EL6751 EtherCAT Terminals and an EL6614 – forms the central control platform of the test bench and communicates directly with all components.

- The required Simulink® model can be created with virtually no effort
- Different databases can be used without any problems
- The connection to the hardware can be automated and configured directly in the Simulink® model
- Users benefit from a straightforward interface.

The current focus of the toolchain is on the CAN bus, which in concrete terms means that CAN message blocks can be created quickly via a DBC file, for example. Blocks like this can then be directly connected to the rest of the model and the connection to the hardware can be configured in Simulink®. Users can configure the individual messages via a GUI and configure other connections to the hardware directly in Simulink®. Once the Simulink® model has been created, it can be easily connected to TwinCAT via the toolchain. All users have to do is decide which Simulink® model is to be linked to which TwinCAT project.

Otherwise, everything runs automatically and it is also possible to make adjustments to the TwinCAT project in terms of the hardware or the implementation of PLC projects, for example. □

Commenting on the test bench ABT said in a statement: "The test bench at Kempten University of Applied Sciences allows us to respond quickly to changing requirements. It enables us to implement new and comprehensive test scenarios within a short time and to test our vehicle on a fully automatic basis. The test bench provides us with innovative support throughout our agile development process." □

For more information visit: www.beckhoff.com/en-za/

Setting a new standard for jib crane cable guides

Trendsetting crane manufacturer, Stahl Cranes and Hoists in Vereeniging, is changing its jib crane cable management systems from the old system of festoons and pulleys to reliable and snag-free energy chain systems from specialist supplier, igus.

Manufactured from engineered polymers the energy chains are mechanical machine elements that guide and protect data and power cables needed to operate the crane. Rather than the cables being exposed and hanging from the festoon system, the energy chains secure the cables within the chain and provide the required movement without damaging the cables.

Stahl Cranes and Hoists Sales Manager Marius Ferreira says the latest crane manufactured and supplied to SEW Eurodrive's Gauteng factory, is supplied with an energy chain system from igus. Its ease of installation on the crane and lack of rotating moving parts make for a less complicated system with fewer structural attachments, clamps and weld points.

Abrasion resistant energy chains

The three-ton monorail system is used in the company's parts wash bay for the cleaning of equipment from its customers' sites around the country. This means the potential for dirt and ingress is significantly higher than in the usual applications and the use of abrasion-resistant polymers ensures that the cable and energy chain do not wear. Compared to a trolley system on a festoon, there are far fewer moving parts, no lubrication is required, and the energy chain system is less likely to be damaged by accident, which is a vulnerability of the older method.

"With the introduction of igus energy chains on our cranes there is no reason to return to the old festoon systems. Data gathered from our cranes using energy chains indicates that they are considerably more reliable, need almost no maintenance, do not use lubricants and most importantly, keep the cables out of harm's way.

"With igus' Chainflex cables which are specially designed to bend and flex, the energy chain and cables



Stahl Cranes and Hoists is choosing to use igus energy chains on its crane systems.

should last the lifetime of the crane, with just routine maintenance. Growing demand for igus' energy chains has led to keener pricing and they are considered more cost-effective over the lifespan of the system," says Ferreira.

Engineered polymers

Managing Director of igus in South Africa, Ian Hewat, says the success of igus' systems lies in the engineered polymer materials used, which he says simply cannot be matched. igumid G, a high-performance plastic that incorporates various characteristics for different environments, can handle strenuous loads and extreme temperatures. It is also abrasion-resistant and suitable for outdoor use. A range of other materials are available for even extreme or unusual applications.

"We supply our energy chains for applications as diverse as heavy port cranes, mining machines, industrial machines and 3D printers and robotics. Whatever the size or application, we can produce energy chains that are fit for purpose and able to outlast and outperform just about everything available in the market today.

"With ongoing research and development at the company's headquarters in Germany and plants around the globe, igus continues to innovate and develop solutions and materials for almost any application," Hewat says.

For more information contact igus South Africa.

Tel: (011) 312 1848

Email: ihewat@igus.net, visit: www.igus.co.za



Together with HMIs, PLCs, which store and execute logical sequencing processes, are fundamental to automation and control systems.

HMI and PLC are core to automation advances

Automation has become synonymous with industry, whether it is in the automotive or food and beverage industry, and has changed the way most industry sectors operate today.

Sbo Chili, Product Manager: EcoStruxure – IDHMI & IDMST at Schneider Electric, highlights that human machine interface (HMI) technologies and programmable logic controllers (PLCs) are fundamental to industrial automation and have become an integral part of automation systems.

HMI incorporates the software facilitating human and machine interaction, which makes it a critical compo-

nent in the broader scope of SCADA (supervisory control and data acquisition) systems and propels the application of the Industrial Internet of Things – IIoT – across multiple sectors.

Chili explains that HMI software works as a communication link or platform between the people responsible for operating machines and the system, to oversee and control operations. Variants of HMI also transform data from industrial control systems into visual depictions of the systems, which can be interpreted by people for their clearer understanding of the equipment, and analysis.

HMI enables employees to operate complicated

Continued on page 7

Continued from page 6

machines proficiently and, in turn, offers a number of benefits, including:

- Increased productivity
- Higher levels of employee satisfaction and morale
- Efficient documentation and storing of data
- Mobile technologies that give workers access to guidance or remote expertise wherever they may be working (inside or outside the facility)
- Functioning as powerful edge computers, gathering and processing data in real time to support advanced processes such as predictive maintenance
- Powerful processing and networking capabilities which provide new levels of information to workers anywhere in the plant.

Chili adds that programmable logic controllers (PLCs) also continue to drive automation forward. PLC technology monitors the various inputs involved in the performance of machinery and enhances it to an optimised level that makes manufacturing processes fluid.

Technically, a PLC is a microprocessor-based controller that uses programmable memory to help store instructions and execute logical sequencing, timing, counting

and arithmetic processes – to control machines.

It contains a central processing unit (CPU), digital I/O, analogue I/O and communication modules, which can operate smoothly in an industrial environment – configured to control different process parameters using the software, written in accordance with the industrial processes.

Importantly, to match the demands of rough industrial environments, PLCs are designed to be extremely robust and sturdy, often capable of functioning under conditions such as unpredictable temperatures, humidity, vibration, and noise. PLCs are used in many diverse manufacturing operations – from the harsh environment of cement manufacturing for example, to the smart highly automated factory – and in virtual modelling of plant and systems.

Many PLCs today offer embedded IIoT protocols and the encryption to provide cloud connectivity and digital service. IIoT is revolutionising how companies across industries monitor their operations, ushering in continuing advances in automation and smart industry solutions. Technologies such as HMI, PLC, and SCADA remain core to these advances.

For more information visit: www.se.com

Updated MESA certificate training programme

The Manufacturing Enterprise Solutions Association, MESA International, has recently implemented a comprehensive update of its MES (manufacturing execution systems)/MOM (manufacturing operations management) Methodologies Certificate of Competency (CoC) training programme to reflect today's manufacturing practices. Although the programme has had continual improvements over the years, the latest update reflects a more comprehensive modernisation of the content. Changes include:

- The addition of a specific Smart Manufacturing/ Industry 4.0 course that includes a wide range of advanced technologies and explains how MES/MOM forms the foundation for leveraging these technologies successfully
- The foundational course about standards offers a more explicit focus on MES/MOM and is up to date with the latest versions of relevant standards
- A larger focus on 'manufacturing maturity' as a fact-based approach for creating roadmaps towards a future improved situation, outlining the assessment and analysis process, leading to a plan for improvement
- The addition of a course dedicated to Manufacturing Master Data Management as this knowledge is required to form an effective response to the increasing dynamics of the demand for Smart Manufacturing and Industry 4.0
- The addition of a MOM Solution Deployment course, which replaces the former Project Management course

- The inclusion of more pragmatic examples throughout all courses, including practical answers to the 'How to...' questions for which so many practitioners are working to find answers.

Khrist Kammer, MESA's Knowledge Committee Chair who provides oversight of the education programme, said: "This is a long-awaited update to our training materials. Manufacturing technology professionals will find the education very valuable." He thanked MESA's subject matter experts Jan Snoeij, Michel Devos and Gerard Ipskamp, as well as the peer reviewers involved, for bringing the updates together.

The MES/MOM Methodologies Certificate of Competency (CoC) is part of MESA International's independent global education programme developed for the worldwide manufacturing community. The certificate was created to educate and build knowledge and awareness of MES/MOM solutions, which are essential for advancing to Industry 4.0 and Smart Manufacturing.

A schedule for online training sessions is available from the MESA website.

MESA International is a global, not-for-profit community of manufacturers, producers, industry leaders and solution providers who are focused on improving operations management capabilities through the effective application of information technologies, IT-based solutions, and best practices.

For more information visit: www.mesa.org



MESA has updated its MES/MOM Methodologies training programme to reflect today's manufacturing practices.



Adrian van Wyk, Managing Director at Referro Systems, says the company supplies automation solutions to meet customers' needs no matter the size of the business.

Control technologies for the food and beverage industry

Industrial automation, electrical control and instrumentation supplier, Referro Systems, is taking its solutions and capabilities to smaller and medium-sized businesses in the food and beverage industry.

Adrian van Wyk, Managing Director at Referro Systems, says there is a notable gap in the implementation of automation and control in the food and beverage industry. "Small and medium-sized businesses are being left behind and are not benefitting from the capabilities and savings that control technologies enable."

He says, "There is a misconception at this level that the cost of control technologies is high. In the South African food and beverage sector, there are varying levels of implementation of control technologies and most is done in multinational companies. There is a gap in the smaller businesses, which are critical to our country and Africa as a continent."

Van Wyk cites various reasons for this and highlights the perceived cost and scale factors as the main concerns. "Other than the cost hurdle, there is also a view that control technologies are only available to bigger companies with the budgets and volumes that warrant the relative investment. This is incorrect. Referro, together with its suppliers, offers fully connected, integrated, modular, and scalable solutions to meet any business's requirements.

"There is clearly a lack of information and know-how on the capabilities and benefits of control technologies in smaller businesses," he adds. "We need to provide them with the right information and real insight."

Van Wyk outlines some of the control technologies and solutions that Referro Systems supplies. "For the food and beverage industry, we supply integrated, multi-discipline control systems such as Allen Bradley Micro800™, CompactLogix™ and ControlLogix®. For scalability, we supply fixed speed intelligent motor control solutions, on-machine solutions such as Allen-Bradley ArmorStart® distributed motor controllers, intelligent soft starters such as SMC Flex and SMC 50, and intelligent motor protection devices such as the E100/200/300."

For additional scalability and production flexibility, variable speed intelligent motor control solutions such as the PowerFlex® range of ac and dc variable speed drives offer unrivalled performance and reliability as needed for standard as well as higher performance applications.

Referro also provides intelligent sensing devices, intelligent safety devices for plant-wide solutions and on-machine applications. "We have various HMI solutions, from high-end stainless steel based products to standard operator interface devices where high IP ratings are important. For example, a customer may have high-temperature washdown areas or require an HMI that can withstand high heat. In addition, we can deliver plant-wide control, automation, and information solutions

to meet the customer's requirements," van Wyk adds.

All these solutions can be applied to a range of discrete and process industries beyond the food and beverage industry. Safety, motor control and motion control systems, plus HMI, SCADA, MIS or MES solutions can be specified to suit various applications.

The benefits of control technologies are seen in connected and integrated operational systems, with real-time control information from various platforms and devices installed throughout the manufacturing plant. "In addition, data from control technologies is secure and contextualised, enabling the business to make decisions proactively and in real time. Businesses will also benefit from improved productivity and, in turn, improved business performance.

"These benefits," says van Wyk, "are available to all food and beverage businesses, no matter the size. We can address customers' requirements accordingly."

He points out too that Referro supplies not only the conceptual solutions, but the products as well. "We help our customers through the decision making process, guiding them in finding the best control solution for their requirements, whether a large multinational or a small business supplying the local food sector or export market. We also provide a training and post-sales service, including support and spare parts as close to customers' operations as possible," he adds.

Closing the gap

"Our support for smaller businesses in the Northern Cape is an example of our commitment to our medium- and long-term goals. We invested substantially in the region because it is one of the most important food export regions for South Africa.

"However," van Wyk notes, "our customers outside the major metro areas presented a challenge in the time and costs entailed in travelling to provide them with the required level of service and support. So Referro has invested in resources and skills closer to those customers. We can now supply and support our existing customers, and new customers, in the outlying regions, and we aim to expand in the long term to cover more outlying regions in South Africa.

"It could be argued that the location of many small to medium-sized businesses is why many of our customers have not been exposed to the control technologies available, their benefits, and their various applications, and this has led to the gap we see in the market. Referro aims to close that gap by spreading awareness and offering control technologies and solutions that are scalable, modular, and applicable to the needs of any customer without excessive cost," he says.

For more information contact Referro Systems.

Tel: +27 (0)12 349 1297

Email: info@referro.co.za, visit: <https://referro.co.za>

Specialist electrical partner for mining and industry

Hamar Controls has worked with companies in mining and other industry sectors across Africa for over 40 years. As a leading supplier of world-class electrical, control and instrumentation product solutions and a Level 2 B-BBEE company, it supports its comprehensive product portfolio with end-to-end service. This extends from concept and in-house design and manufacture, to procurement, construction, supply, installation, commissioning and final handover.

Established in 1981 as a panel manufacturing specialist, Hamar Controls saw increasing customer demand for its quality products and expert workmanship and subsequently expanded its capabilities, adding electrical and instrumentation installation and construction to its portfolio in 2001.

Managing Director, Chris Joubert says, "Our panels are used on most mines in South Africa." He attributes the company's growth and success to several factors. "We have a highly skilled team of specialists who follow best practice and we use manufacturing materials and components of only the finest quality. We keep in step with the latest developments in this dynamic industry. When industry standards changed, we made sure that we achieved full compliance with SANS 61439 through our strategic technology partnerships with industry leaders – Siemens, Cubic and Logstrup.

"Furthermore, we populate our panels with leading switchgear brands from reputable companies like Schneider, Siemens, ABB, Rockwell, Mitsubishi, Hagar, Eaton and WEG, with whom we have longstanding relationships. Our motor control centres (MCCs) and distribution boards are supplied in accordance with customer requirements and conform to SANS 10142, SANS 60439 and SANS 1973 standards. Our proud membership of the Electrical Contractors' Association of South Africa (ECASA) assures customers that all our electrical installations meet the highest standards and that we deliver tried, tested and proven electrical solutions." Joubert adds that all in-house designs are certified by a professional engineer.

As well as distribution boards and MCCs, programmable logic controllers (PLCs), distributed control systems (DCSs), and various starter and control panels, lock-out stations and high-pressure pump panels also form part of the company's scope of supply. "Basically, we can supply any electrical equipment that goes into a box," says Joubert.

The company also offers purpose-built and fully customised mobile solutions for remote, pilot and semi-permanent plants and fast-track projects. These include containerised electrical substations or e-houses which can be skid mounted if required.

Hamar Controls services a range of mining sectors, including gold, platinum, diamond, coal and iron ore mines, as well as aluminium and iron ore smelters, and more broadly, clients in the food and beverage indus-



A containerised motor control centre built by Hamar Controls for a mine in Tanzania.

try, ports and harbours, wastewater management, water purification, cement, paper & pulp, petrochemicals, process plants and materials handling.

Regarding mobile electrical substations, Joubert says, "We build a complete substation in a shipping container, modified to meet each customer's individual requirements."

This mobile solution delivers substantial cost- and time-saving advantages for customers. Factory acceptance testing includes the joining of panels, electrical testing of the assembly in final form, software testing and some pre-commissioning. This is done at Hamar Controls' premises by electrical and software engineers, before the completed container is delivered to site. Once it is in position, only a small electrical team is required to complete the necessary cable work and connections which make the mobile electric substation ready for operation. In addition to eliminating expenses related to electrical contractors and engineers having to travel to site, downtime is substantially reduced, supporting overall productivity. This seamless plug-and-play solution also saves construction costs for customers as a brick and mortar structure to house the substation is not required.

Joubert adds that a containerised solution is particularly cost-effective for projects outside South Africa, solving the challenges presented by long distances and lack of infrastructure that commonly plague remote locations. "We are currently constructing four containerised units for customers in Mozambique and Lesotho. In addition to the savings already noted, the customer does not have to face the costs of flying engineers to site for the interfacing and testing of the units."

Based on its expertise and capabilities, Hamar Controls has secured projects as far afield as Malaysia and China where its teams have been on site to assist the respective customers with the installation and commissioning of its locally manufactured substations and with applications of turnkey electrical, control and instrumentation projects. The company also provides retrofitting and refurbishment services for its customers.

For more information contact Hamar Controls.

Tel: +27 (0)11 472 4267

Email: bennie@hamar.co.za, visit: www.hamar.co.za

Engineering electrical and C&I solutions offsite

Johan Basson, Managing Director of JB Switchgear, presents the case for offsite turnkey solutions as a time- and cost-saving alternative to the conventional approach – and a way of overcoming the arduous demands and delays of working on often remote sites.

Why is it that we persist with the construction of brick and mortar buildings for substations, transformer bays and motor control centres, in often hostile and remote locations? Conventional thinking is constrained by the idea that the only substitute for brick buildings are shipping containers. This is not the case. A combination of heavy engineering thinking and substation integration breaks the shackles of this entrenched approach and offers the possibility of turnkey solutions, engineered offsite, for large electrical plants – with the potential for substantial savings on costs and the scheduling of projects.

Having spent much of my career at the tail end of projects, trying to compensate and correct for delays caused by the sequential reliance on other disciplines and poor interfacing, I needed to change the traditional electrical and C&I execution strategy. The aim was to do as much work as possible offsite, but the main barrier to this was designing and developing mega mobile housings that would meet the criteria of all the specialised equipment installed in them – and the logistics of getting these buildings to site.

The answer for me came while I was driving, and stuck behind a 12-metre wide 50-ton Komatsu 960 iron ore bucket destined for the Sishen Mine just outside Kathu. It occurred to me then that if a load nearly five times wider than an ISO shipping container could find its way from the West Rand of Johannesburg to the Northern Cape, my logistical concerns were not as daunting as I had envisaged. And as it turned out, the same company that fabricated the bucket held the key to the mobile building problem and to unlock



JB Switchgear also supplies prefabricated modular substations, or E-houses, built to clients' specifications, a cost-effective alternative to conventional brick and mortar buildings.

significant positive spinoffs for the project in which I was involved.

The complexities of working on site

After completing a challenging mega iron ore project, the JB Switchgear team was given the blank canvas of a greenfield project to redefine the electrical and C&I execution strategy. With the learnings from the shortcomings of our previous project, we were determined to change the sequential reliance on other disciplines. Our primary objective was to reduce our exposure to site-based inefficiencies and poor productivity.

The Achilles heel was the brick and mortar building, as

this is typically the starting point for all site-based work. That traditional first concrete pour commits every other aspect of the electrical and C&I installation to a two- to three-year stretch on site. As I see it, there are a number of fundamental issues that complicate site-based work: site-based health and safety policies, site access, generally poor productivity, and the logistics associated with working on often remote sites.

In a world where health and safety has rightly become the number one priority on site, all other aspects of projects have



Core to the mega buildings are the custom-designed base frames, made to match the equipment to be installed.

to accommodate the related requirements, resulting in increases in construction time and cost. Large construction sites are by nature harsh and hazardous environments. The health and safety policies have to encompass all disciplines and all circumstances, which makes them extensive, cumbersome and complicated. The solution to overcoming the obstacles consequently presented would be to find a way of doing as much work as possible offsite, in purpose-built facilities, where there are substantially fewer hazards and health and safety is far easier to manage.

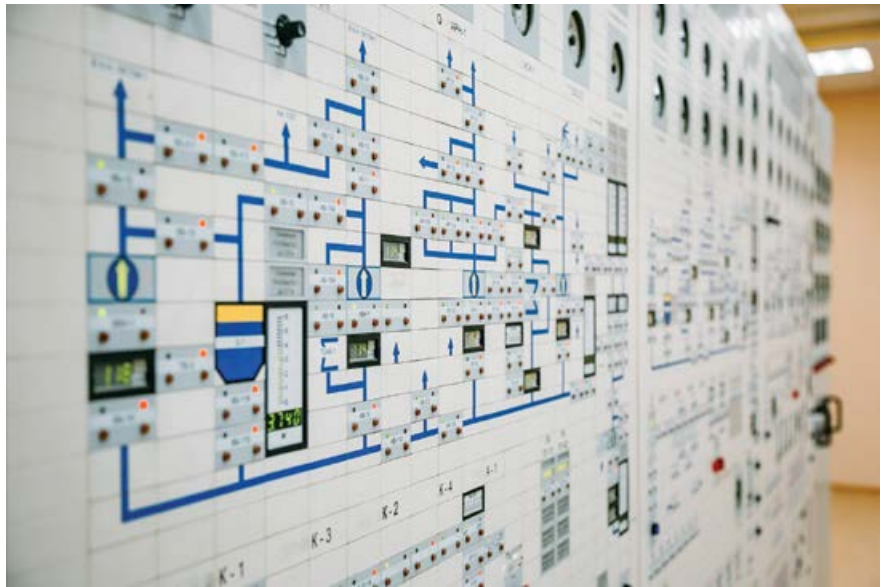
Both access to site and access to work are becoming bigger issues. The process of getting personnel and equipment onto sites is expensive and time-consuming. A number of companies are recommending that contractors should allow at least two months to obtain the relevant safety files, site personnel medicals, inductions and equipment certification before any work is carried out.

With so many different types of specialised equipment needed within substations and motor control centres (MCCs), a large number of equally specialised personnel are needed to install, test, integrate and commission the equipment. If the substations or MCC buildings are built on site, all the follow-on work needs to be carried out in the remote, harsh and difficult conditions that site-based work presents.

Another fundamental problem of site-based work is access to work. By its nature site-based work is sequential; there is no practical way of completing a particular task until all the items preceding that task are completed. This will often involve numerous other disciplines with delivery limits that are not always clearly defined or understood and interfacing that is difficult to manage. The classic example of this is the civils contractor having to build a substation or MCC building: in the scheme of what the civils contractor is usually responsible for, these buildings are often a low priority and there is no real understanding of the complexity of the equipment the buildings will house. Furthermore there is a widespread disregard for the specification of floor tolerances for medium voltage switchgear; in reality these are seldom met, making for difficult electrical installations.

An additional concern with site-based work is that because it is often in remote locations there is a significant cost associated with doing work in these environments. In order to install all electrical and C&I equipment in buildings on site, the equipment and the personnel responsible for installing it need to travel to site, access the site and the people need to stay near the site. This has a major impact in increasing 'Provisional and General' (P&G) costs as well as imposing numerous delays and complicated logistics for any project manager or engineer.

The reality is site-based work is expensive, unproductive and always takes longer than expected.



Electrical control & instrumentation solutions include a lot of specialised equipment.

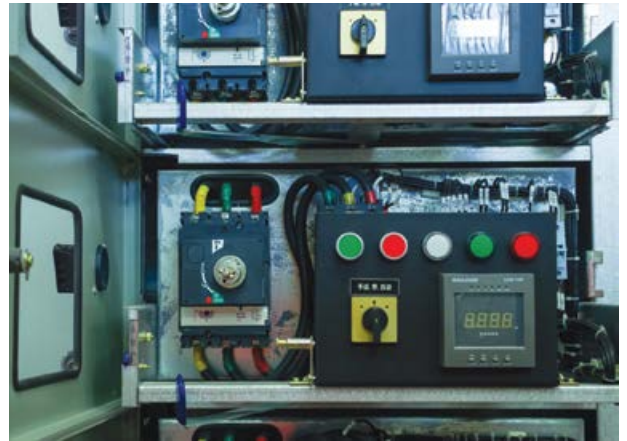
So why is it we persist with doing so much work on site? Why are we not building and commissioning electrical and C&I equipment for site in our main business centres, removing our exposure to site-based issues and risks? The answer to this is simply the size of the buildings that are often required to house electrical and C&I equipment. Convention would say we are constrained by standard transport loads, which is why we stay with brick and mortar buildings.

I acknowledge that we have been building simple mobile substations for many years. However, these are often for temporary solutions and have not considered what is possible if we adopt a comprehensively offsite approach. ISO shipping containers have their purpose and are not ideal for substations.

Complete offsite fabrication needs companies with facilities and skills to design and fabricate customised, mega mobile buildings that outperform traditional substations and MCCs at every level. Once fabricated the mobile building needs to be equipped, test integrated and have every possible piece of equipment commissioned in the same facility, in order that the building leaves for site 100% operational: 'from mouse to motor'. This approach makes it possible to have a substation with MV switchgear, a MCC and a C&I room fully operational within a week of arriving on site – and completely changes the extent of site-based commissioning. If this offsite approach is adopted, the saving to the project can be orders of magnitude greater than the total cost of the buildings themselves.

The offsite approach

The solution is in the unusual marriage between electrical and C&I requirements, and heavy engineering as offered by the same company that built the Komatsu 960 bucket I was stuck behind on that trip to Kathu in the Northern Cape. That company is Efficient Engineering in Johannesburg. It has been building massive equipment and buildings



Above and right: The installation of substations and MCCs, including testing, integration and commissioning, also calls for highly specialised skills.

for sites around the world for the past 40 years. Efficient Engineering is not constrained by what convention would say is a large load for transport. It is this 'nothing is too big to make or move' approach to building bespoke mega structures for land transportation that unlocks the electrical and C&I engineers' ability to control their aspects of the project. Importantly, this approach allows for a parallel construction path, removing most of the sequential reliance entailed in site-based execution.

The key is to have buildings that are custom-built around the equipment they will house, rather than trying to force equipment into a standard building container. Clearances should not be compromised and every combination of equipment requires a bespoke solution. If one is going to challenge convention, the alternative needs to be superior, as well as saving money and time for the project.

Core to these buildings are the custom-designed base frames, which are made to match the equipment that will be installed on them and to accommodate the deflection criteria

of MV switchgear and its tolerances for floor levelness. The buildings are designed for more than thirty years of service and have a track record to back this up. Specific attention is given to explosion venting, fire detection and suppression. Lux simulations are done for each room to ensure statutory lux levels are met or exceeded. Rooms are positively pressurised and HVAC systems are designed around the heat outputs of the equipment installed in the buildings.

The thermal performance of the buildings is designed to be superior to that of brick and mortar construction, with the possibility of passive buildings (no net heating or cooling requirements), depending on the primary equipment installed. Pre-fitted walkway hand rails and stairs are also part of the standard offering with the option of self-lifting buildings that remove the need for site cranes.

However, the most important benefit is that all electrical and C&I installation and commissioning can be carried out in main business centres rather than harsh site environments. □

For more information visit: <http://jbswitchgear.co.za/>

Cost savings and benefits

The following costs are based on the rounded numbers from a major mining project on which JB Switchgear was the Lead Electrical Engineer. The project's basic approved budget for the Electrical and C&I delivery was a little over R500 million, with a provision for R11 million for substations and MCC buildings (only 2% of the budget). By making use of large, customised, modular buildings built offsite and moved to site post the installation and commissioning of all the equipment internal to the buildings, the overspend on the 'traditional brick' building budget was a little over R3 million.

However, by removing the need for any of the electrical and C&I contractors to travel to site to install, integrate, test and commission the more than R100 million worth of equipment

designed for those buildings, there was a saving on the electrical and C&I budget of more than R80 million. This was mostly due to almost all the associated P&G costs being avoided, a reduction in commissioning time and no spend of the contingency budgets. Perhaps more significantly, the project was operational five months ahead of schedule. The early delivery alone realised more than 1.4 million tons of additional iron ore for the mine, and the early closure of the construction site. This had financial benefits for the company that exceeded a billion rand.

It seems clear that there are alternative, simpler and cost-effective solutions to working on site, which just require a logical mind shift.

More local focus with new motor assembly line

Supporting the drive for local industrial development and energy efficiency in industry, Zest WEG has established a new assembly line for its low voltage (LV) premium efficiency WEG IE3 electric motors. The new line forms part of the facilities at the company's corporate premises at Longlake, east of Johannesburg. It marks another advance from Zest WEG in its commitment to local economic impact and sustainability.

The company's CEO Eduardo Werninghaus, who recently took up the reins at Zest WEG, says the addition of the new line is an important contribution to local manufacturing capacity in South Africa. It improves the company's flexibility in its electric motor supply chain, and ensures prompt delivery times for customers. It is producing WEG W22 IE3 LV motors in various sizes, which provide high reliability in all applications.

"As a Level 1 B-BBEE company, our commitment to transformation includes continuous promotion of local manufacture," Werninghaus said. "And our focus on premium efficiency IE3 motors is also significant as it helps drive energy efficiency – a key sustainability goal for mines and other industries."

It is estimated that motors account for some 65% of industrial energy consumption worldwide – and because they use such a significant amount of energy, it is anticipated that legislation governing the use of more efficient motors – as is already in force in many parts of the world – will be introduced in South Africa within the next year or two. This will see the use of high efficiency motors become a requirement for all industrial sectors; it will also help to reduce the country's energy demand and support reduced GHG emissions.

Local investment for world class manufacturing

Sindi Mbhalati, Operations Executive at Zest WEG, says the new assembly line required considerable investment in equipment. This included jib cranes for easier materials handling, an air reticulation system to feed compressed air to the pneumatic tools on the line as well as to the spray booth and packaging equipment, enhancing the efficiency of the production processes, and a state-of-the-art test panel.

As with any world class manufacturing and assembly operation, record keeping is an important cornerstone. The panel is therefore synchronised with the advanced WEG manufacturing facilities in Brazil, for complete and accurate record tracking and evaluation. Each motor undergoes routine testing which includes winding resistance tests, accessories tests, insulation resistance tests and no-load tests.

Mbhalati adds that the panel tests winding resistance per phase with an unbalance test to compare the unbalances between the resistance results, while the accessories resistance test confirms that the accessories installed in the motor are in working order. The panel also tests for insulation resistance, which provides the team



A closer look at the new assembly line for LV IE3 motors: the first rotor being positioned.

with data on the health of the motor winding. A no-load test is conducted to determine the current that the motor draws at no-load and determines the unbalance of the current drawn between the phases.

"Also ensuring operational efficiency, the line is capacitated with advanced equipment including a heating and greasing facility as well as rotor assembly C-hooks," says Mbhalati. "In addition and importantly, the assembly line has been engineered to allow multiple shifts to be worked, should it become necessary to increase capacity and output. This type of futureproofing to accommodate market demands is in line with Zest WEG's commitment to its customers."

The facility has created several new jobs within the business. Most of the new employees are dedicated to the W22 motor assembly line, and some are shared with the company's various production lines.

"To ensure the highest quality standards in the assembly process, Zest WEG put its new staff through extensive technical and process training relevant to the new line," Mbhalati says. "This included in-depth product and component training, as well as the operation of the specialised test panel."

Among the components Zest WEG procures for assembly are rotors, stators and bearings. These are produced mainly at WEG's manufacturing facilities in Brazil, under stringent quality conditions. They are thoroughly tested before shipment to Zest WEG. Smaller components are sourced from local suppliers wherever possible, in line with the company's supply chain development policy.

"Governed by our ISO 9001 quality certification, the new assembly line is closely monitored by our dedicated quality department," says Mbhalati. "All motors are tested and quality inspected prior to dispatch to customers."

She highlights that Zest WEG's quality control personnel are rigorously trained to assess motors during the build process as well as in final quality inspection and testing. All aspects are aligned with WEG quality procedures, ensuring world class standards are maintained across all operating parameters.

For more information contact Zest WEG.

Visit: www.zestweg.com

Girth gears for Venetia scrubber upgrade

As part of De Beers' scrubber upgrade project at its Venetia Diamond Mine in Limpopo, drive technology specialist SEW-EURODRIVE is installing four girth gear systems for the mine's primary and secondary scrubbers. The installations are being conducted in-situ, and are timed flexibly to suit Venetia's limited shutdown windows. With the first girth gear successfully in place since last year, the next two are expected to be installed soon, according to SEW-EURODRIVE Project Engineer Bruce Farthing.

The Venetia mine, which has been in operation since 1992, is upgrading its two primary scrubbers and two secondary scrubbers, and the girth gear replacement is an integral element of the project. Farthing says the order was placed in 2020 and all four units were manufactured and delivered within six months. This short lead time was achieved despite the global disruptions caused by the Covid-19 pandemic.

He adds that the installations have been planned in close collaboration with the mine, "to make sure our teams are ready when the mine's shutdown periods allow for our work to proceed. The first girth gear was installed on one of Venetia's secondary scrubbers in September 2021, confirming the accuracy and duration of our installation procedure."

The expertise of the installation team was brought to the fore by the specific design of the scrubber. The bearing design in particular makes it impractical to bring the whole drum to ground before changing over the girth gear. Instead, the replacement has to be conducted with the drum in-situ, and it stands about three storeys high.

"In the first installation, we therefore assembled the girth gear on the ground, lifting it into position once the old components had been removed from the scrubber," Farthing says. "The challenge, of course, was to ensure



Smaller gearboxes from SEW-EURODRIVE's X series are coupled to the main gearbox.



The first girth gear was installed on one of Venetia's secondary scrubbers last year.

no damage to any of the new components, which we managed with careful planning and experienced execution using large overhead cranes."

The large girth gears measure 5.3 metres in diameter and weigh about six tons each. Given the scale of the equipment, the segmentation of the gear makes for easier transportation and handling. He explains that each girth gear is made up of 10 identical segments which can be easily assembled on site.

"The segments allow for relatively quick assembly with less lifting equipment required," says Farthing. "A further advantage is that individual segments can be kept in stock and used as replacements in the event of a breakdown – keeping the customer's downtime to a minimum."

The second and third installations – to be conducted on the two primary scrubbers – are scheduled for later this year. With the limited time available during a plant shutdown, the installation team adopts a 24-hour work cycle.

The contract includes the supply of SEW-EURODRIVE's large two-stage industrial gearboxes and the external pinions to drive the girth gear. The motors are coupled to the gearboxes using a fluid coupling on a purpose-built, drop-in baseplate. Smaller gearboxes from SEW-EURODRIVE's X series are also coupled to the main gearbox as auxiliary drives for commissioning and maintenance.

Farthing notes that the company's segmented girth gear systems have recently been a popular choice for South African customers, with six orders being received within about a year. Apart from the four supplied to De Beers Venetia Diamond Mine, SEW-EURODRIVE also recently supplied girth gear solutions for applications in a paper mill and a cement mill.

For more information contact SEW-EURODRIVE South Africa.

Visit: www.sew-eurodrive.co.za

Industrial gear units for lifting applications

Lifting applications place particular demands on the installation space for drives. With MAXXDRIVE® XD, NORD DRIVESYSTEMS has developed an industrial gear unit with increased centre distance that is ideally suited to the U-shaped configuration of drive, motor and cable drum.

With the new MAXXDRIVE® XD industrial gear units NORD DRIVESYSTEMS is closing a gap in its portfolio. "We can now offer our customers the complete package of running gear and lifting gear drives for cranes from a single source," said Jörg Niermann, Head of Marketing. As for all NORD gear units, the proven principle of robust one-piece UNICASE housing will be applied. During development, the MAXXDRIVE® XD's housing was specially designed for lifting applications and optimised for downward loads. The elongated arrangement of gear stages also enables mechanical tailor-made dimensioning of the gear unit with sufficient centre distance – thus avoiding the otherwise all too common over-dimensioning.

Standardising variants

NORD currently offers the new MAXXDRIVE® XD in five sizes with centre distances between 509 and 963 mm and in versions with three or four gear stages. Housing dimensions and centre distance are identical for the

three- and four-axle versions. This enables customers to standardise and reduce versions when constructing their cranes. With the three and four stage versions, MAXXDRIVE® XD covers a wide speed range with a maximum nominal gear ratio of $i=355$. The constant torque across the whole speed ratio guarantees high efficiency in use. "We are pleased to offer complete drive solutions that are economical and tailor-made and in line with NORD's quality standards," said Niermann.

Serial components for quick delivery

For the MAXXDRIVE® XD's components, NORD is using tried and tested standard parts from its proven range of industrial gear units. This offers customers a wide range of options and guarantees short delivery time. Additionally, housing is available with an inspection cover, enabling a visual check of internal components without having to remove the gear unit. The units are available in grey cast iron (GJL) or nodular cast iron (GJS).

For more information contact NORD DRIVESYSTEMS. Visit: www.nord.com



The MAXXDRIVE® XD's housing was designed specifically for lifting applications and optimised for downward loads.



JB SWITCHGEAR SOLUTIONS (PTY) LIMITED

Switched on to excellence




Tel: +27 (0) 11 027 5804
 Email: info@jbswitchgear.co.za
 4b Molecule Rd,
 Vulcania Ext 2,
 1541, Brakpan,
 Gauteng
www.jbswitchgear.co.za



Leading manufacturer of a comprehensive range of electrical switchgear systems

Bearings can boost motors' energy efficiency

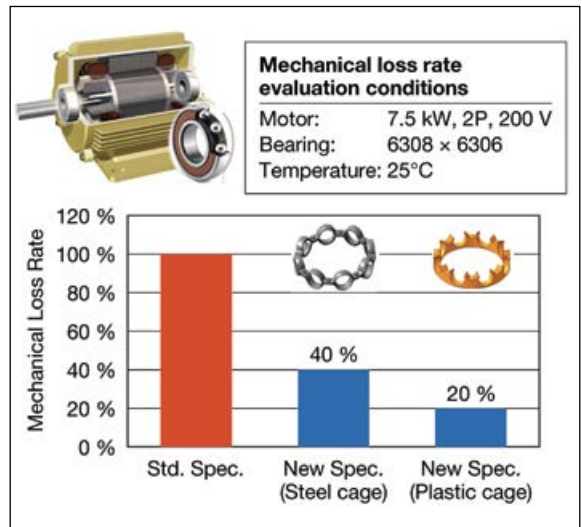
The power used by motors in machinery accounts for a high share of global electricity consumption (up to 50% by some estimates), which makes these industry-essential devices a key focus for energy reduction. The market is seeing a growing number of industrial motors offering improved energy efficiency. The latest inverter motors are also contributing to lower power consumption as they adjust their rotational speed according to operating conditions. In addition, demand is ramping up for new-generation servo motors, which are typically used in industrial robots (among other applications) as they can rotate forwards and backwards for accurate positioning. These three types of motors – high-efficiency, inverter and servo motors – all rely on one common component that can help maximise performance and minimise energy consumption: bearings.

Worldwide endeavours to reduce power consumption have led, in many countries, to regulations requiring motor efficiency improvements. A motor's energy loss comprises three factors which can be described as: iron loss (heat generation from the iron core); copper loss (heat generation from the winding); and mechanical loss (due to bearing rotation, for instance). Although mechanical loss can be as small as 1% of a motor's power consumption, this means it accounts for 0.4 to 0.5% of global electricity use and the impact of any reduction in that loss would be significant.

Low-torque bearings for high-efficiency motors

NSK has been evaluating mechanical loss from bearings using high-efficiency motors in real-life operating conditions. By developing a test method that allows for the direct evaluation of mechanical loss, it sought to identify the potential for reduced power consumption. The results from these tests have been used to inform NSK's bearing development programme for high-efficiency motors. For instance, the evaluation of a two-pole high-efficiency motor running at 3 000 rpm revealed that the cause of around 80% of mechanical loss was lubrication resistance: the shearing and agitation resistance of grease between the bearing parts. NSK consequently initiated a project to optimise the type and amount of grease, as well as the bearing's cage shape.

Subsequent tests showed that optimising the grease quantity reduced mechanical loss by 60% in comparison with conventional bearings. Reducing the grease content in conventional bearings tends to break the oil film and shorten grease seizure life. In contrast, the low-torque bearing developed by NSK uses special grease that, in tests, demonstrated an increase in grease seizure life by more than 2.7 times. Further tests showed



The graph shows the mechanical loss rate of different cage materials tested on NSK's low-torque ball bearings for high-efficiency motors.

that NSK's specially developed plastic cage reduced mechanical loss by half that of steel cages, largely because the plastic cage suppresses grease agitation resistance between the cage and balls.

NSK's low-torque bearings, which reduce mechanical loss and allow for longer grease seizure life in high-efficiency motors, are available in sizes from 16 to 170 mm outer diameter.

Ceramic-coated bearings

Inverter motors, controllable with optimal rotational frequency, are useful for delivering energy savings in pumps and blowers. The general development trend is that the frequency requiring control (the carrier frequency) is increasing so the motor can operate with a higher degree of accuracy. However, as the carrier frequency increases, electrolytic corrosion may occur due to high-frequency current in the bearing.

NSK has therefore developed ceramic-coated bearings to counteract the phenomenon of electrolytic corrosion. These have tested well and are available in sizes ranging from 130 to 230 mm outer diameter for medium and large inverter motors.

Low particle emission bearings

For servo motors, which feature precise positioning capability, NSK has developed a bearing that uses a low particle emission grease with optimised composition to ensure the motor's positioning functionality is not compromised. The low particle emission bearings are available in sizes from 26 to 120 mm outer diameter to suit all common servo motors.

For more information contact NSK South Africa.

Tel: +27 (0)11 458 3600

Email: nsk-sa@nsk.com, visit: www.nskeurope.com

NSK's ceramic-coated, electrolytic-corrosion-resistant bearings for inverter motors.



Celebrating 65 years and growing into Africa

Leading supplier of bearings and power transmission products, Bearings International (BI), has grown its countrywide distribution network by four branches this year and is looking to add a new complementary business unit to the existing four. This comes as BI celebrates its 65th anniversary in 2022.

Managing Director Bart Schoevaerts, says, "Growth into Africa has been good and sustained due to demand, even during the pandemic. In our approach to the market, we do not want to grow too quickly; we want to build sustainable growth, giving us a solid foundation. I believe we will continue to go from strength to strength."

Having been at the helm of the business for two and a half years, Schoevaerts came on board during the difficult Covid-19 period. BI, designated an essential services provider, was able to operate through the lockdowns and continued with its restructuring process. "It was the ideal time to drive change in the business," says Schoevaerts. "Although we had grown significantly up to that point, the existing structure was insufficient to support ongoing growth."

"We had transformed from being a bearings company to supplying ancillary products – from motors to fasteners," he adds. "We stepped back to refocus and segmented the business into four distinct business units, each with its own operational structure. This, in turn, allowed us to look much more closely at our customer service and support."

He highlights that today the market has evolved away from the traditional concept of technical support to one where customers are much savvier in terms of trends and latest developments. "They are now enquiring if specific products and technologies are available and how quickly they can access them. This has meant we have had to adapt on the retail side of the business as well," says Schoevaerts.

The renewed focus on customer service and support also means ensuring sufficient stock of all the latest products at branch level. "That was a mindset change we drove throughout the organisation and one that has definitely resulted in significant growth," Schoevaerts notes. Turnover has grown since he became MD and is expected to increase by more than 50% this year.

"We achieved significant growth in difficult circumstances and against a backdrop of global supply chain disruption, caused by the pandemic and then the conflict in Ukraine," says Schoevaerts. "All our products are imported, and we had to contend with issues such as ports being closed in China and no vessel or container availability."

Another factor has been price volatility. "Customers have been used to stable, incremental increases on a yearly basis, but are now having to review their cost bases at quarterly intervals to mitigate the impact of escalating prices," he adds. A side-effect of this volatility has been a lot of smaller players falling by the wayside,

and it has levelled the playing field for the whole industry.

In the light of all these changes, and especially the acceleration into digitalisation and remote management and maintenance of plant and equipment, Schoevaerts says the traditional sales approach of physically visiting customers on a regular basis to introduce them to new technology or products and to gauge their specific requirements has given way to a new business model.

"As we migrate to remote marketing we expect 60% to 70% of our direct business-to-consumer and business-to-business sales will be online."

This has largely been driven by BI's development of its own online portal, although that project took longer than anticipated due to the steep learning curve it presented – and in order to accommodate the complexity in choice and specification across the company's portfolio of industrial products.

Schoevaerts says the online portal is another way for customers to engage with BI, "over and above contacting our sales representatives or visiting the nearest branch. Going forward the company plans to add more technical content to the online platform to provide added value to its customers."

He also highlights that for BI, being part of the larger Hudaco Group is a definite advantage in Africa, due to economies of scale. "Major customers such as in the mining industry and breweries see us as a trusted partner as we grow into Africa. Being part of a larger group we offer customers security of supply and the financial stability of the overall business," Schoevaerts says.

For more information contact BI.

Tel: +27 (0)11 899 0000

Email: info@bearings.co.za

Visit: www.bearings.co.za

BI is a leading distributor of power transmission products, including IE1, IE3 and higher efficiency motors and variable speed drives.



Bart Schoevaerts, MD, Bearings International.

Fine tuning temperature sensors to handle new plastic packaging

Marine plastic waste is a global problem. About half of the plastics that enter the oceans are packaging materials such as containers and wrapping. To reduce the environmental impact, manufacturers around the world are looking for ways to switch from plastic packaging to eco-friendly alternatives. One of the challenges is that new materials require finer temperature control in the process of heat-sealing packages. With a view to resolving the bigger issue of marine plastic waste, a team at OMRON set about developing a temperature controller that would overcome the packaging defects arising with the use of eco-friendly materials.

Plastic bottles and containers washed up on the beach, plastic bags drifting in the ocean... The burden of marine plastic waste has become a serious problem worldwide. It is reported that over eight million tons of plastic waste enter the oceans every year. If no action is taken, some sources estimate that by 2025, the cumulative amount of plastics dumped in the oceans will be about one billion tons, outweighing all the fish in the sea. Plastic waste in the oceans has a multitude of harmful effects on the marine environment, the marine ecosystem and marine organisms. It pollutes the seas and in turn becomes a threat to human life and the planet as a whole.

Efforts are under way to reduce the use of plastics. In the industrial sector, many companies are switching from plastic to paper materials, or to thinner plastics, or biodegradable plastics (that is, plastics that dissolve in the natural environment) for containers and packaging.

However, the thermal reactivity of new packaging materials differs from that of conventional plastics. Usually, when plastic is used to package products, heat is applied to seal the packages. Attempts to switch conventional packaging machines to using eco-friendly materials have presented a number of problems, which have deterred some companies from making the change. Paper packaging materials

present a problem in that they do not conduct heat well, and thin-walled plastics and biodegradable plastics have such low thermal tolerance that they do not glue well, shrink with heat causing wrinkling, or get scorched or melt. This results in an unacceptable level of defective packages.

This impasse came to the attention of Miho Nishide, who was developing temperature controllers with the product planning team of OMRON's Components Division, Product Business Division HQ. OMRON has a history of more than 50 years of developing and manufacturing temperature controllers for a wide range of industries and is among the largest players in the global market. With a sincere wish to address the social and environmental issues caused by marine plastic waste, she embarked on the development of a new family of temperature controllers, leveraging OMRON's technology to expedite the introduction of eco-friendly packaging materials.

A temperature controller to eliminate packaging defects

With common automatic packaging machines, once a package is filled with product it is sealed at the mouth by metal bars heated to a high temperature (sealing bars). It is important to keep the correct temperature on the surfaces of sealing bars. If the temperature is even marginally lower or higher, it will cause packaging defects. "Our goal was to reduce the temperature fluctuation on the sealing surfaces during the packaging process to one-tenth of that on conventional machines," Nishide recalls. She soon realised that this was an unexpectedly daunting challenge, even with OMRON's long history of experience in leading temperature control technology.

How can a packaging defect occur when the temperature is set correctly? At first, members of the team did not fully understand the mechanism of the controller. Questions arose: "Can we really solve this with OMRON's technology? Given the variety of materials, thickness, and the number of layers, there would be tens of thousands of types of packaging materials, and it's simply impossible to accommodate all of them."

The team became uneasy but everyone chose to keep going. The impetus came from the overriding goal. "We



Marine plastic waste is a worldwide problem threatening marine life and ecosystems.

didn't start this project because we wanted to enhance the performance or specs of temperature controllers. Rather, we had an overriding goal to help solve the issues caused by marine plastic waste as a way to contribute to the global community. We knew no one else could offer solutions to this global issue in this particular way, and that helped us to overcome the many ups and downs we encountered," says Nishide.

"As we continued our work, we gained a circle of supporters from other departments. In addition, customers who had purchased temperature controllers for packaging machines from us were generous enough to educate us on the mechanisms of the packaging machines and tell us under what conditions sealing defects occurred at their line. There were as many as 82 of those helpful customers."

Members of the development team read academic papers and other reference literature. To extend their understanding of packaging machines, they installed a flow wrapper machine in the development area to create a complete packaging line. To build their technological knowledge, they conducted sealing experiments using different packaging materials time and again.

High precision temperature control

Finally, the team pinned down the cause of recurring sealing defects. When sealing bars hold packaging materials, heat on the sealing surfaces is lost, lowering the temperature. To solve this problem, it was necessary to measure the temperature on the surfaces of the sealing bars accurately and consistently. Yet, it was not easy to sense fast-moving bars and simultaneously monitor their temperature in real time, particularly with conventional temperature sensors for packaging machines being positioned away from the sealing surfaces due to their heat resistance and other properties.

Going back to the drawing board Nishide and the team members took a fresh look at the sensor's materials and structure. They increased the sensor's heat resistance as well as its responsiveness so it could follow the fast-moving sealing bars, successfully measuring the temperature on the sealing surfaces.

But accurately measuring temperature alone was not enough. The controller needed to control the temperature, which fluctuates rapidly, to keep it constant. So they improved the temperature control algorithm and introduced AI technology, making it possible to control the temperature precisely by having parameters automatically adjusted in response to temperature fluctuations.

This resulted in a technology for real-time temperature sensing on the fast-moving sealing surfaces and another for automatic parameter adjustments to control temperature precisely. By honing these two technologies, the team created an innovative application that reduces temperature change on the sealing bars' surfaces to one-tenth of the conventional fluctuations, irrespective of the type of packaging materials in use. OMRON launched AI-embedded temperature controllers that feature this application, which is now known as the Perfect Sealing Solution.



Examples of scorched plastic packaging and defective sealing.

The Perfect Sealing Solution

OMRON's Perfect Sealing Solution was welcomed by customers. "A globally leading company that had never used OMRON products before decided to use the solution and reported that it was able to reduce temperature fluctuation during the sealing process to 0.7°C, when previously it was over 8°C at the highest," says Nishide.

OMRON subsequently assembled a portable, small-scale but high-performance packaging machine as a demonstration machine. This has been presented to prospective customers to show them how it works and let them know about the value it can offer them. If the number of packaging machines equivalent to the total unit sales of OMRON's temperature controllers with the Perfect Sealing Solution were switched from conventional plastic packaging materials to eco-friendly plastics, this would constitute a reduction of some one million tons of plastic waste.

OMRON is now looking to increase the variety of packaging materials that its temperature controllers can handle, beyond flow wrapping. It also plans to roll out this technology to plastic bottles, stick packages, and other packages where the production process differs from that used for bag packaging.

"Temperature controllers and the marine plastic waste problem: at a glance, it may seem they have nothing to do with each other, but if we think carefully, there are many social issues that we can address by using appropriate technologies," Nishide concludes. □



Omron's high precision temperature controller for new plastic packaging lines.

For more information, visit: www.industrial.omron.co.za

Maximising safety in working with cobots

Human-centred manufacturing places high priority on safety in manufacturing facilities where people work closely with machines. Where cobots are used, they are designed to work side by side with people, unlike the typical industrial robots that are physically separated from human operators. This proximity leads to a significantly higher requirement for safety. Research institution IDTechEx, based in Cambridge in the UK, looks at the use of sensors to ensure safety in these operations.

Torque sensors can be used for collision detection and force control. Generally, human operators set the range of torque sensors in advance. When a collision occurs, the force/torque detected by the sensors will exceed the pre-set range, triggering the emergency stop function. The robustness and relatively low cost of torque sensors makes them the sensors most widely used with collaborative robots. However, torque sensors only detect the torque change once a collision has happened, which means they cannot make predictions and detect an upcoming collision beforehand.

Proximity sensors and visual sensors can provide a solution to this as they can detect and monitor the distance between human operators and machines. Proximity sensors are usually capacitive sensors. The capacitance of the air gap between sensors and people will change when the human operators are in proximity to the cobotic arm. However, proximity sensors are relatively expensive, and quite a number of proximity sensors are needed to enable the cobot to detect human operators from every direction. This leads to higher costs and limits affordability.

Aside from proximity sensors, vision systems also play an important role in detecting people. However, as with capacitive proximity sensors, precisely detecting the distance between the sensors and the object is difficult

because the measurement value varies depending on the object's characteristics.

Another drawback of proximity sensors is that the maximum distance detected by the sensors is limited, typically to about several hundred millimetres. To mitigate this issue, distance sensors can be used to help improve the safety and functionality of human-robot interaction (HRI). A time-of-flight (ToF) sensor is one of the distance sensors that can be used, either on the robotic skin as a measurement for collision avoidance, or as end-of-arm tooling (EoAT). To detect distance, ToF sensors use photodiodes (single sensor elements or arrays) and active illumination. The reflected light waves from the obstruction are compared to the transmitted light waves, thus determining the distance. This information is then used to construct a 3D model of the object.

In simple terms, the ToF sensors detect the distance to an object by measuring the time to receive light reflected from the object when it is irradiated with an infrared ray. The average error of distance measuring for ToF sensors is relatively small (less than 10%). However, despite its great promise in detecting distance, so far, research done by IDTechEx has not seen any commercialised ToF sensors being used for proximity sensing. There may be several reasons for this.

- *ToF sensors are susceptible to ambient light conditions* – since ToF sensors essentially use light to function, they can be affected by the ambient light conditions
- *Scattered light* – in the event that the surfaces around the ToF sensors are very bright, they can scatter light waves and this results in unwanted reflections, which will affect the accuracy to the ToF sensors' measurement
- *Multiple reflections* – when the ToF sensors are on corners or concave shapes, there might be unwanted reflections because the lights could be reflected multiple times, which distorts measurements.

IDTechEx has noted that torque sensors are still the most commonly used sensors on commercial cobots and the only sensor system used for collision detection. However, with the increasing complexity of tasks and safety requirements, some companies have begun to integrate different sensors and apply sensor fusion. Sensor fusion entails a



Cobots are designed to work side by side with people which raises requirements for safety.

process of combining sensor data or data derived from disparate sources such that the resulting information provides greater certainty than would be possible when these sources were used individually. By integrating the signals with sensor fusion, the resulting model is more accurate because it balances the strengths of the different sensors. Sensor fusion enables tight coupling between multiple sensors and their associated algorithms.

In summary, for cobots positioned to work closely with human operators, the sensors and algorithms noted here ensure a relatively safe human-robot interface. Many end users have not adopted some of the more expensive sensors, such as proximity sensors, because of their high costs and relatively limited uses in practice. However, IDTechEx's recent research for the report titled *Collaborative Robots (Cobots) 2023-2043: Technologies, Players & Markets*, indicates that with the increasing multi-tasking ability of cobots and growing safety requirements, more sensors will likely be integrated into cobot systems. □



Cobots are being used increasingly in automating production lines.

For more information visit: www.IDTechEx.com

SENSORS + SWITCHES : PRODUCTS + SERVICES

Condition monitoring vibration and temperature sensor

In exhaust systems, pumps, compressors and many other applications, motors of various sizes are used in production plants and warehouses, quite often in remote locations. Maintaining machines on remote sites can be time-consuming and vulnerable to errors, especially if maintenance personnel perform on-site inspections only on an infrequent basis.

As an alternative solution, data from multiple motors can be collected, evaluated, centrally displayed and, if necessary, linked to alarm actions in order to warn of irregular operation and impending failures in good time. Turck Banner's QM30VT1 vibration and temperature sensor with the high-performance TX700 HMI device can be connected using radio technology to serve this purpose.

Has the motor become loose, causing the shaft to be misaligned? Is a bearing jammed, or is an attachment out of balance? Mechanical vibration can indicate issues such as these. The QM30VT1 vibration and temperature sensor detects vibrations with a high level of accuracy. The compact MEMS- (micro-electro-mechanical system) based sensor is simply mounted directly on the motor block with a magnetic holder. From there, it delivers speed and acceleration data over two dimensions in different frequency ranges. Changes in the measurement data can be used to identify different types of possible damage.

Measuring the temperature of motors is also important, as a significant increase in temperature can be an indication of wear or insufficient lubrication on bearings. The IP67 sensor detects such temperature changes within a measuring range from -40°C to +105°C. With the vibration and temperature sensor wired to the battery-powered DX80 radio module, the measured values are sent to the receiver module of the DX80 system via a

proprietary wireless network, making it easy for maintenance personnel to transfer the data from the QM30VT1 sensor.

The customised data visualisation of the motor's status is then clearly displayed on Turck Banner's HMI/PLC TX700 so maintenance personnel can monitor the condition of the motor. Using TX VisuPro software, the values from the motor can be displayed in different ways. In addition, users can track historical trends, extract logged data or configure alarms such as automatic email notifications. Ethernet connection to the company network is also possible, allowing for data to be queried throughout the company.

With this standalone solution, maintenance teams can always view the status data of all machines – whether on site at the HMI or on any computer in the company network – and this insight allows for preventive maintenance to be performed.

For customers, the sensors and connections can be retrofitted easily without intervention in the control system. They ensure reliable motor operation through monitoring, individual motor data visualisation and automatic alarms. And technicians can be assigned to undertake specific predictive maintenance tasks.

For more information contact Turck Banner.

Tel: +27 (0)11 453 2468

Email: sales@turckbanner.co.za

Visit: www.turckbanner.co.za



The QM30VT1 vibration and temperature sensor can be used to monitor multiple motors.

Temperature monitoring in pharmaceutical labs

Pharmaceuticals manufacturers around the world are subject to strict regulations to ensure all medicines are produced to the highest quality. Monitoring the conditions in a manufacturing facility 24/7 typically requires high-end, often costly networking technology. However, Ian Loudon, International Sales and Marketing Manager at remote monitoring instrumentation manufacturer Omniflex, points out that temperature monitoring systems that are reliable and compliant with regulatory standards can also be cost-effective.

Because of the costs associated with the installation of devices for electronic record keeping – temperature sensors, for example, to monitor laboratory conditions – many companies have previously opted for manual auditing, keeping paper records, rather than overhauling a laboratory's electrical infrastructure.

However, the USA's FDA's (Federal Drug Administration's) standard operating procedures for Good Laboratory Practice (GLP) now dictate that 24/7 data logging of lab conditions, including temperatures, is necessary to ensure compliance. Some study grants even require that records be kept in a 21 CFR Part 11 compliant system, which means access to electronic records is limited to authorised individuals, reducing the risk of data manipulation.

A single temperature sensor can gather data from only one point in a room, fridge or freezer, so, for a clearer representation of the temperature conditions in a laboratory, usually multiple sensors need to be installed throughout the facility. In some cases, technicians may still choose to monitor temperature readings manually, using a clipboard and spreadsheet. However, manual methods rely on staff being constantly on site and can place unnecessary pressure on them. Furthermore, manual record keeping will only reflect conditions at the time of reading.



To monitor temperatures 24/7, multiple plug-in sensors can be placed throughout a facility and feed data back via a controller to a central monitoring station.

Staff cannot immediately identify problems that arise between recording intervals.

As a cost-effective and easy-to-configure and install alternative, manufacturers can place plug-in sensors around a laboratory, in dry storage, fridges and freezers, to enable continuous data recording. Using a cloud-based network, one DIN rail mounted controller can support up to 80 sensors and feed the data back to a temperature monitoring station.

The Teleterm mLC8 mounted controller networked to Omniflex's microLAN system offers this kind of setup. Each mLC8 device has eight microLAN ports, each of which can share a two-wire cable to support ten sensors. Minimal wiring makes installation easy to fit into existing infrastructure.

Loudon says this technology is more cost-effective and efficient than manual equipment monitoring. And, to be fully compliant to FDA 21 CFR Part 11, Omniflex's Data2Desktop system provides for 24/7 monitoring and recording with protected access, on site or remotely.

For more information visit: www.omniflex.com

Measurement technology certified to ISO 19443 nuclear standard

Measurement technology manufacturer WIKA has been certified by TÜV SÜD in accordance with the new ISO 19443:2018 quality management standard for civil nuclear projects.

This makes WIKA, thus far, the first company in



The quality management team at WIKA's head office in Germany.

Germany, and only the fourth worldwide, to achieve this status. It passed the ISO 19443 audit at the first attempt.

Until recently, WIKA has been certified to KTA 1401. However, this standard was designed primarily for the German market. With its processes certified in accordance with ISO 19443, WIKA is now focusing on global project business in the civil nuclear power generation sector. The certification will reduce and simplify customer audits for qualification as a supplier.

For the measurement requirements of the civil nuclear power generation industry, WIKA offers products and customer-specific solutions for the measurement of pressure, temperature and level.

For more information contact WIKA Instruments.

Tel: +27 (0)11 621 0000

Email: sales.za@wika.com, visit: www.wika.co.za

Powerful IO-Link masters and matching L-coded cables

IO-Link is an ideal system for connecting intelligent sensors to higher level fieldbuses. In order to make it suitable for use in the food industry, components with a high protection rating are required. With new IO-Link master modules and L-coded cables, ifm offers a suitable solution for this purpose.

For many applications in the food industry, daily cleaning of the installations with a high-pressure jet is the norm. The components used in this process must meet hygienic requirements, with regard to the materials in which they are made, for example, and they must have a high protection rating. The new IO-Link masters in ifm's PerformanceLine series are specially designed for such applications. They meet IP65, IP67 and IP69K protection ratings, the M12 sockets are made of stainless steel and the seals are made of EPDM.

The new IO-Link masters have either four or eight ports and are available in two versions – for either PROFINET or EtherNet/IP communications protocols. Since the ports can supply actuators with up to 2 A, actuators with high power requirements, such as valve terminals, can also be connected. A current limitation can be set separately for each port, and current and voltage measurement enables easy monitoring. If several masters are used in one application, the power supply can be cascaded

via L-coded M12 cables with a daisy chain. This saves material, time and costs during installation. The parameters of the IO-Link masters and all connected sensors can be conveniently set via the moneo|configure SA software.

Matching L-coded cables

Connecting sensors to IO-Link masters in the food industry requires suitable cables which also meet the strict hygiene and related requirements. For this purpose, ifm offers a comprehensive range of cables with connectors that are L-coded according to IEC 61076. The proven ecolink technology ensures a reliable and tight connection through secure mounting, even without tools. The integrated mechanical end stop protects the O-ring from being destroyed by overtightening the nut and the asymmetrically acting vibration protection keeps the nut firmly in position. The L-coding and the cable cross-section of 2.5 mm² enable transmission of currents up to 16 A. The connection cables are available with straight and angled connectors and in lengths from 0.25 m up to 50 m.

For more information contact ifm South Africa.

Tel: +27 (0)12 450 0400

Email: info.za@ifm.com, visit: www.ifm.com



The new IO-Link masters and L-coded cables from ifm meet the hygiene and protection ratings required in the food industry.

Extended portfolio of microwave consistency sensors

ABB has updated its KPM KC7 Microwave Consistency Transmitter portfolio with a larger flow-through sensor to fit process pipes with a diameter of up to 16". This gives more customers the option to measure the total consistency of mixed pulps with a flow-through sensor. The company has also launched a redesigned insertion type model with an improved dual-plate sensor.

Both the device options will be used in the stock preparation area of paper mills (and similar applications), which feeds the wet end of the paper machine. The enlarged flow-through model, increased from a previous maximum of 12", expands ABB's market reach to customers with wider diameter pipes that previously could only use insertion type sensors, but can now consider both. The larger size, capturing the whole pipe diameter, means the KPM KC7 sensor offers the most representative process pipe consistency measurement on the market, and it provides precise, reliable measurement of total consistency irrespective of flow rate, for optimum process control.

For mills opting for the insertion type model, the improved dual-plate design is the only one on the market with an optional temperature sensor that can be retracted for abrasive and unscreened processes, a feature also available with the flow-through model. The parallel antennas avoid microwave reflections in the pipe and generate a self-cleaning effect, removing the risk of ob-

structions and thus increasing uptime and reducing maintenance costs.

Microwave measurement is becoming more popular due to its low calibration requirements, high accuracy, and ability to measure total consistency independent of process variables and fibre properties. Unlike optical and shear force technologies, KPM KC7 is unaffected by process changes, such as flow speed, pressure and turbulence, or by variations in pulp species, fibre length and freeness.

Karin Hermansson, Product Line Manager at ABB, said: "ABB verifies each sensor individually before implementation to ensure high accuracy. With this update to fit larger pipes, reduce obstructions and ensure smooth temperature readings for even the most difficult processes, we can meet more diverse requirements in the complex world of papermaking."

ABB's KPM KC7 expanded sensor portfolio is now equipped with an added pressure sensor – available as a spare part – to further improve diagnostics. With no moving parts or preventive maintenance requirements, the updated sensors, which are compatible with third-party couplings for simple upgrades and replacements, make for easy operation and maintenance to deliver a lower total cost of ownership.

For more information visit: go.abb/processautomation



The KPM KC7 microwave sensor offers the most representative process pipe consistency measurement on the market.

Inspecting solar panels to maintain optimum performance

In South Africa, solar energy is being used increasingly in commercial and industrial applications by organisations looking to supplement grid supply from the national electricity utility, to transition to cleaner energy and, particularly in industry, to reduce carbon emissions and potential carbon tax liabilities. Obviously, contracted suppliers and the users of solar energy installations look for optimum performance from the system.

Gerrit Barnard – Comtest Fluke Product Manager advises that, to support this objective, solar panels should be inspected regularly and defective panels repaired or replaced as necessary. Here Barnard points to some of the problems maintenance teams should look out for.

Solar panels are made up of cells joined together in series, and their combined energy is relayed to a control box. Of course, when connected in series, the panel is only as good as the weakest cell. If one of the cells fails, it affects the overall performance of the whole panel. The case of a rooftop installation on the Old Mutual building in central Johannesburg illustrates this vulnerability and other indicators of below par performance.



In this rooftop panel installation on the Old Mutual building in central Johannesburg, an initial inspection shows where the hotspots are. Using a Fluke TiS60+ thermal imager, the technician identifies and pinpoints a number of faulty panels. The ideal thermal imager presents a high resolution image (minimum 320 x 240) and must have good thermal sensitivity in order to detect and highlight sometimes small differences in the cells.



The image below left, shows how one block is heating up relative to the rest of the cells. This indicates a faulty panel and that one of the cells, which are connected in series, has failed, reducing the performance of the panel. This panel needs to be replaced.



This image clearly shows that it is the corner cell in this panel that has failed.



It can happen that two or more cells at different points in the panel fail. A thermal imager is particularly useful to identify and pinpoint those faulty cells in a solar panel quickly. Keeping in mind that all the strings are connected in series, if this one has two cells that are faulty, overall performance is lost on the panel. The screen of the thermal imager shows that one cell is running at 53°C relative to the high marker – the centre point is the general temperature of the panel – here, at 29°C, it shows a significant (23°C) difference in temperature. This panel has performance problems and is not delivering the full output expected.

In this view of another panel (opposite page, above), hotspots show up in different places. The image clearly demonstrates the advantages of a thermal imager. Looking at the panels with the naked eye, one would not pick up any



anomalies, but, with a good imager (suitable to required specifications), the various problems with different panels, sometimes involving multiple faults, can be clearly seen.

Other points of consideration

Installation

Close attention should be given to the installation of panels. If, as illustrated in the overall view of this installation, the panels are located too close to the concrete roof surface, they are affected by radiated heat. This is evidenced by quite a few cells failing along the bottom of the panels. In this installation there is no more than a 15 cm clearance between the roof and the bottom edge of the panels. For this installation to be successful and deliver better performance, the panels would have to be raised, allowing for better ventilation and less heat build-up at the bottom. Fluke's IRR1-Sol Solar irradiance meter measures panel performance and temperature, and it is specifically engineered to align solar panels for optimum performance. It accurately measures the irradiance and the angle of the panel versus the angle of the sun.

Inspection conditions

Ideal conditions for inspecting solar panels are clear, sunny skies for optimum readings. In such conditions faulty cells will be a lot warmer because overcast conditions do not produce maximum performance.

Access

In order for a technician to scan the panels, they need to be accessible via walkways. The Fluke 401 or TiS60 imagers suit solar installation inspections well, as long as the instal-

lations are spaced so that technicians can walk along the series and scan the panels individually.

In manual testing using the TiS60 imager, the pictures are saved with time and date, and can be tagged with voice memo recordings stating where faulty panels are located. The photos can then be downloaded so that for future reference the technician knows exactly where to find a particular problem panel. In addition, the serial number of the panel can be included, and four additional images can be added to clearly identify the panel to be worked on.

Easy walkway access to solar panels is not always possible and, in such cases, drone technology can be used, where drones with on-board vision instruments fly over the panels and view them remotely. This technology is used, for example, in the vast solar arrays of some installations in the Northern Cape.

Panel lifetime

Installers and users of solar energy installations should be aware that the performance output of solar panels does degrade over time, and they have a finite lifecycle. Hence regular inspection and maintenance is needed.

Other devices technicians use to test and troubleshoot solar installations include the:

- Fluke 393FC Clamp meter/troubleshooting tool which measures load and voltage levels
- Fluke 1775 PQ Logger which measures power inverter efficiency, power output and power quality of solar systems
- Fluke BT520 which is used to measure and test the batteries in solar applications, and identifies the weakest battery in the string, allowing owners to choose to replace only one particular battery, if necessary. □

All images illustrate inspection of the rooftop solar photovoltaic installation on the Old Mutual building in central Johannesburg.

For more information visit: www.comtest.co.za

A handheld tool for safe solar troubleshooting

The growing number of solar PV installations is creating an increasing demand for technicians who know how to troubleshoot PV systems efficiently. Clamp meters are often used in the installation and commissioning phases of PV projects as well as in maintenance and troubleshooting.

The new-to-market Fluke 393 FC Clamp Meter is the only CAT III 1500 V rated true-RMS clamp meter that enables technicians to take measurements safely in dc environments, such as industrial solar farms. The tool is specifically designed to test and measure solar

PV applications. Key functions include:

- an IP54 rating, ideal for working outdoors on solar arrays and wind power systems
- dc power measurement with readings displayed in kVA
- an audio polarity indicator to prevent accidental mis-wiring
- visual continuity turns provide a bright green light in the display to aid technicians working in dark and noisy environments
- logging and reporting of test results via Fluke Connect software.



The new Fluke 393 FC clamp meter enables technicians to measure up to 1 500 V safely.

Designing reservoir level control systems

Peter Telle of Ultra Control Valves highlights that both pressure and velocity must be considered in designing reservoir level control systems. For reservoir level control valves, anything above 4 to 5 bar is high pressure; Telle says pressures above 6 to 8 bar can be disastrous for control valves if precautions are not taken. This is because cavitation can lead to rapid erosion of the valve body. He says Ultra Control Valves has seen holes caused in valve bodies after only a few weeks of extreme cavitation.

Pressure considerations

Cavitation is the phenomenon caused by bubbles forming at low pressures and then collapsing when the pressure builds up. The collapsing causes a high velocity jet inside the bubble. The jet is powerful enough to erode the valve body or any other metallic parts.

For reservoir inlet control valves, the safe operating range – where cavitation is unlikely – is usually expressed as a ratio between upstream and downstream pressure. A typical self-actuated globe control valve used in the water industry might have a 3:1 ratio. That means if the upstream pressure were 12 bar, the downstream pressure could be as low as 4 bar before cavitation sets in.

Some diaphragm-actuated globe control valves allow for a higher ratio because of the flow pattern in the valve body. For instance, the Ultra Alpine Control Valve can handle a 4:1 pressure difference. To prevent cavitation, the ratio between upstream and downstream pressure should not exceed the designed range.

Velocity considerations

Every control valve has a maximum allowable flow velocity to ensure good controllability, long life and low noise levels.

For standard diaphragm-actuated globe pattern valves it is about 6 m/s for 24/7 operation. Exceeding this by up to 20% for a few hours a day is acceptable.

Axial flow type control valves can accommodate higher velocities due to the flow pattern through the valve.

The velocity is often expressed in terms of flow rate.

Consider a typical 200 mm diaphragm-actuated globe control valve in a reservoir. The inlet pressure is 4 bar inlet and the back pressure from the reservoir head is 1 bar. A typical valve might have an acceptable pressure drop

ratio of 4:1 (to prevent cavitation) and an acceptable flow rate of 200 l/s.

The sizing formulae for control valves is $Q = C_v \sqrt{dP}$ where:

Q = flow rate

C_v = the fully open capacity for the valve

dP = the differential pressure across the valve.

Using this formula it can be seen that if the valve was fully opened, the flow rate would be 329 l/s. Operating this valve under these conditions would result in a much reduced lifespan.

If the same calculation is done for other valves it would indicate that the maximum recommended flow rate is reached with a differential pressure of around 1.5 bar.

So how do we ensure that the valve operates within the design parameters for pressure drop and flow rate?

Limit the flow

In cases where the dynamic head is greater than 3 bar, and the static head is 10 m or less, a rate of flow control feature is recommended for the level control valve. An alternative is to add something like the Maric Flow Control Valve to the system. It's simple, tamper-proof and adds another back pressure device.

Limit the pressure drop ratio

This is a little more complex and requires some judgement.

An artificial back pressure device like an orifice plate can provide the designed back pressure only at the design flow rate. When the flow rate changes the back pressure changes.

Consider an installation with a valve designed for a 3:1 pressure drop. The dynamic upstream pressure is 9 bar and the head from the reservoir is 1 bar.

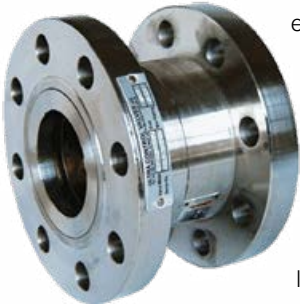
We would need an additional 2 bar of back pressure to reach the acceptable 3:1 ratio. This could be accomplished using an orifice plate. However, an orifice plate is sized to produce a specific pressure drop at a specific flow rate.

Reservoir valves must normally open and close slowly to avoid water hammer. In some instances it can take 10 minutes or more for the valve to change from closed to open or the other way round.



The Ultra Alpine diaphragm-actuated globe control valve can handle a 4:1 upstream: downstream pressure ratio.

During this time the flow rate through the valve body is not at the rate for which the orifice plate was designed. The orifice plate does not produce the expected back pressure and there is consequently potential for cavitation to occur.



A ratio reducing valve can assist in reducing flow to meet the design parameters of the inlet control valves.

The design engineer needs to exercise his or her judgement to decide if the duration and size of the pressure drop is likely to lead to cavitation and damage to the valve. If it is, a pressure reducing valve may have to be installed upstream of the level control valve. The pres-

sure reducing valve will ensure that the level control valve operates within its design parameters during normal operation and during opening or closing. A ratio reducing valve is a good candidate for such applications as it is simple, stable and requires no maintenance.

Conclusion

Although water control valves are designed to destroy energy and, in some cases, handle pressures of up to 250 bar they can be vulnerable to cavitation and velocity damage at low pressures. It is the engineer's duty to ensure that the level control valves operate within their design parameters. □

For more information visit: www.ultravalves.co.za

PLANT MAINTENANCE, TEST + MEASUREMENT : PRODUCTS + SERVICES

First CAT IV instructor in Africa

Condition monitoring specialist company, WearCheck, recently announced that Technical and Training Manager in the company's Asset Reliability Care (ARC) division, Louis Peacock, is officially Africa's first and only CAT IV instructor. Peacock passed his final exam with flying colours.

CAT certification is achieved through the Mobius Institute, a worldwide provider of education in reliability improvement, condition monitoring and precision maintenance. WearCheck is one of a few certified Mobius training centres for Africa, and now the only centre to have a local person presenting the CAT IV course.

Training courses are run by WearCheck for clients anywhere, any date, on demand.

The CAT courses include Vibration CAT I (junior analyst and data collector), Vibration CAT II (intermediate analyst and data collector), Vibration CAT III (senior analyst with supervisor roles) and Vibration CAT IV (expert analyst with additional roles and expert techniques).

For the CAT IV certification, students must pass the exam with >70% and work through 52 hours of online videos during part one. Part two entails 40 hours of classroom-based instructor-led coursework and students must have the required number of years' condition monitoring experience as per (ISO 18436-2), (ISO 18436-1, ISO/IEC 17024), (ISO 18436-3) certification.

The CAT IV course covers:

- Advanced signal processing
- Cross channel measurements
- Dynamics (mass/stiffness/damping, natural frequencies, modes)
- Resonance testing (run-up/coast down tests, impact tests, ODS, modal analysis)
- Corrective action (flow control, resonance correction, isolation, and damping)
- Proximity probe and casing measurements
- Orbit and centreline plot analysis



Louis Peacock (right) WearCheck Technical and Training Manager in the ARC division and Philip Schutte, (left) WearCheck ARC Manager.

- Rotor dynamics (natural frequencies, modelling)
- Journal bearings (design, fluid film instabilities)
- Flexible rotor balancing
- Torsional vibration.

Peacock, who passed the course with marks from 80 to 90%, said, "I relished the challenges presented by the comprehensive course material, and I'm pleased that all the extra hours of hard work have paid off. One thing is for sure – the CAT-IV course transforms a very good vibration analyst into a vibration super-hero!"

Peacock's high marks earned him a distinction, which enables him to register as a CAT IV instructor – a feat no one else on the continent has yet achieved.

There are only eight other CAT IV analysts in Africa, but Peacock is the first and only instructor.

The next scheduled in-class CAT IV courses to be run by WearCheck will take place in January 2023 and July 2023.

For more information contact WearCheck.

Tel: +27 (0)31 700 5460

Email: support@wearcheck.co.za

Visit: www.wearcheck.co.za



The Optris Xi410 in application

Compact IR imager with auto hotspot finder

Instrotech, local supplier of Optris instruments, has available the new compact infrared Optris Xi 410 camera, which combines the benefits of infrared cameras and infrared thermometers. "As well as allowing for the standard use of an IR camera with a PC and software, this camera also works fully autonomously as a smart, target-seeking pyrometer with analogue/alarm output," says

Torsten Czech, Head of Marketing at Optris.

Auto hotspot finder

The Xi 410 has a fast Ethernet interface and can be powered via PoE. This allows simple installation – even if the distance from the PC is large. The integrated auto hotspot finder function can be used to measure moving objects reliably, without having to adjust the camera. If the network connection is disrupted or there is a problem in the connected PC, the camera takes on the job autonomously; it ensures thorough measurement and a reliable alarm if a problem is detected. This feature makes the Xi 410 ideal for safety-related applications, in preventive fire safety for example, and in condition monitoring of machines and equipment.

As well as the Ethernet interface, the Xi 410 has a USB 2.0 interface for the rapid configuration of parameters as well as direct 0/4-20 mA analogue output. An external process interface can be used to forward up to nine freely definable measurement fields as analogue outputs (choice of 0/4-20 mA or 0-10 V) or emit these

as an alarm via a relay, which is ideal for use in the OEM sector.

Easy installation and application

Like the other two models in the Xi Series, the Xi 410 is equipped with a motorised focus that allows convenient distance focusing via the free software program

PIX Connect. The camera has a resolution of 382 x 240 pixels with an image frequency of 25 Hz. The Xi 410 is calibrated for temperature measurements from -20 to 900°C. Customers receive a ready-to-use package, including mounting nuts, mounting brackets, software, Ethernet and USB connection cable.

Key features

- Robust and compact thermal camera with motorised focus
- Autonomous operation with automatic spot finder
- Software with exclusive analysis features included
- Temperature range: -20°C ... 900°C
- Designed for intensive use on industrial sites

For more information contact Instrotech.

Tel: +27 (0)10 595 1831

Email: sales@instrotech.co.za

Visit: www.instrotech.co.za



The compact Optris Xi410 combines the benefits of an infrared camera and a thermometer.

Monitoring smart field devices to support plant uptime

All manufacturing facilities looking to produce consistently high quality products also have to manage their assets to ensure maximum reliability and availability of plant and equipment.

Predictive maintenance is key to reducing unplanned shutdowns, increasing productivity, and improving safety. And maintaining essential smart devices is an important aspect of this.

Emerson's AMS Device Manager enables predictive maintenance for devices to reduce unplanned shutdowns and support consistent quality operations. It provides online access to real-time diagnostics and alerts

from smart devices and valves that help faster and more proactive decision making.

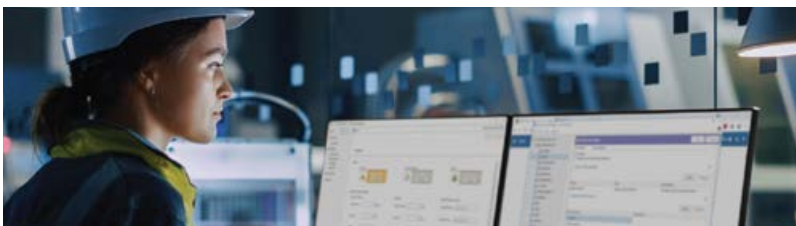
Users can make informed decisions and gain the ability to:

- Simplify asset management with Field Device Integration (FDI)
- View device health, calibration status, and project tracking from anywhere with browser-based AMS Device View
- Configure and calibrate all devices using one software application
- Automatically synchronise field changes made from AMS Trex with asset database.

Using Emerson's AMS Device Manager, plant operators and maintenance teams can achieve their operational goals by focusing on reliability throughout the instrument life cycle, ensuring optimal health and productivity for the whole plant.

For more information visit: www.emerson.com/en-ae

Monitoring and maintaining essential smart devices is an important aspect of predictive maintenance.



‘Next-generation’ technology and training

JTB Industrial Solutions (JTB) holds the view that South African businesses have a collective responsibility and obligation to support the communities and sectors in which they operate, to keep the country moving forward at a macro-economic level and as a society. JTB is an importer and distributor of engineering consumables, equipment and accessories serving a range of industry sectors locally and pan-Africa. In line with its perspective, and the company's ethos of providing 'next-generation engineering solutions', JTB recently lent its support to the relaunched John Orr Engineering School of Specialisation in Johannesburg in several different ways.

JTB MD, Joash David, says JTB is committed to supporting education and training – and to playing its part in upskilling the next generation. “Previously known as John Orr Technical High School, the school of specialisation has enjoyed a proud history since it was founded in the 1960s,” he says.

“We share the government's view that promoting industrialisation will have a tremendously positive effect on South Africa's future. Education is crucial in addressing the current shortage of skilled people. It is the foundation required to equip the next generation and empower young people for their future role as the country's custodians,” he says.

“As part of the John Orr School of Specialisation launch celebrations, we invited a group of Grade 11 learners, girls and boys, to our premises for training on simulation and 3D printing,” says David. “Our aim was to offer them a holistic industry and business experience.”

Education in industrialisation

The John Orr Engineering School of Specialisation supports industrialisation by training learners in various trades in the Further Education and Training (FET) arena. These include plumbing, electrical, auto-mechanical and auto-electrical trades, fitting and turning, woodworking, mechanical engineering and welding.

“Relaunched under its new name in August, the intention is for the school to become a benchmark institution for other schools of specialisation, operating at a world class level, and offering training to teachers from other schools. The facilities must therefore be of the highest standard, and it is here that JTB has been particularly proud to play its part.”

A productive partnership

David says the John Orr Engineering School contacted JTB in June 2021, following a referral from a school in Pretoria. “We presented our services to the teachers and they were happy with our diversity and breadth of knowledge,” he notes. “We became a partner to the school and were able to advise the team regarding the technology they required, and assist them in procuring it. In the process, we serviced and refurbished some of the school's existing machines – as well as donating additional machinery and equipment.”

As a partner to the school, JTB quickly realised the

need to advise it on upgrading its machine tool workshop.

“The workshop gives learners the experience of working in a fully functional industrial workshop. Some of the existing machinery was operating using old technology, which meant it was no longer suitable for teaching.

To free up space, we moved a number of the older machines out of the workshop. This was no small task – some of them weighed up to 1.5 tons and required derigging. We hired in a vehicle and spent time clearing the workshop earlier this year.”

Freeing up the workshop space made room to bring in three new machines, as well as various tooling items, which JTB supplied. David notes: “As well as being more modern than the previous models, the new machinery has significantly improved safety features. This is important to safeguard the learners in the workshop, and the school has requested our machines going forward.”

After clearing the workshop, JTB repaired the remaining machines that were still functional and fit for teaching purposes – and gave the teachers assistance and training on the operation of the machines.

“It took about two months to revamp the mechanical engineering workshop,” says David, “and it remains a work in progress. We will assist the school to replace machines over time and as required, working within its budget. We also upgraded the school's civils workshop with the supply of new benches and vices, and we built a new entrance and guard house for the school.”

In addition, JTB refurbished a shaping machine from the 1960s and arranged for its display in the school grounds. “It stands today as a testimony to the history of the school, which has played a historic role in educating and ‘shaping’ some of the country's industrial pioneers.”

Next steps for the next generation

“In line with our principle of offering next-generation technology and engineering solutions to our customers, we are pleased to support the next generation of South Africa,” David adds. “By supporting the John Orr Engineering School of Specialisation, its teachers and learners with the latest engineering machinery and technology, we are also assisting with educating and training tomorrow's young engineers and industrial minds. Over the longer term this will contribute towards alleviating unemployment and poverty, and building industry and the economy,” he says.

For more information visit: <https://jtbind.co.za/>



A shaping machine from the 1960s, refurbished by JTB Industrial Solutions, acknowledges the history of the John Orr Engineering School of Specialisation.

Virtual CISO services – an option for SMEs

The world generates an estimated 2.5 quintillion bytes of data every day. Amid this mind-boggling amount of chatter, cybercrime is a very real threat. The UN reports that it increased exponentially since the start of the pandemic.

This surge in cybercrime activity kicked off when global lockdowns saw millions of employees working remotely and often logging in from unsecured home computers. According to the Fortinet Global Threat Landscape Report, 80% of organisations experienced one or more data breaches during 2021, with a tenfold increase in ransomware attacks alone.

Patrick Evans, Chief Executive Officer of SLVA Cybersecurity says cyber threats are increasing at a rate far faster than the industry is able to cope with, and small and medium enterprises (SMEs) are particularly vulnerable as the financial impact of such security breaches can be devastating. A sobering thought when we consider that 43% of cyberattacks are aimed at small businesses, according to Accenture's Cost of Cybercrime Study, and only 14% are adequately prepared to defend themselves.

As the business landscape evolves, simply keeping abreast of technology advances and security vulnerabilities is no longer enough, Evans says. Data breach risks need to be managed strategically, and this requires a specific skill set. "Previously CIOs and CTOs were expected to take data security into their fold, but it has become clear that there is a need for a separate security role," he says.

Chief information security officers

This is where a Chief Information Security Officer (CISO) comes in, and business owners are starting to realise the importance of this role in their organisations. "Even if a company has an accomplished and technically skilled team on board, using the services of an advisor with decades of experience on how to mitigate the risks and implement up-to-date security measures is invaluable," says Evans.

Not all organisations, however, have the budget or even

the need for a full-time CISO, and there is currently a shortage of skilled cybersecurity professionals. The answer to this is a virtual or fractional CISO – an outsourced security practitioner, usually working on a part-time basis and remotely, and who, drawing on a wealth of experience in the cybersecurity industry, can provide valuable insight, advice and mentorship to help prevent an attack or to recover from one.

Highlighting some of the main challenges facing organisations:

- Cyberthreats are increasing rapidly
- Financial impacts are severe
- Shortage of skills

Evans outlines how a virtual or fractional CISO can help.

Virtual or fractional CISOs (vCISOs) provide those that need it most with solutions to fit their needs and budget, and go several steps further than simply box-ticking. "SLVA Cybersecurity offers this service to SMEs and other businesses that have neither the need nor the funds for a full-time security officer. These virtual CISOs are industry veterans and offer expert advice for a fraction of the full-time cost," Evans says.

SLVA works with customers to develop fit-for-purpose, fit-for-budget solutions, ensuring they receive the CISO service they need to remain on top of the industry's most pressing cybersecurity challenges, no matter their size or budget. "There are different CISOs for different purposes. Together with my co-founders, Steve Jump and Andrew Odendaal, each with over 20 years' experience in the information and cybersecurity industries, we identified the different CISO roles that organisations typically need."

These include the following.

- Interim vCISO: an organisation may require an acting vCISO while it sources someone new for the role. The interim vCISO can fix urgent issues and put in an action plan to take the company to the next level of cyber resilience. They can also assist in finding a suitable full-time CISO.
- Shadow vCISO: if an organisation has decided to employ someone with only a few years' experience and 'grow' its own CISO, a shadow vCISO can be provided to nurture and guide the unseasoned employee.
- Mentor vCISO: if a company is worried about its current security function, it can hire an industry expert to coach and mentor the current CISO or CIO.
- Post-compromise vCISO: if a company faces an attack or security breach, it may need to bring in someone with extensive, post-compromise recovery experience to help it deal with the aftermath while its own CISO carries on with business as usual. A post-compromise vCISO, who has weathered many breaches, including ransomware, can offer invaluable assistance.



Virtual or fractional CISOs offer SMEs cybersecurity solutions to fit their needs and budget.

For more information visit: <https://slva-cs.com>

Engineering an offshore wind-to-hydrogen demonstrator project

Principle Power has been contracted by ERM to advance the front-end engineering design (FEED) for a wind-to-hydrogen Dolphyn 10 MW demonstrator project off the coast of Aberdeen in Scotland. The contract was signed after ERM Dolphyn was awarded £8.62 million in funding from the UK government, via the Low Carbon Hydrogen Supply 2 Competition.

ERM Dolphyn (Deepwater Offshore Local Production of HYdrogen) has developed a concept design to produce large-scale green hydrogen from floating offshore wind. The ERM Dolphyn concept employs a modular design, integrating electrolysis and a wind turbine on a moored floating semi-submersible platform based on the proven WindFloat® technology by Principle Power to produce hydrogen from seawater, using wind power as the energy source. ERM and Principle Power have been collaborating on the development of decentralised hydrogen production opportunities since 2019.

"It is now established that to meet net-zero ambitions in the UK and around the world, hydrogen from offshore floating wind needs to be a significant component in any viable long-term solution for heating, electricity generation, and transport. The ERM Dolphyn project, a first-of-a-kind, is an innovative integrated system combining all the technologies required to bring the latest floating wind and hydrogen production technologies together to enable offshore wind resources to contribute towards hydrogen production at scale. Principle Power has been instrumental in this process, and we are delighted to extend our collaboration," said David Caine, Partner at ERM.

The 10 MW demonstrator project is a key step in proving the Dolphyn concept prior to commercial-scale deployment. It is targeting operations in late 2025. Commercial scale projects (300 MW+) are under development and expected to be operational pre-2030, followed by large-scale (GW) deployment post-2030. When fully deployed, at an expected 4 GW total capacity, ERM Dolphyn has the potential to supply energy to heat more than 1.5 million homes with no carbon emissions, avoiding the release of millions of tons of CO₂ into the atmosphere every year.

100 000 new jobs by 2050

ERM Dolphyn is a core project for the UK's Hydrogen Coast strategy, and it is expected to help generate more than 10 000 new jobs by 2030 and more than 100 000 by 2050. Many of these jobs will rely on the world-class skills and knowledge found in the offshore renewables and oil and gas sectors. This enormous opportunity is not without challenges: the rapid scaling up of floating offshore wind to meet the energy transformation goals of governments and markets requires an equally significant investment in the entire supply chain. A healthy supply chain, engaged early on, is essential to having a holistic view of each project's challenges and achieving the desired cost reductions that will bring floating offshore wind LCoE (levelised cost of energy) in line with other forms of energy generation.

"We are pleased to continue our years of collaboration with ERM on the Dolphyn project, and we are eager to develop further partnerships across the entire supply chain supporting

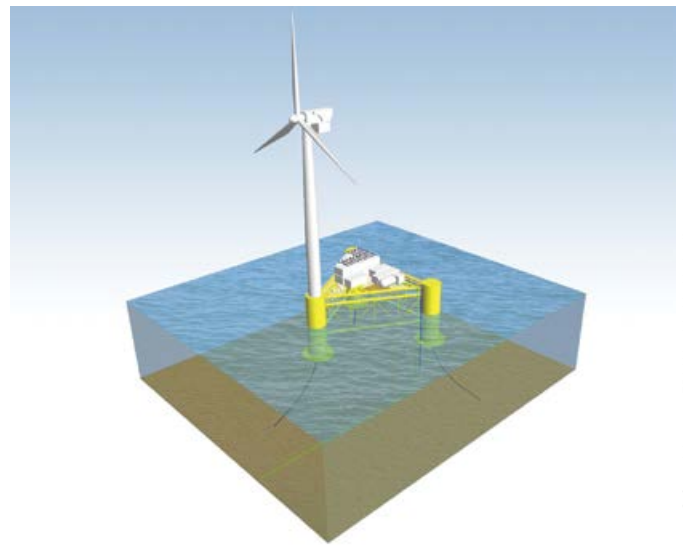


Image © Copyright 2021 ERM Worldwide Limited

The award-winning Dolphyn technology is a first-of-its-kind technology, which combines electrolysis, desalination, and low-carbon hydrogen production on a floating wind platform.

floating offshore wind applications to advance and accelerate growth in the UK and globally. Moving to FEED on the Dolphyn project marks a significant milestone in our journey towards our collective carbon-free future," said Gregory Campbell Smith, Senior Business Developer Manager, Europe, at Principle Power.

Additionally, getting to utility-scale requires advances in modularisation and industrialisation, for which Principle Power is leveraging its 15 years of experience and lessons learned in pre-commercial projects such as WindFloat Atlantic (25 MW, Portugal) and KOWL (50 MW, UK) to streamline all elements from design concept, to manufacturing, to installation and load-out.

ERM's Dolphyn technology

The award-winning Dolphyn technology is a first-of-its-kind technology, which combines electrolysis, desalination, and low-carbon hydrogen production on a floating wind platform. It has been developed by ERM, a leading sustainability consultancy, with significant support from the UK, Scottish and Welsh governments. The intention is to harness its full potential by working with energy developers and investors at multiple locations globally.

For more information visit: www.erm.com

Principle Power

Principle Power is a leading global technology and services provider for the floating offshore wind energy market. The WindFloat®, the company's globally patented and proven floating platform technology, enables offshore wind turbines to be sited in any water depth or seabed condition, unlocking offshore wind potential worldwide and allowing projects to harvest the best wind resources.

For more information visit: www.principlepower.com



Prashaen Reddy,
Partner at Kearney.

Green hydrogen: now is the time to act

The world's steadily growing demand for green hydrogen is expected to exceed supply by 2030, making now an ideal time to invest.

Speaking at the Hydrogen Africa Conference, which took place on 28 and 29 September, Prashaen Reddy, Partner at Kearney, highlighted that green hydrogen's ability to store renewable energy holds one especially attractive possibility:

it can be transported. This is achieved by transforming it into a portable product such as ammonia, methanol, or an e-fuel, and work is under way to develop a method to transport liquefied green hydrogen over long distances, without having to transform or reprocess it.

A recent study by the global management consultancy Kearney, has noted that southern Africa, which has favourable conditions for renewable energy production, will be able to store renewable energy and export it to areas where renewable energy production is technically or economically limited.

Reddy says, "Although southern Africa has a significant opportunity to produce green hydrogen, the region's demand is projected to be lower than that in the demand centres in Europe and Asia. For example, South Africa, the region's most industrialised country, is projected to reach a demand of only 238 kt by 2030.

"Hence, with the region's relatively low demand, favourable production climate, and the limited impact of transport costs, southern Africa could become a green hydrogen export hub."

Moving ahead

Looking beyond the theoretical merits of green hydrogen to the tangible strategies to meet global demand, Reddy believes five key steps can put market entrants on the path to success as they seek to establish green hydrogen production facilities in southern Africa.

- *Gain government support in establishing a supportive regulatory environment*

Government has a central role to play in the energy transition as the success of market entrants will be impacted by the level of government buy-in and a clearly defined green hydrogen strategy. Governments set policies that affect the

speed and direction of the energy transition, and they create the regulatory environment that supports the development of production facilities and the attractiveness of the location for investors.

- *Establish public and private partnerships to de-risk projects*

In this nascent market, any new development will have a number of project and operational risks which could make it more difficult to secure funding for the project and any off-takers. To be successful, market entrants will need to establish partners in different spheres to attract funders and off-takers: public partners (state enterprises, state agencies, and governments), off-takers, and technology partners.

- *Overcome infrastructure barriers and capitalise on the opportunities*

As with any major project, significant amenities are required. Sizable green hydrogen projects, such as some announced giga-scale projects, also require vast areas of land to produce renewable power.

- *Secure funding*

For any mega project, and more so for projects working with nascent technologies that carry inherent risk, securing adequate funding is complex. Often, funding from multiple sources is required. Kearney's market sensing study of the southern African renewable's ecosystem identified the main options for investors interested in financing renewable energy projects, each with their respective value proposition, risk appetite, and expectations for return on investment.

- *Drive the just energy transition*

Southern Africa's energy mix is currently predominantly carbon-based. South Africa, for example, gets the bulk of its electricity from coal fired power stations. The coal value chain directly employs about 150 000 people – and those jobs are at risk in the transition to a low-carbon economy. The production of green hydrogen will become a fundamental aspect of the region's just energy transition, and will need to play a part in creating new jobs. (The International Labour Organisation defines the just energy transition as occurring "in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind.")

Success for early entrants

"The development of green hydrogen – as a nascent industry in an underdeveloped region – will need to overcome several obstacles to gain the full benefits that the global market offers. The five success factors mentioned will need to be carefully considered along with strategies for enabling success. This new energy sector presents many potential benefits and opportunities, promising profitable enterprise, new jobs, and more environmental sustainability in the region," Reddy says.

For more information visit: www.kearney.com



Southern Africa is an attractive region for new entrants in the green hydrogen sector.

BRIEF

Botswana Resources Infrastructure Energy Finance
Investment Summit

13th & 14th
February **2023**

Gaborone, Botswana



Who says digitalisation is easy?



We do!

Moneo: The IIoT tool kit for industrial evolution.

Do you want to know more about the health status of your fans or the best time to change the mechanical sealing of your pump?

Do you want to be told when your compressor needs maintenance or your cooling circuit has a leak that needs to be fixed? The easiest way to get this information is to let the machines tell you. And the easiest way to get the machines tell you is to contact us.

We know where to put sensors to get the big health picture.

We know what infrastructure is needed to get the data to your plc and to your IT level.

And we know how to set the alarms to enable you to react early enough to prevent unexpected downtime and save a lot of money.

In line with our corporate slogan "ifm - close to you", we offer tailor-made complete solutions for process optimisation to our customers around the globe: "moneo - simply made for you".

