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THIS MONTH:

- Lubrication management made simple
- HVAC contract for class 23E locomotives
- A revolutionary offsite approach to plant projects
- Game changers from SA electrical equipment OEM

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Manufacturing, construction and modular plant

Opened last year in Melville, Johannesburg, was a practical yet 'edgy' new-generation mall called 27Boxes, which was built almost entirely from shipping containers. And while you might think such a mall would look like a row of rural cell phone shops, the stacking angles, glass frontages, cutaways and the use of open surrounding space makes this retail centre architecturally very interesting.

Consisting of around 100 small stores with an average size of 27 m² (hence 27Boxes), the containers are stacked on each other and on structural steel supports to form several levels, sandwiched between above ground and below ground parking.

Above ground is all steel, while the concrete underground car park – the only part of the construction to be traditionally built – provides the foundation. Erection was completed rapidly and economically (R30-million) supporting the underpinning philosophy to create an affordable rental space (R3 000 to R5 000 per month) for small tenants on short or long leases.

The developer, Citiq, also recently used containers stacked on the old grain silos in Newtown, Johannesburg, for student accommodation and the company is now planning a 270-unit container apartment development in the Johannesburg CBD.

This month's special report comes from Efficient Engineering's Warwick Jackson, a South African pioneer of offsite-construction/manufacturing of modular plant. Starting with the 'containerisation' of electrical infrastructure and switchgear, the company has now extended its offsite modular manufacturing approach to include plant sub-systems such as pump stations.

But Jackson doesn't like to use the word 'container' to describe Efficient Engineering's plant solutions. Having been once told that it was not feasible to build large substations offsite, because they could not fit into standard ISO shipping containers, he argued that Komatsu 960 haul trucks, at 11,6 m wide, could also not fit into shipping containers, yet they are delivered to mines all over Africa.

By breaking out of ISO-container size restrictions, but retaining the modular principle that an entire functional plant module could be manufactured in a factory environment, Efficient Engineering can deliver electrical plant 'buildings' and modular pump stations that are tested and commissioned before they arrive on site. "Our slogan was from motor to mouse. Only once everything was signed off at Efficient Engineering, did we arrange delivery to site. Once there, we connected the power cables and everything worked," says Jackson, describing the successful delivery of seven plant 'buildings' to meet the electrical infrastructure requirements at the Kolomela mine in the Northern Cape.

From a construction perspective, Jackson says that the only site-based requirements are the concrete plinths onto which the modules are placed. For pump stations, which need foundations to resist significant thrust levels, even the shuttering formwork and steel reinforcement required to cast the concrete blocks below each pump are built into the module. Once the pump station 'building' arrives on site, the formwork is dropped and the concrete poured. The onsite installation is complete as soon as the concrete cures, the inlet and outlet piping is connected and the electrical connections are made.

In a further reduction of site-based infrastructure needs, Efficient Engineering has developed a highly innovative hydraulic lifting system, which obviates the need for an expensive oversized mobile crane to be sent to site to unload truck-trailers and position the modules.

Our cover story about Sasol and ABB's mobile E-House is a related development. Although designed to be mobile – this flexible switchgear solution is mounted on a custom built roadworthy trailer – the functionality has not been limited by standard shipping-container dimensions and, like Jackson, ABB's Manie Jooste avoids using the term 'containerisation'.

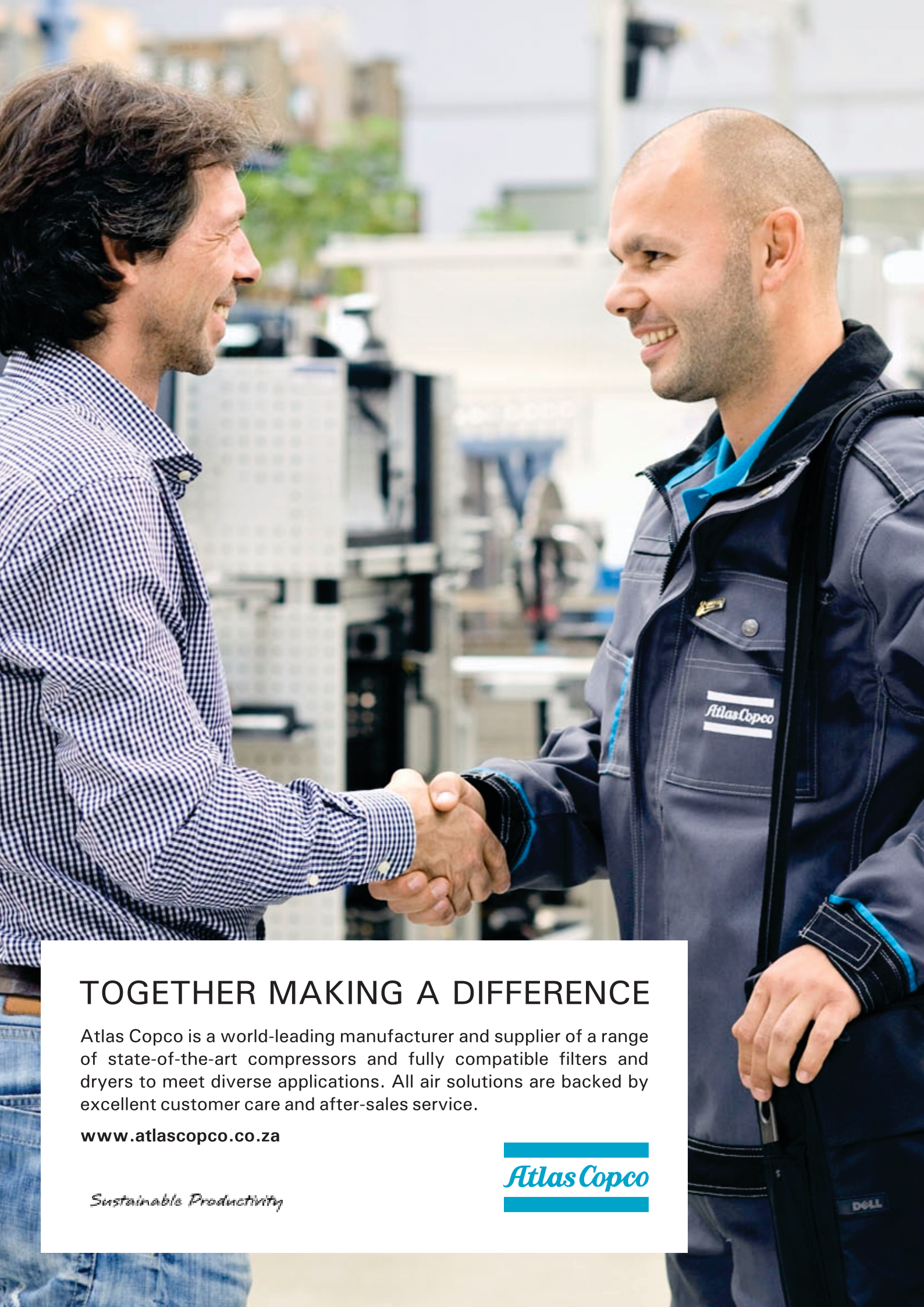
The module will be used to help Sasol upgrade its ageing electrical switchgear, without having to wait for shutdowns to do so. But to accommodate all the different voltages and equipment that have to be energised and protected across all of Sasol's plants – motor feeders, transformer feeders and line feeders – this mobile unit incorporates the most modern digital switchgear and sensor technology. As well as being a highly flexible electrical solution, "the unit complies to the same standards that apply to every other substation on the Sasol plant," Jooste says.

Encouraging in terms of localisation is the degree of innovative, design and customisation embedded into these solutions. Manufacturing and construction in South Africa depends the ability of our engineers to develop and realise solutions that better meet local needs. In the current climate, those needs include better than ever cost effectiveness; the delivery of state-of-the-art technology, in spite of the remoteness of the operating environment; and an uncompromising approach to quality and safety standards.

The modularised approach, via the use of shipping containers by Citiq for its retail and accommodation developments; and Efficient, Sasol's and ABB's adoption of the offsite modular approach to the construction of complex plant technologies, symbolises the ability of South African industry to do this very successfully.

Peter Middleton





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8



18



24



32

ON THE COVER



Future-proof mobile E-House avoids downtime

ABB, the leading power and automation technology group, has delivered a complete mobile modular substation – aptly called the E-House – to the Sasol Secunda plant in Mpumalanga. Its purpose? To minimise production downtime during annual shutdown periods and enable substation upgrades to proceed with minimum disruption to the plant's power supply. *MechTech* talks to Hermanus (Manie) Jooste.

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Features

Special report

8 A revolutionary offsite approach to plant projects

Efficient Engineering has pioneered the offsite construction of complete modular plants, which include the containment structures and all functional equipment. *MechTech* talks to Warwick Jackson of subsidiary company Efficient Power.

Proactive maintenance, lubrication and contamination management

12 Metallurgical NDE of a column pressure vessel

Tim J Carter, outlines the findings of a non-destructive evaluation (NDE) into a self-supporting column pressure vessel in the petrochemical industry following damage by a fire.

16 Mario on maintenance: Asset management and proactive maintenance – friends or foes?

Materials handling and minerals processing

18 Customised solutions for screening efficiency

As the demand for enhanced efficiencies and throughput increases, the market is seeking proven solutions that can be customised to suit specific applications, this according to Rhodes Nelson, managing director of Multotec Manufacturing.

19 Pulley lagging reduces costs and increases safety

20 Coal dewatering solutions for lower ownership costs

23 Benchmark chute systems and transfer points

Local manufacturing and beneficiation

24 Game changers from SA electrical equipment OEM

At a media event at its Linbro Park, Sandton premises during January, Zest WEG Group Africa announced its annual 'game changer' with extended product guarantees across its product portfolio. *MechTech* attends and reports.

27 Exploiting the potential of composites

Heating, cooling, ventilation and air conditioning

28 HVAC contract for class 23E locomotives

Booyco Engineering has won the prestigious contract for the supply of HVAC systems for 240 Traxx Africa locomotives for Transnet Freight Rail's (TFR) Class 23E locomotives.

29 Harnessing the ocean to heat and cool buildings

30 Fan and evaporation collaboration optimises energy efficiency

31 Ionisers remove static from manufacturing environments

Innovative engineering

32 Lubrication management made simple

Leon Muller talks to *MechTech* about the practical aspects of condition monitoring and the use of ultrasound to trend and optimise bearing lubrication.

Regulars

1 Comment

4 On the cover: Future-proof mobile E-House avoids downtime

6 Industry forum

34 Products and services

36 Nota bene

Future-proof mobile E-House avoids

ABB, the leading power and automation technology group, has delivered a complete mobile modular substation – aptly called the E-House – to the Sasol Secunda plant in Mpumalanga. Its purpose? To minimise production downtime during annual shutdown periods and enable substation upgrades to proceed with minimum disruption to the plant’s power supply. *MechTech* talks to Hermanus (Manie) Jooste.



Hermanus (Manie) Jooste, ABB’s product group manager for Modular Systems and Leon Viljoen, managing director (MD) of ABB South Africa.

“ABB has been involved in numerous modular projects, however this custom designed E-House was built to meet Sasol’s on-site requirement for unconstrained functionality and flexibility,” begins Jooste, ABB’s product group manager for Modular Systems.

The new E-House for Sasol Synfuels in Secunda is a mobile substation with a module designed specifically to suit the electrical equipment it contains. “It has been built with all of the correct height and space clearances ensuring electrical safety standards are met. The unit complies to the same standards that apply to every other substation on the Sasol plant,” Jooste tells *MechTech*.

Designed by ABB and Sasol Engineers, in partnership with Efficient Engineering and Aurecon, the E-House for Sasol Secunda was envisaged and specified as a mobile universal substation, suitable to be operated from any of the commonly used supply voltages, 3.3, 6.6 and 11 kV – without requiring changes to the hardware or any significant changes to the configurations. In addition, this optimised solution was designed to energise and protect motor feeders, transformer feeders and line feeders – all from the same mobile unit.

“This is what we mean by flexibility. We have incorporated a host of different functions that can be customised to suit the equipment being energised and the environment in which the plant has to operate. This has made the E-House project very exciting,” Jooste says.

As specified by Sasol, the E-House is fitted to a roadworthy trailer so that it can be moved on public roads to different Sasol plants. For the trailer, air suspension has been incorporated to protect the electrical equipment from excessive vibration while being moved on various road surfaces. A hydraulic levelling system has also been incorporated so that once the unit arrives on site, it can be levelled and stabilised, irrespective of the site’s condition, ensuring level walkways even if the plant area is sloped. In addition, fold-up staircases enable fast and safe access.

“The hydraulic system is based on Efficient Engineering’s design for unloading large modular ‘buildings’ from trailers without having to rent an onsite crane,” says Jooste, adding that, “the trailer chassis, air suspension and hydraulics are all designed and built in South Africa to meet Sasol’s high-level specifications.”

Once built, the trailer was delivered to Efficient Engineering, where the E-House, including all substation equipment, was incorporated to complete the mobile unit.

Typically, switchgear replacements can only take place during shutdown periods when process equipment is not in full operation. With the switchgear in the plant critical to its operation, an alternative replacement strategy was sought, thus increasing the number of switchboards that could be replaced outside of the annual shutdown period of eight to ten days.

Describing how Sasol uses the system, Jooste says that when medium voltage switchgear at Sasol Secunda reaches the end of its life, this mobile unit is utilised for switchgear replacement



projects. “The challenge was to conduct switchgear replacements outside the shutdown period, without creating plant disruptions or unplanned outages,” he explains.

“This E-House contains the ABB UniGear ZS1 digital switchgear that can be programmed to switch and protect either motor feeders or transformer feeders or a combination of both. This makes it one of the most flexible switchgear systems available, easily movable and configured for use in different plant areas.

“The same switchgear is used to perform various switching and protection tasks. The only thing that changes is the software programming, via the engineering station,” Jooste explains.

The E-House has now been successfully used for the first switchgear replacement project at Secunda. A 26-panel switchboard was upgraded in two phases. “The left hand side of the switchboard was replaced first, followed by the right hand side, and for this project the E-House was configured to cope with a mixture of motor and transformer feeders,” he relates.

The mobile E-House is parked in a convenient space near the existing switchboard being replaced. Incoming power at the same voltage used by the substation is connected to the E-House. “The cables driving the plant equipment

downtime



are disconnect from the old switchgear and connected to the E-House. The plant equipment runs from the mobile E-House, enabling the permanent substation to be safely upgraded without having to wait for a downtime opportunity," Jooste informs *MechTech*.

Once the upgrade/maintenance is completed, the E-House is disconnected and the plant reconnected to the on-site substation.

ABB and Sasol chose to use UniGear ZS1 Digital switchgear as the main switchboard platform. The E-House is equipped with the latest future-proof technology. The broad scope includes:

- Unigear ZS1 digital switchgear with sensor technology (14 panels).
- A remote control panel in a separate room for remote operation of the breakers.
- A remote engineering station for configuration and event recording.
- An ac distribution board with 220 V or 380 V ac input supply options.
- A 110 V dc distribution board.
- An interposing relay panel for transformer differential protection schemes.
- A battery-tripping unit with a 25 Ah duel battery charger. (Batteries installed in a separate battery room.)
- An alarm annunciator panel alerting to any unhealthy or dangerous conditions.



Above: Sasol chose to use ABB UniGear ZS1 Digital switchgear with sensor technology (14 panels) as the main switchboard platform.

Left: ABB's E-House for Sasol Secunda is a mobile universal substation, suitable to be operated from any of the commonly used supply voltages, 3.3, 6.6 and 11 kV. The module is fitted to a roadworthy trailer with air suspension and a hydraulic self-levelling system so that it can be moved on public roads and quickly set up on site.

Right: The E-House is equipped with the latest future-proof technology and a Remote Control Panel (RCP) in a separate room for remote operation of the breakers.

Below right: ABB's breaker technology is designed to create a revolving arc, which ensures that arcing never occurs at the same positions on the contacts. "That is why our contactors last so long," says Jooste.

- Built in air conditioning.
- A fire detection system.
- A substation pressurisation system.
- An ARC venting ducting system directly above the Unigear ZS1, which vents to atmosphere outside of the E-House.
- A safari roof construction to enable airflow and additional cooling of the roof structure.
- A roadworthy trailer with a hydraulic levelling system.

Communication and information sharing between various components and systems are digitalised by using the IEC 61850 protocol. The installed Unigear ZS1 Digital switchgear, rated at 17.5 kV, 2 500 A and at 40 kA, gives the unit the flexibility to safely operate at any point in the Sasol plant where



switchgear replacement, refurbishment or maintenance may be required.

All components of the trailer and E-House are locally manufactured. "We strive to use local manufacturers and suppliers for as much of the work as possible. All of the support systems, intellectual property and engineering design is local.

"The outcome is a brilliant solution, which serves the needs of our customers" Jooste concludes. □

Cold storage facility for meat products optimised

APC Storage Solutions SA recently assisted Lynca Meats in designing and erecting an onsite cold storage facility to store the company's pork products at its Meyerton premises. The storage solution included the mobile racking system, Movirack®, as well as two articulated forklifts that will store and retrieve the 5 500-odd pallets currently accommodated.

By having its own cold storage facility,



APC Storage Solutions SA has designed a cold storage facility for Lynca Meats, consisting of a Movirack® mobile racking system and two articulated forklifts.

Lynca Meats can streamline storage, handling and distribution logistics without the need for double handling or storing through a third party, enabling better control and service to the company's end users. The new facility is approximately 2 000 m².

APC Storage Solutions SA designed, supplied, installed and commissioned a Movirack mobile racking system, consisting of two blocks of 10 and seven bases, plus two additional back-to-back conventional racking systems. In both systems, the racks are configured as seven bays in length, six levels high, with each bay holding three pallets.

On the materials handling side, APC Storage Solutions SA supplied two Aisle Master articulated forklifts that are ideal for operation within very narrow aisles. The forklifts were provided under a full-maintenance rental package from APC Storage Solutions SA's material handling division, IHS Forklifts.

"APC Storage Solutions SA offered

an integrated storage solutions service that, in addition to the provision of mobile racking and the materials handling equipment, included a sizing study that determined the most efficient process flow of stowed items," explains André Snyman, general manager, Lynca Meats. "The facility was tailored to the operational storage and throughput capacity of the pork products."

"The level of aftersales service, including support and product guarantees, was also a major factor in us choosing to partner with APC Storage Solutions SA," Snyman continues.

As detailed in the original contract, phase two of the project includes the installation of an additional four mobile bases to provide storage for an additional 1 040 pallets. The embedded rails for these bases have already been cast, ensuring a seamless transition and implementation of this phase of the project.

The facility commenced operation in December 2015.

www.apcstoragesolutions.co.za

Customised onsite training increases plant efficiency

In another display of its customer-centric support focus, Multotec undertakes training of customer personnel *in situ*. According to Javier Kirigin, comminution product manager at Multotec Rubber, this type of practical training is invaluable and enables customers to run their plants more efficiently and effectively.

"Multotec places emphasis on partnering with its customers across all aspects of successful plant operation. We have a symbiotic relationship whereby we help our customers to understand our products and they, in turn, help us to better understand their needs. This results in fit-for-purpose solutions that promote increased productivity and throughput, coupled with minimised downtime and maintenance," says Kirigin.

As an example of a successful training initiative, Multotec conducted an interactive technical seminar over a two-day period both in French and English in Ouagadougou, the capital of Burkina Faso. "If Multotec customers cannot come to Multotec's office, then Multotec takes the information to the market. We deployed six

product specialists to Ouagadougou and the training comprised a technical introduction to Multotec products and the application thereof in the mainly gold and zinc commodity sectors that were represented by the customers at the seminar."

The training was extremely well received by customers who seldom have access to this high level of expertise and technical knowledge. "The seminar also facilitated a networking opportunity for the teams from the various mines who do not often get to discuss their issues with colleagues. We hosted personnel from more than eight mines in this French-speaking West African region, with more than 30 customers from all over West Africa including Mali, Niger, Burkina Faso and the Ivory Coast," Kirigin says.

www.multotec.com



Multotec conducts interactive technical seminars for its customers.

Software prices hit as rand plummets

International accounting software vendors will soon feel the effect of the plummeting rand as local businesses consider cheaper options. Software prices have already increased by 40% and will continue to rise as the rand weakens.

According to Palladium Business Solutions managing director Stephen Corrigan, this is the time for locally owned accounting software companies to shine. "The weakening of the rand will be the cause of price increases across the board. At Palladium, we reduced our international pricing accordingly and have seen an upsurge in demand. We all need to take advantage of the weakening rand," he suggests.

Corrigan says this is also a good time for companies to retire their aging costly enterprise software. "To have a rand-hedged product in today's environment is critical. The modern way of thinking is a 'pay as you go' or subscription model with no upfront balloon payments."

Palladium offers a subscription model as well as a software purchase model with an optional support contract, giving its clients options. In addition, clients can switch from the subscription model to the outright purchase model at any time, and will receive up to three months of their subscription fees back against the software purchase cost.

www.palladium.co.za

SA's engineering graduates in demand

"Graduates are not often in high demand by the job market due to their lack of work experience, especially in heavily technical areas," says Bellah Nxumalo, team leader at Network Recruitment. "However, South Africa's engineering sector is bucking this trend and actively seeking graduates. Here's why," she argues.

"For a start, graduates are often single, footloose and fancy free. They don't have to excuse themselves from weekend projects and overtime jobs to be home with their family; they can more readily travel; are prepared to take up long-term posts in other (often remote) areas; and they don't run the risk of having to leave the project environment because their marriage is suffering – which happens more often than people think.

"Then, graduates don't cost the company as much. Granted, some engineering firms are looking to pay for critical skill but, when the market hit a slump in 2013, graduates suddenly became very marketable. This trend has largely continued, with companies now actively requesting more budget-friendly graduate candidates who can be trained in their systems, as opposed to highly skilled staff who come with a hefty price tag," she says.

"More and more of our clients are

rejecting engineers with many years' experience, saying they bring with them their own ideas and habits picked up from previous employers. It's easier, cheaper and more effective to train new blood than undo years of preconditioned thinking.

"We're also seeing a shift among engineering to newer approaches and the increasing integration of cutting-edge technology. Connected to this is an inherent shift in company culture towards a more dynamic ideal. Graduates come with their own fresh outlook, which instantly suits this culture.

"But graduates can be more focused on their potential salary than on career opportunities. Sometimes smaller, more dynamic companies offering less money provide greater career growth prospects for new engineers.

"If SA's engineering graduates wish to remain marketable and in demand by good employers, they would do well to balance their sought-after graduate potential with positive, more modest attitudes," Nxumalo advises.

www.networkrecruitment.co.za



Excavation technology shared with students

Atlas Copco Mining and Rock Excavation Technique shared valuable practical information on the diverse field of mining with final year BSc Mining Engineering Honours students from the University of the Witwatersrand.

"South Africa's mining, industrial, business and commercial future lies firmly in the hands of our youth and how aptly they are able to apply their knowledge when they embark on their working careers," says Kgothatso Ntsie, corporate communications manager for Atlas Copco South Africa. "I decided to extend an invitation to the students to join us for a few hours at Jet Park-based Atlas Copco House to gain an insight into the multi-tiered business relationships between the customer (in this instance the mining industry) and the supplier, which goes far beyond simply the sale of equipment and includes expert advice, after-sales service, etc. It is essential that students, irrespective of their field of study, gain a practical taste of the working world to

assist them in orientating theory within the perspective of real situations."

Wits students, Sipiwe Nkosi and Steven Valoi, shared their thoughts on their Atlas Copco experience and agreed that the day was extremely valuable. "The time spent at Atlas Copco was for me the perfect follow up to a tour to a number of mines in Mpumalanga and Limpopo," remarks Nkosi who, after graduating, will focus on obtaining her blasting certificate.

www.atlascopco.co.za



Atlas Copco shares expertise with WITS Students, from left: Steven Valoi, Kgothatso Ntsie (Atlas Copco) and Sipiwe Nkosi.

In brief

Magnet, specialists in the supply, implementation and support of electrical equipment, industrial instrumentation and automation, has made two new appointments at its Johannesburg branch. Dean Lotter is now the divisional head of Magnet Projects & Solutions, while Myendhren Govender is business development manager for Magnet's a-Eberle range of power quality and voltage regulation equipment.

With the goal of helping customers reach their lowest sustainable cost structure, **Metso** will introduce new Life Cycle Services packages for the aggregates industry. The offering will be unveiled during the Bauma construction machinery exhibition in Munich, Germany on April 11-17, 2016.

International engineering and project management consultancy **Royal HaskoningDHV** has announced a simplified organisation and management structure, consolidated into four Business Lines and four regions: Water will be led by Anke Mastenbroek, who will also be responsible for Africa, Middle East and India; Buildings, led by Marije Hulshof, who will take responsibility for the Asia Pacific region; Transport & Planning, led by Anton van der Sanden, head of the Netherlands region; and Craig Huntbatch will head up Maritime & Aviation and the European and Americas region.

SMEC South Africa, the local provider of consultancy and project lifecycle services to a broad range of infrastructure development sectors, has announced the appointment of Tumelo Molope as of group head of HR, with effect from 1 November 2015. Molope has also been appointed as a director to the board of the company.

As of April 1, 2016, Jan Willem Jongert will join the executive board of **Wacker Neuson SE**. In his new role as chief sales officer Jongert will be responsible for all global sales, service, logistics and marketing activities of the Wacker Neuson Group.

Johnson Crane Hire was contracted by **SAPREF** to undertake the heavy lifts associated with maintenance work on two columns during the biannual turnaround at the Durban refinery. The company supplied an extended fleet of cranes for the maintenance work, which was all completed within the required time.

Festo South Africa, the market leading supplier of industrial automation solutions and technical training, recently appointed **BMG** as one of its official logistics distributors. With over 100 BMG branches nationwide, this strategic appointment significantly enhances convenience to all Festo customers throughout South Africa. Also now falling under the BMG umbrella is hydraulic and pneumatic automation solutions specialist, **Hyflo**, which has seized the opportunity to become a certified Festo Distributor.

A revolutionary offsite approach to plant projects

Following the successful deployment of seven modular 'buildings' for the electrical infrastructure at the Kolomela mine, Efficient Engineering has pioneered the offsite construction, assembly, testing and commissioning of complete modular plants similar to as these, which include the containment structures and all functional equipment. *MechTech* talks to Warwick Jackson (right), now the managing director of Efficient Power and the inspiration behind this new approach.



The idea underpinning large integrated modular plants arose while Warwick Jackson was the lead electrical engineer for Anglo American – Kumba Iron Ore – SSP on the development of its operations in the Northern Cape. He had been told that it was not feasible to build large substations offsite, because they could not fit into standard ISO shipping containers, making delivery impossible.

"After the meeting, I happened to be driving behind a Komatsu 960 haul truck. At 11,6 m wide, I realized that products five times wider than conventional ISO containers were being routinely delivered to sites all over Africa," Jackson says.

On discussing his observation with his switchgear colleagues, Jackson was advised to talk to Efficient Engineering. "Johan Basson, who ran RBF at that time, now JB Switchgear, recommended

Efficient, which, he said, was not afraid of size," he recalls.

"That is where my relationship with Efficient began. I met Tony Cimato, the then owner, who showed us how the company made large buildings, control rooms and huge shell structures to house equipment: for shiploaders, e-houses, and reclaimers, for example," he adds.

For Kolomela, Efficient Engineering was willing to build the shells for the substations, motor control centres (MCCs) and control and instrumentation (C&I) rooms as single integrated modules, and fully equip them offsite. "So my staff and I were given an office here at Efficient, where we collaborated to build exactly what we needed for Kolomela. It was a fantastic way of working," Jackson says.

The result was the development of seven 'buildings' that met the project requirements for the entire electrical infrastructure needed at Kolomela: for

the primary, secondary and tertiary crushers; the run-of-mine conveyor; the product screen; the load out station; and the dewatering pump station.

"It was an amazing success. The modular plants arrived on site 100% commissioned. Our slogan was from motor to mouse. Only once everything was signed off at Efficient Engineering, did we arrange delivery to site. Once there, we connected the power cables and everything worked," he says.

On the Kolomela project, Anglo had a R500-million budget for the electrical and C&I infrastructure. For the seven substations, the building budget was R11-million. "By taking the offsite modular approach, the shell structures cost close to R15-million, but by the time we had completed the installation, we had under spent our R500-million electrical budget by R83-million," Jackson says.

So by agreeing to spend R4-million



extra on the offsite modular construction approach, R79-million was saved.

The main reason? “The provisional and general budget virtually disappeared, because all the work was done offsite. Very few contactors had to be paid for travel, accommodation or material shipping costs to the site. In addition, the contingency budget went unspent, because there were no unexpected additional costs due to onsite issues.

“And the knock on savings were outrageous. We closed a site with running costs of R150-million per month five months early. As a result, 1.4-million tons of ore was put through the mine before it was due to open – and the capital expenditure for the development of Kolomela, which was about R8.4-billion, was paid off in 24 months,” Jackson reveals.

From electrical to mechanical plant

Pit dewatering at Kolomela is achieved via 16 boreholes that lower the surrounding water table. “The water is fed into an eight-million litre water tank and it is then pumped 18 km as potable water to Beeshoek, into the Vaal Gamagara municipal intake at up to 1 500 m³/h.

“While the mine had moved towards offsite modular designs with respect to its substations and MCCs, the pump house itself experienced civil delays. We had a fully functional MCC control room and all of the medium-voltage infrastructure onsite and operational, but the pump station building hadn’t been completed. So, while massively successful on the electri-



cal side, we were still being hampered by delays on the civil and mechanical side,” Jackson says, adding, “the budget for the pump station building was originally in the order of R1.8-million, but it ended up costing well north of R4-million – and it was more than eight months late.”

“Onsite construction of plant at remote mines is such an onerous thing. A project can be hampered by continuous delays, due to late deliveries of inputs, the wrong people being sent to site and a host of safety and security restrictions that make rapid progress impossible,” he explains.

Following the success of Kolomela

Above: Based on its success at Kolomela, Efficient Engineering now builds fully functional e-houses, including the shells for the substations, motor control centres (MCCs) and control and instrumentation (C&I) rooms as single integrated modules, and fully equips them offsite.

Left: A modular pump station was built by Efficient Power to pump and additional 1 800 m³/h at a 40 m head from the deepening pit.

Centre: To accommodate pumps, decoupling vibration dampers and reinforced mountings carry the 35 t of trust down to the 3.0 t concrete mounting plinth below the ‘building’. Shuttering formwork and a steel reinforcement cage was also incorporated below each pump.

Below: Built into the housing structure is an overhead crane to enable installation and servicing of the heavy pumps and piping systems.





year and delivered to site during the last week of November. Jackson describes some of its features.

Built into the housing structure is an overhead crane, enable installation and servicing of the heavy pumps and piping systems. So the steel frame of the building had to accommodate the lifting loads.

Shuttering formwork and a steel reinforcement cage was also incorporated below each pump, so that once the pump station was delivered to site and placed on its plinth, the shuttering can be lowered to the floor to enable the void below the pump to be mass filled with concrete. This creates the base support needed to transfer the thrust. So the steel building incorporates its own concrete former.

Rag bolts are included to allow for adjustments and should the mine wish to move the pump station to a new location, the entire module can be disconnected from its suction and discharge flanges, lifted off the plinth and moved to a new one.

To further facilitate delivery and installation, Efficient has developed a highly innovative hydraulic lifting system. "Because of the costs and logistical issues associated with cranes on remote mining sites, we have developed an amazing hydraulic jacking system to make loading, unloading and installation simple and delay-free. Typically, to accommodate safety and reach issues, an oversized crane would be needed to load and unload a module of this size."

According to Jackson, the hire of a 700 t crane can cost up to R1.4-million plus R11 000 per hour thereafter. "With our system, we typically budget around R150 000 to deploy and lift a module into place," he estimates.

Initially based on a telescopic jacking system with hydraulic rams, an Efficient shop floor foreman came up with the idea of a vertical lift system based on a forklift mechanism. "So we went to a forklift specialist, who designed a system based on six synchronised forklifts running off a central hydraulic power pack. The 'jacks' are bolted onto the module, and each can lift 20 t, giving a total safe lifting capability of 120 t," Jackson explains.

Once attached, the lifting system raises the module to allow a trailer to be reversed underneath. Then it is lowered onto the trailer for delivery to site. The lifting jacks are removed and packed for immediate use when the truck arrives on site. "There, the entire pump station



Above: The complete pump station, which was fully tested and commissioned on the factory floor of Efficient Engineering's Tunney premises, was delivered to the Sishen site and then deployed and anchored to the plinth in only three days.

Left: The motor control centres (MCCs) and the pump system controllers are incorporated into a separate room of the pump house.

on the electrical side, therefore, when another pump station project emerged, Jackson, together with Kevin Hundley who was with Aurecon at that time, began to explore a similar approach. The mining pit at Sishen, which is one of the largest open cast pits in the world, is getting deeper, so an additional dewatering pump station is required. Similar to the Kolomela pump station, an additional 1 800 m³/h station with a modest 40 m head was proposed. At Sishen, water from the pit is pumped into a reservoir and then gravity fed into the Vaal Gamagara system.

"To accommodate pumps, however, we knew that we needed big concrete blocks to cater for the 35 t of thrust and the vibration issues. But we remained convinced that pump stations could also be built using the offsite modular approach," says Jackson. "And if it were possible to house and equip a pump station building offsite, we would change

the execution strategy completely, from an onsite nightmare to a plug-and-play dream," he adds.

"Along with people such as Stephan Kleynhans from Aurecon and his specialised team, we identified the issues, went back to first principles, did the calculations and designed a structure. We determined that, if we mounted the pump station module on a 3.0 t concrete plinth and included vibration dampers for decoupling, then an entire pump station could be delivered as a module in a large custom built container," Jackson explains.

As an additional benefit, the 'building' becomes structurally sound and dynamically optimised, purpose-designed to best suit the equipment it houses. The only site-based construction requirements are the concrete plinth and, for a pump station, some key thrust points designed to transfer loads through appropriately placed beams.

This solution was completed late last

module is lifted off the trailer, the truck can be driven away from underneath it and the module lowered directly onto its plinth," Jackson reveals.

The complete pump station, which was fully tested and commissioned on the factory floor of Efficient Engineering's Tunney premises, was delivered to the Sishen site and then deployed and anchored to the plinth in only three days. "The concrete bases underneath the pumps were poured earlier this year and, after a few days of curing, the pump station was fully operational," he adds.

As well as for electrical substations and mechanical pump stations, the off-site modular approach to the construction of plant, according to Jackson, is ideal for any large, complex equipment systems that operate in remote or difficult environments. In particular, he cites mini-hydro plants; telecommunication centres; dust scrubbers for pollution control; lubrication systems for crusher plants, with oil purification and cooling/heating systems to protect the assets; and geotechnical laboratories, with robots and automation equipment that is difficult to commission in remote environments.



Efficient Power also specialises in custom-built backup generators. The offsite modular approach is ideal for any large, complex equipment systems that have to operate in remote or difficult environments.

Significant savings accrue by changing the project execution strategy: "A brick-built building requires that everyone, including the equipment installers, have to drive to site and install the equipment. They will all bill the project for the additional travelling, accommodation and inconvenience. These costs can easily amount to 30% of total project costs.

"Efficient Power manufactures properly designed plant buildings that use advanced materials such as our South African-Developed 3CR12 stainless steel. They are equipped with the best equipment, from companies such as KSB and ABB. Yet the cost deviation by taking an offsite approach is dramatic!" Jackson concludes. □

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Metallurgical NDE of a column pressure vessel

This article, by consulting engineer, *Tim J Carter*, who specialises in defect and failure analysis and materials selection, outlines the findings of a non-destructive evaluation (NDE) into a self-supporting column pressure vessel in the petrochemical industry following damage by a fire. The key goal was to determine whether the column could be safely returned to service.

A self-supporting column, containing two separate vessels separated by a diaphragm, was examined using non-destructive examination techniques following fire damage. The primary reason for the examination was fairly straightforward, could the column be safely returned to service? A replacement column would cost several hundred thousand US\$, take months to manufacture, transport to site and then erect. The transport and erection costs alone ran to six digits in US\$. There would clearly be a major saving in both direct and business interruption costs if the column could be saved.

The column was found to be noticeably bent during post-incident inspection. Initially manufactured over twenty years previously, no detailed 'as-built' drawings were available. Since the primary requirement was to ascertain whether or not the vessel could safely be returned to service, only NDE could be done.

The fire was severe in nature, as refinery fires usually are, and resulted from an equipment failure at ground level about 20 m from the column. It was not of long duration, being promptly isolated and contained by operating personnel. Much equipment in the immediate vicinity was destroyed and the refinery production was halted.

The column in question had been in service since start-up some twenty years previously and was situated at an elevation of about 10 m above ground level on a reinforced concrete structure. While affected by the fire, it was partially shielded from direct exposure by the support structure and other plant items. The column was also externally covered with thermal lagging, placed to prevent undue loss of temperature from the process during normal operation. This would have also protected the column from the external fire. The lagging was in poor condition, however.

Vessel construction

The vessel was constructed from seven strakes welded together to form a cylinder 16.6 m long and 1.0 m in diameter, with semi-elliptical ends. The material of construction was reported to be ASTM A515 grade 60, a weldable, medium strength carbon steel. The vessel was internally divided at the mid-

point with a semi-elliptical diaphragm to give two separate process units in a single column, with the lower portion being internally clad with ferritic stainless steel for improved corrosion resistance.

ASTM A515 Grade 60 is a plain carbon-manganese steel without alloying additions and without significant high temperature properties [1]. This is not to say that it is unsuitable for moderately elevated temperatures. With appropriately low stress, it will perform at temperatures substantially above ambient, and in the present situation, was performing well at around 300 °C – and it had done so for some twenty years.

These temperatures do not reach the high levels likely to have been attained during the fire incident in areas where the thermal lagging on the vessel exterior was either damaged or compromised through wear and tear, and estimations of higher temperature properties for similar materials have been obtained from other sources [2, 3]. These indicate that the material would have very little strength above about 650 °C. A Larsen-Miller relationship curve for a similar material, SABS 1431 Grade 300WA was available [4], and shows definite deterioration in properties as temperature increases (Figure 1).

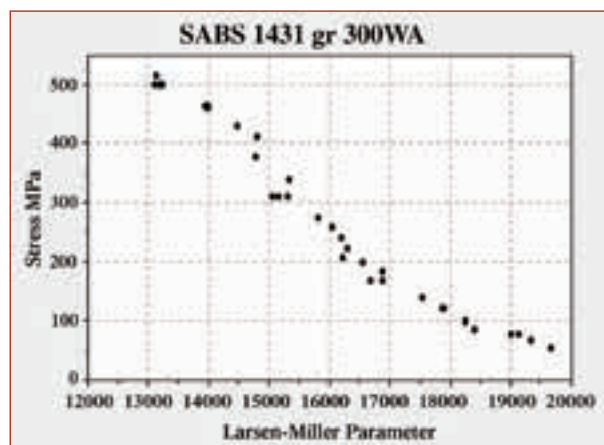


Figure 1: The Larsen-Miller relationship for SABS 1431 grade 300WA, showing deterioration of properties with increasing temperature.

The upper and lower halves of the vessel both contained a series of internal trays, carbon steel in the upper section, ferritic stainless steel in the lower. These trays were bolted to brackets welded to the inner surface of the column and did not form part of the structure. As such, they have been ignored in this study.

Visual examination

Once the external thermal lagging, which was in poor condition, had been removed, the condition of the outer surface of the shell could be evaluated. The whole of the column exterior, except for the central circumferential weld, was heavily rusted. The drawing quickly explained why the central weld was clean. This was where the centre dividing membrane, in the form of a semi-elliptical internal dish, was situated. The weld metal

C	Mn	Si	S	P	Ni	Cr	Mo	Fe
≤0.24	≤0.90	0.15/0.30	≤0.040	≤0.035	-	-	-	Balance

Table 1: Composition of ASTM A515 grade 60.

Thickness (mm)	YS (MPa)	UTS (MPa)	EI (% on 2")
≤25	221	414 - 552	≥25

Table 2: Room temperature mechanical properties of ASTM A515 grade 60.

Temp (°C)	50	100	160	200	250	300
MPa	150	141	133	130	117	97

Table 3: Typical elevated-temperature yield strength for a similar material to ASTM A515 grade 60.

was stainless steel to match the internal surface cladding of the lower part of the column.

Two areas appeared to have suffered localised damage in the incident, one close to the base and one just below the mid-point, both taking the form of local bulging or wrinkling of the shell. It was noted that both of these areas were on the stainless steel clad portion, raising the fear of possible cracking or disbondment of the cladding.

Dimensional examination

Once the column had been brought out of the plant and laid horizontally, the bend in the longitudinal direction was clearly visible (Figure 2). A dimensional survey showed that the column was about 50 mm out of true at the centre – with the bending being fairly uniform along the length – and presented marked ovality in two distinct areas (Figure 3).



Figure 2: Bending of the column was clearly visible.

Shell thickness is an important factor in the design calculations for any pressure vessel, and thus a detailed survey of the shell thickness was undertaken using a precision ultrasonic technique. To ensure that accurate readings were obtained, each area measured was cleaned by lightly grinding the surface and removing the roughness due to corrosion, but removing the minimum amount of material. Measurements were taken over a series of regularly spaced positions located in a square grid pattern covering the whole of the cylindrical portion of the column. The results were a fairly uniform thickness with a standard deviation of only 0.34 on a mean thickness of 7.71 mm (Figure 4).

No individual thickness measurement fell below the minimum allowable thickness of 7.0 mm specified in the design. Special attention was paid to the two wrinkled areas to determine if disbondment of the internal cladding had occurred, but no sign of this was found.

Mechanical properties

Whilst mechanical properties were of paramount importance, the need for non-destruction of the vessel necessitated an indirect determination technique. Quite clearly, the vessel could not be moved into the laboratory and neither could material be removed from it, and thus neither conventional tensile testing nor high precision hardness testing using laboratory equipment was possible.

A portable hardness testing technique had to be employed, and the Equotip® system was utilised. This system uses the velocity measurements from a spring-driven hammer as the hammer approaches the surface to be tested and then again as it rebounds. The difference represents the energy absorbed, which can be related to Vickers hardness, HV_{EQ}.

The results of a detailed hardness survey on the same positions as the thickness survey gave a mean value of 93.4 HV_{EQ}, with a standard deviation of 6.93 HV_{EQ}, a remarkably uniform result (Figure 5). It was noted that, despite their different ap-

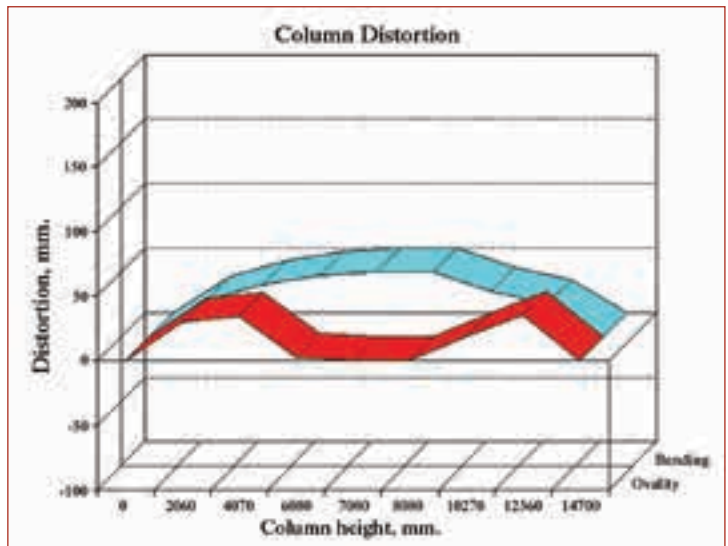


Figure 3: Bending and ovaling results as revealed by dimensional survey.

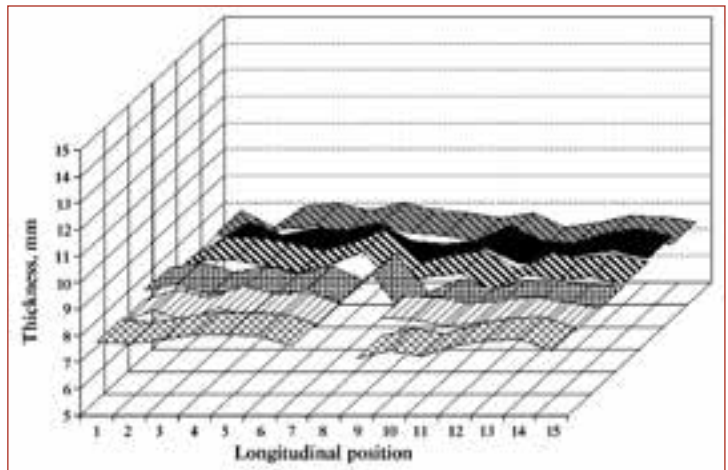


Figure 4: Measurements revealing fairly uniform, but low thickness in the shell.

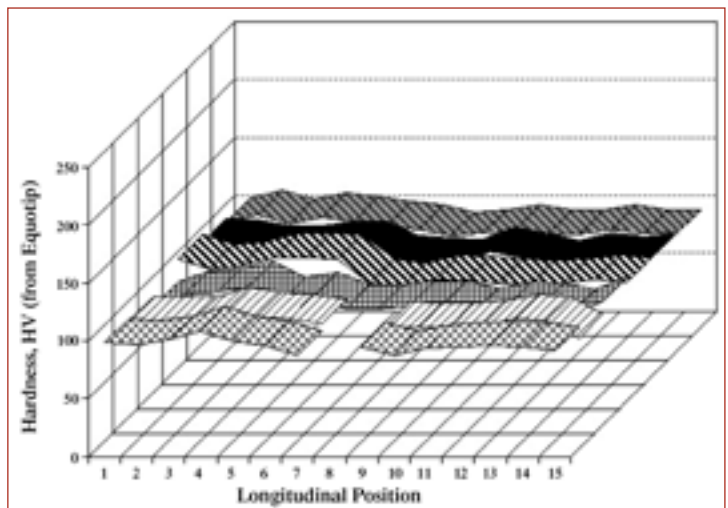


Figure 5: The hardness survey results showing uniformly low hardness.

pearance, having apparently been locally heated during the fire, no significant reduction in the hardness of the two discoloured zones was found.

Relating hardness to ultimate tensile strength in steels is a well-known, though empirical, technique and can be accomplished with fairly good accuracy using conversion tables published in a number of standards [5, 6]. Relating hardness to yield strength, upon which the mechanical design of the

column is based, is trickier. Probably the best known method is by using the relationships developed by Cahoon and further studied by Auerkari [7], who derived a relationship between hardness and ultimate tensile strength, though this relationship relies on knowledge of n , the work-hardening exponent for the material, which is not readily determinable non-destructively.

Using an algorithm derived from published hardness tensile relationships [8], the tensile strength of the column material was obtained.

From ASTM A515, however, it is known that the yield strength of Grade

60 is approximately 50% of its UTS, and this value has been used. A hardness of 93.4 HV_{EQ} corresponds to a tensile strength of 330 MPa (47.85 ksi), and thus the yield strength observed, 115 MPa (23.93 ksi), is unacceptably below the minimum requirement of ≥ 221 MPa specified for Grade 60 material, even allowing for probable errors in hardness testing and the derivation of the value.

Discussion

That the column was subjected to the effects of a fire is without doubt. Several adjacent items of plant were sufficiently

damaged to be discarded on the basis of visual examination alone – and a great deal of the piping and support structures were destroyed. The effects of the fire on this column, however, present a number of anomalies in terms of the damage observed and properties determined.

The effects of exposure of the column to a fire under the circumstances that are known to have occurred in this case were expected to be more severe at the base of the column, which was closest to the fire epicentre, and were expected to decrease with height and therefore distance from the conflagration itself. In addition, the thermal lagging on the vessel exterior was expected to offer a large degree of protection from external heating.

Heating of the lower part of the column as the result of exposure to fire was expected to cause a partial collapse under its own weight and the weight of the product contained within the vessel. This was expected to restrict buckling to the part of the column directly affected by the fire, in this case the lower portion. While some evidence of this was observed, the deformation was minor and the overall deformation of the column was in the form of a fairly uniform curve, with two areas of ovality, approximately equidistant between the mid-point of the column and the ends. This cannot be explained in terms of localised fire damage to an erected self-supporting column. It can, however, be attributed to the effects of thermal stress-relief whilst in a horizontal position, particularly if the stress-relief temperature was high.

The reduction in mechanical properties, as revealed by hardness testing, indicates a uniform heating over the whole length of the column, to a temperature at which significant degradation of the pearlite phase would be expected to occur – in the region of 650-700 °C.

The uniformity of loss of mechanical properties also gives cause for concern. This loss is the result of microstructural changes, principally the degradation of pearlite as the result of exposure to elevated temperatures. As with the deformation observation, such damage would be expected to become more pronounced as the epicentre of the fire was approached, and the thermal lagging on the vessel would be expected to offer a high degree of protection, giving further temperature differences and therefore greater differences in the degradation properties. As with the deformation observed, however, the uniformity of the drop in mechanical properties can readily be explained if it had

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occurred during thermal stress-relief of the column during manufacture.

The possibility of an incorrect material, such as ASTM A285 Grade A – with similar properties to those found – having been used in error was discounted following examination of the manufacturing records. This, together with the uniformity of loss of properties, tends to suggest that the effect had occurred during stress-relief heat treatment. Post-weld stress-relief heat treatments, however, are usually carried out at around 600 °C for short periods, and do not generally degrade the properties to any extent. This in turn suggests that stress-relief heat treatment at a higher than normal temperature is probably the cause, rather than exposure to elevated temperatures during the fire. The column would probably have collapsed under its own weight had the reduction of properties been caused by heating to stress-relief temperature whilst erect.

The thickness measurements taken on the column show a uniform loss of wall thickness, but examination of the vessel interior and internal structures do not show any major corrosive attack. In addition, the upper and lower vessels in

the column are of different materials to compensate for different process conditions, and a difference in the mean wall thickness between the two would have been expected had the material loss been due to process corrosion.

This suggests that the loss of material thickness is due to external corrosion due to poor maintenance of the lagging vapour barrier on the external surface.

Conclusions

That the column has suffered damage as the result of exposure the fire is proven beyond doubt. The wrinkle observed in the shell close to the base is the result of localised heating, which could only have been the result of the fire.

The most serious damage to the column, however, is the deformation, which presented as both longitudinal bowing and localised ovaling, and the loss of mechanical strength as indicated by the reduction in hardness. The effects of the fire cannot adequately explain either of these phenomena, but both can be explained by incorrect post-weld stress-relief heat treatment during manufacture. If it is accepted that both these fea-

tures originated during manufacture, it may be argued that, despite their being of a magnitude greater than that which the design code regards as permissible, the fact that the column has performed satisfactorily for twenty years could be taken as an indication that their presence would not compromise the integrity of the column, and on these grounds it could be returned to service.

In the final analysis, however, the thickness of the column shell was considered too thin for extended service, and it would have had to be replaced within a short time, necessitating a second major production interruption. A decision to replace the column was therefore taken, based on economic rather than technical grounds. □

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Asset management and proactive friends or foes?

In his column for this month, Mario Kuisen talks about the importance of having an asset management system in place to realise long-term benefits from proactive management system investments.

Previously we discussed the principles of proactive maintenance and how it can be of benefit to an organisation wishing to improve the bottom line or enhance the reputation and quality of service of public entities. We examined the various strategies and how it is important to use the right combination for optimal results. We spoke about the wide and rapidly growing range of technologies that are available to the reliability engineer and how economics is making this more and more attractive.

There is no point fixing the symptoms. It is essential to get at the root of the problem, which occurs for one simple reason – the physical asset management system is deficient.

Whilst it is hoped that this was informative, it completely omitted one vitally important point that is the topic for discussion here. Without it, many of the benefits of proactive maintenance will never be realised and sustainability is practically impossible.

So what can this be?

If you have not already guessed, it is of course the fact that everything we discussed falls under the ambit of physical asset management and that,

without an effective asset management system in place, all manner of things not only can, but will go wrong. In doing so, one's carefully thought out and implemented proactive maintenance strategy will be derailed. Strong words, and only expressed with confidence because of the myriad of personal experiences encountered. This is one instance where rather than explain how things should be done, the concept is better illustrated with examples of what happens when things have not been done as they should.

In one example that really stands out, very large medium-voltage motors in a production plant with four yearly scheduled outages were correctly identified as critical by the reliability engineering team. As a consequence, the motors have been equipped with effective, but relatively costly, continuous on-line condition monitoring systems that have automatic defect detection and predictive alarming capabilities. Early warning will be given so as to permit convenient intervention to prevent unplanned failures, which would far exceed the monitoring cost. The monitors are installed, configured and commissioned with appropriate alarm set points.

All good so far – everyone is happy that risk of unplanned failure is well managed.

And indeed all is well for more than

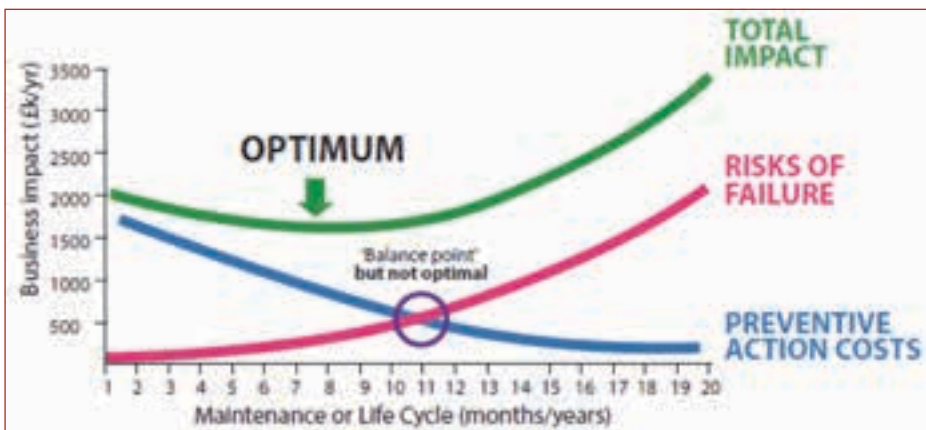
two years. Then a failure occurs in one of the motors, of exactly the nature that should have been detected by the monitor and prevented. All sorts of questions are asked and, most importantly, why did the investment in monitoring not pay off as planned?

On investigation, it was found that the monitors were standalone and under the control of the reliability team. No one had bothered to involve asset management/maintenance or to connect the monitors into a system to bring the predictive alarms to the attention of anyone at all. Nor were any measures put in place to have the monitors inspected regularly to check for alarm conditions. When the monitor's stored data was examined after the failure, the records showed that the monitor had detected the deteriorating defect and had first been in low- then high-level alarm for months, but no one knew. More specifically, no one who was in a position to recognise the importance of the alarm and do something about it.

The above example relates to condition monitoring to improve plant reliability. Let us look at another common example where condition monitoring is employed to improve plant efficiency. Valves, glands, gaskets, steam traps, pipes, pressure vessels and the like deteriorate over time. If not attended to, the consequence is huge losses – and potential safety and quality issues – due to compressed air, steam and gas leaks. Many energy managers are well aware of this and engage professionals to survey their plant to locate, tag and report such leaks so that they can be fixed and the losses stemmed. This is recognised to be one of the most basic and beneficial energy saving interventions that any plant employing these utilities can do. It's simple and obvious.

It is also obvious that no benefit will accrue if the leaks are not fixed.

Why, then, is it not unusual to go to the same site to conduct repeat leak surveys only to find the same leaks previously reported still unfixed, with the tags



Caption: Physical asset management is a structured approach in which techniques and processes are determined and formalised to allow an organisation to both achieve and demonstrate that it is managing its assets optimally.

maintenance —

from the last or even the last two surveys still in place? Similar to the example of the failed motor, the fact that corrective action needed to be taken was never brought to the attention of that part of the organisation that was in a position to do something about it.

The cause and fix for both examples seem entirely logical and certainly very embarrassing and costly, but since there have been multiple such incidents in a variety of organisations, it points to an endemic and common problem. In these situations, there is no point fixing the symptoms. It is essential to get at the root of the problem, which occurs for one simple reason – the physical asset management system is deficient. If it was as comprehensive and managed as it should be, then reliability engineering, energy management and maintenance would be brought closer together, since they have a common objective in taking care of the physical assets of the organisation. In fact, let us consider just a few of the benefits applicable to these assets that would have accrued from a mature asset management system:

- The fact that condition monitoring was required would have been a natural outcome from the asset criticality assessments that would have been done.
- Historical failure analyses would have identified the most appropriate monitoring regime, considering both technical and economic factors.
- The necessity for getting asset health data back to maintenance planners would have resulted in regular inspections and alarm outputs going to the right people to respond to them.
- When a defect condition was detected, timeous corrective action would have been initiated, planned, scheduled and completed, with the necessary spares and resources made available and the corrective action verified for efficacy.
- Plant performance would be routinely measured and reported to top management.
- The statistics showing improved plant availability and efficiency would ensure ongoing management support.
- Because benefits to the organisation are quantified and visible, the sustainability of the plant's proactive maintenance strategy is ensured.

The term 'physical asset management' employed here is not a loose one, but in the strict sense of the principles embodied in the ISO 55000 series of standards and related documents. It is the key to success for any asset intensive organisation since it permits the knowledge and tools that are required by the organisation to be harnessed in order to extract the intended value from its assets, and so achieve its purpose. It is a structured approach in which techniques and processes are determined and formalised to allow such an organisation to both achieve and demonstrate that it is managing its assets optimally. It fully supports all aspects of a mature proactive maintenance strategy. This is well illustrated in the chart opposite, which is an extract from the Institute of Asset Management publication 'Asset Management – an anatomy', version 2, July 2014.

Seen in this light, how well is your condition monitoring integrated into your asset management system and how well would your enterprise asset management system (EAMS) perform? □

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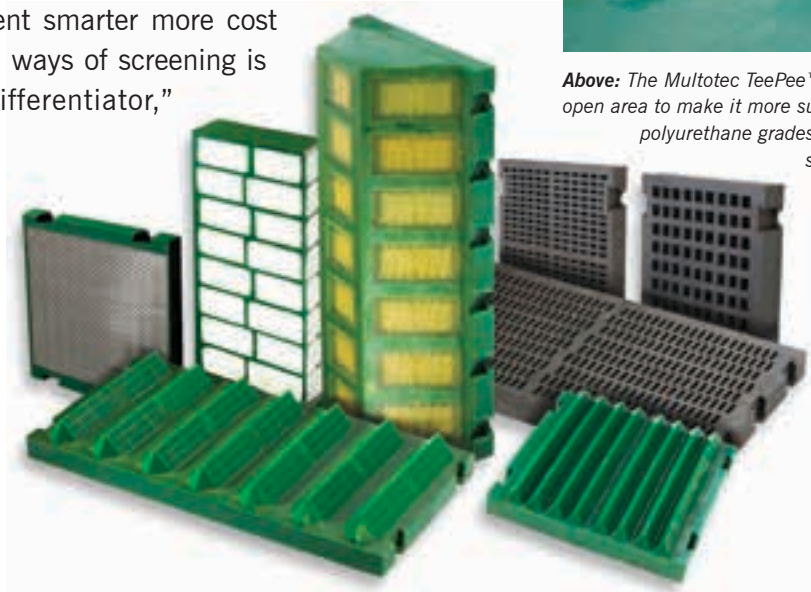
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Customised solutions for screening efficiency

As the demand for enhanced efficiencies and throughput increases, the market is seeking proven solutions that can be customised to suit specific applications, according to Rhodes Nelson, managing director of Multotec Manufacturing. “The ability to stay abreast of technological changes and implement smarter more cost effective ways of screening is a big differentiator,” he says.



Above: The Multotec TeePee™ three dimensional screen panel has an optimised open area to make it more suitable for dewatering applications. **Left:** Various polyurethane grades, rubber grades and steel grades of Multotec's screen panels are available.

“The screen panel is the most critical aspect of the screening application as it defines the product you will receive from the process,” Nelson argues, adding: “For this reason it is essential for the appropriate panel to be in place to ensure correct feed envelopes to downstream processes. Much of the time, screening media is misunderstood and insufficient attention is given to this critical component.”

He says that one of the current driving forces in screening is the ability to determine the wear of screen panels and to plan for its maintenance and replacement. “By being able to establish wear patterns before they cause a shutdown, process plants can save substantial amounts on labour and downtime costs. As a result, we have seen an increasing demand for our online monitoring system, Hawkeye, as well as for enhancements in recording processes.”

Visual wear indicators are another technology that is seeing increased demand as it provides a major advantage in terms of monitoring screen panels.

These systems provide visual indicators that show the incremental wear rates occurring on screening media. As the aperture wears, the visual dots become clearly visible “so that the change-out criteria cannot be misinterpreted”. The end result is far more accurate planning for screen panel replacements.

Nelson cautions that the use of visual wear indicators does, however, require active field service participation, with attention to visual observation and monitoring of screen panels to provide feedback. But if correctly implemented, visual wear indicators can further optimise screen performance.

Multotec is seeing a significant change in end users' expectations with respect to product quality and adherence to specifications. Nelson believes that this is predominantly because of the oversupply situation and applies specifically to coal and iron ore plants. “This has led to sampling of product now being far more critical, leading to a need for more accurate feed envelopes to the various processes and for the end product.”

Multotec strategically invests into R&D

to respond to direct customer demands. This has resulted in the development of a number of products and solutions that are geared towards increased return on investment. “Another development we have seen is three dimensional screening with screen panels that have been optimised with respect to open areas. An example is the Multotec TeePee™ panel for dewatering applications,” says Nelson. In addition, Multotec's O-slot™ aperture is being successfully used in iron ore applications where panel life needs to be optimised, while still retaining non-blinding characteristics.

Added to this product development is the availability of multiple screen material options that include various polyurethane grades, rubber grades and steel grades, depending on the customers' process application requirement.

Ongoing market analysis has resulted in Multotec increasing the variety of options and the configuration of its Saddle Top™ runner system to protect both the sub-frame and improve meantime between failures (MTBFs). Coupled with this is accessibility to a wide range of fit-for-purpose attachment systems, which give customers additional flexibility without having to change the screen sub-frame.

“The cornerstones of success for Multotec are unequivocal and uncompromising customer service, customised solutions, product excellence in design and engineering, and a team of highly skilled and experienced employees who are able to devise bespoke screen panel solutions that ultimately result in superior throughput of product,” Nelson assures. □

Pulley lagging reduces costs and increases safety

Conveyor belt slippage, poor traction, inferior wear properties and inadequate water shedding are nightmares that plague plant operators on mines. All of these can cause unplanned downtime with associated cost implications. However, more critically, conveyor belt slippage is potentially dangerous and could even result in catastrophic failure on a plant. Where slippage continues, there is an increased danger of fire as well as damage to the carcass and splice, caused when the belt does not grip.

This is according to Mark Jarrett, national sales manager of Multotec Wear Linings, who says that the company's MultoLag™ pulley lagging functions as a maintenance-free, wear-resistant cover that is applied to pulley shells to improve traction in the case of drive pulleys and to provide a polished low friction surface on non-drive pulleys.

MultoLag™ has become a widely accepted solution for mining and industrial operations as a cost effective response to these recurring problems. "This lagging is particularly effective in aggressive conditions, even on bucket elevators or where material is inevitably trapped between the pulley shell and the conveyor belt. It is suitable for wet conditions and where a high level of traction is required on drive pulleys, a low coefficient of friction on the non-drive pulley or when general

wear protection is needed," Jarrett says.

Traditional rubber or epoxy pulley lagging has a much shorter lifespan than that of ceramics. "This can be attributed to the fact that material is removed from both the rubber lagging and the rubber belt bottom cover when belt slippage occurs. In comparison, direct-bonded ceramic lagging results in a significant extension of the useful pulley life."

The system uses standard smooth high alumina ceramic tiles for non-drive pulleys and studded tile lagging for drive pulleys. The smooth/polished surface provided by the very hard ceramics on the non-drive pulleys provides minimal friction, less resistance and therefore no wear. Conversely, the studded tiles on the drive pulleys have a coefficient of friction as high as 0.78, which reduces relative movement between the lined drive pulley and the belt. What is significant is that, without relative movement between surfaces, there can be no wear.

Ceramic lined drive pulleys are covered with high-density 20×20×6 mm ceramic tiles, with 1,0 mm round-edged studs on the tile face that create maximum traction, without the associated damage to belts. The 6.0 mm high-density smooth ceramic tiles are bonded directly to the pulley's surface with Multotec Hi-Bond epoxy.

"This epoxy allows us to achieve



MultoLag™ pulley lagging functions as a maintenance-free, wear-resistant cover.

a bond strength at least 70% higher than that of rubber to steel or rubber to ceramic. It also allows for surface flexing, corrosion protection and water dissipation. And in the unlikely event that patching is required, local damage can be repaired quickly without removing the surrounding pulley lining," Jarrett says.

"The reduced maintenance and downtime, together with enhanced safety benefits, have made the MultoLag™ a popular choice for leading mining and minerals processing companies. In one particular application the system has been in operation for over five years in comparison to a mere eight months for the original liner," Jarrett concludes. □

Coal sampling technology ensures high quality

Accurate sampling of product is providing coalmining operations with a distinct advantage. By creating a clear understanding of what raw material quality is being supplied, process managers are given an early indication of the final product grade and yields.

Willem Slabbert, applications and process manager at Multotec, says that with accurate and unbiased information, better optimisation decisions can be made regarding how the ore is best beneficiated, and whether a high yield intermediate middling, or high quality final product with lower yield will be produced. "Composite sample provides a result that is fully representative of the quality of the whole, whether done on a two-hourly, daily or batch sampling basis.

"It is also an important facet of a coal operation to allay concerns that out-of-

specification coal is being supplied. Correct sampling designs facilitate this process by capturing accurate and precise data of the relevant product," he continues.

Rolf Steinhaus, sampling specialist at Multotec, says that Multotec has always participated actively in applying sampling best practice and ISO standards in the coal industry, and for other commodities including iron ore, base metals, gold, platinum, heavy mineral sands and manganese.

"Our primary focus is on providing reliable and accurate sampling solutions that can be validated. There is a solid footprint of operational sampling plants and individual sampling machines Multotec can refer to in South Africa.

In-depth expertise and experience enables Multotec to engineer fit-for-purpose sampling plants capable of achieving successful results. Multotec's ongoing invest-



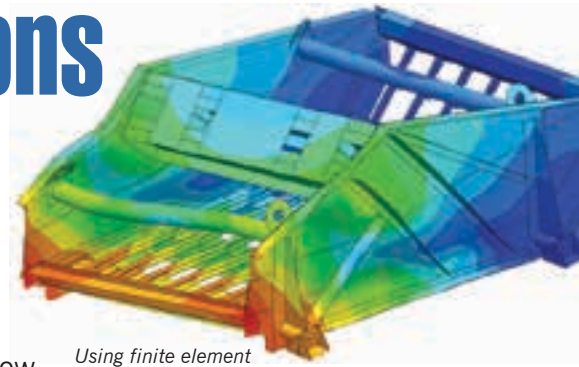
A fully assembled, quality control- and FAT approved Multotec sampler with spares ready for despatch.

ment into research and development, in conjunction with its licensor Siebtechnik GmbH in Germany, has played a major role in positioning Multotec coal sampling technology as one of the most credible in the industry today. □

Coal dewatering solutions

for lower ownership costs

In the coal processing industry, the total cost of ownership (TCO) model is heavily dependent on strategies that lower the initial capital cost of replacement screening machines. Coupled with this is an emphasis on an improvement in the overall durability of traditional coal dewatering screens towards lower operating costs. Weir Minerals' Kurt O'Bryan (below left) and Winchester Maphosa (below right) explain.



Using finite element analysis assists in providing lower cost solutions to customers.



According to O'Bryan, Weir Minerals' global product manager for screens and screen media, achieving TCO goals is possible by carefully and strategically

matching solutions to specific customer needs and applications. He notes that the company's latest developments in coal screening technology are focused on increasing the size and mechanical durability of its coal duty vibrating screen line. The Enduron® product range from Weir Minerals – formerly known as Linatex® – concentrates on increasing throughput and decreasing downtime.

The supply and installation of Linatex screening equipment in the coal industry spans a number of decades. The first Linatex dewatering screens for a coal application were supplied in 1983 to Anglo

American Coal's Kleinkopje operation in South Africa. Linatex dewatering screens have since been successfully supplied for fine coal applications, where they significantly reduce the moisture content of the fines product.

Over 450 Linatex banana and horizontal screens in single and double deck format, sieve bend static screens and horizontal rotary screens have been supplied to the coal industry for applications ranging from primary dewatering and desliming to dewatering of final product. The customer list includes Anglo Coal, BHP Billiton – now South 32 – Exxaro,



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JHDA and Portacalone. “Weir Minerals Africa continues to provide support for these screens and, in a number of installations, the screens have operated for in excess of 10 years without any replacements being necessary,” says Winchester Maphosa – Weir Minerals Africa product manager for comminution and screens.

He explains that Weir Minerals has implemented a number of innovations to improve the design of the dewatering screens in order to increase the longevity and maintainability of the screens. An example he cites is the replacement of the corrosion resistant 3CR12 box deck frame design with a crossbeam and 3CR12 stringer/runner design. This has eliminated the downtime and production losses that previously resulted from premature deck failures due to latent welding defects.

Another brand within the Linatex range from Weir Minerals recently launched in the North American coal market is the high performance Fusioncast® polyurethane screen media panels. The material is designed to maximise service life through superior abrasion resistance, a critical factor in coal dewatering. The product’s properties and wear characteristics make it ideal for use in a number of coal applications including raw coal refuse screens and fine screening.

“In field trials it was confirmed that the product exhibits wear life advantages of up to 50% when compared to injection moulded polyurethane screen media panels. This results in a significant time and cost saving for customers. Added operational flexibility is also a feature, because the product can be supplied with a wide range of openings for separations as coarse as 25 mm,” says O’Bryan

An example of the success of this product is in an operation in North America’s Western Kentucky. After conducting six weeks of head to head trials between the existing continuous slot panels and the Fusioncast panels, the Fusioncast panels were found to have a significantly superior wear life performance.

“As a result of the resounding success of the Fusioncast technology trials, the customer opted to replace the 1 100-plus panels with Fusioncast panels throughout various raw coal, clean coal and fine refuse screening applications in its plant. Further leveraging the success of the trials, the company has been invited to tender on a number of screen media supply contracts, including one for some of the world’s largest coal preparation plants,” O’Bryan points out.

In 2014 Weir Minerals Africa aligned its screens brand with its Enduron comminution equipment, allowing the company to provide 3.0 to 4.3 m wide screen designs for large

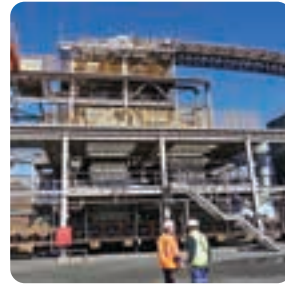
modular coal plants. O’Bryan says that the Enduron VD dewatering screen range has been designed to ensure that maximum efficiency and lowest cost of ownership is achieved.

Featuring an innovative 45° degree feed section, the Enduron screen’s feed profile effectively increases the screening area and the dewatering capacities, using high feed end velocities to aid in the dewatering process. The main deck of the screen slopes upwards to maximise solids retention and to dewater the cake bed.

The lightweight Enduron VD dewatering screen is suited to applications in the sand and aggregates, and mining and minerals processing industries and can be supplied in variations from 0.3 to 3.0 m wide. □



Enduron dewatering screens ensure maximum efficiency and lowest cost of ownership.



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"This book is a perfect learning aid for students who have not been familiar with engineering drawing. The additional standards, conventions and explanations for manufacturing drawings in particular are an important addition for reference to anyone who needs a refresher when producing drawings. The additional link between manual drawing, and CAD makes the use of this manual possible with any teaching method."

Kirsty Veale MscEng, BScEng. (Mechanical) – Lecturer, University of KwaZulu-Natal. Managing Coordinator of Engineering Drawing in the School of Engineering, UKZN (2015 – present).

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Drewan Bennett: Engineering Drawing and CAD lecturer, Department of Mechanical Engineering, Durban University of Technology (DUT).

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Dr David Jonson: PhD, Associate Professor, Department of Mechanical Engineering, Durban University of Technology.

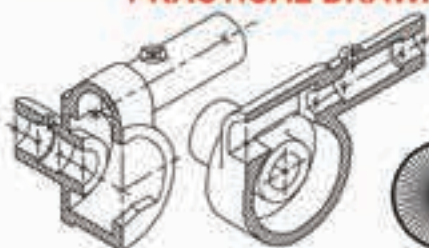
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Dr Sarp Adali: Sugar Millers Professor of Engineering Design; Fellow of University of KwaZulu-Natal; Fellow of the South African Royal Society; Fellow of American Society of Mechanical Engineers.

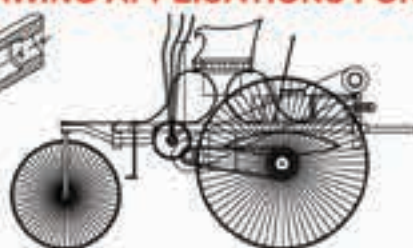
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Prof Glen Bright: James Fulton Professor in Mechanical Engineering; Academic Leader Discipline of Mechanical Engineering (UKZN); PhD, MSc, BSc, MBA.

PRACTICAL DRAWING APPLICATIONS FOR REAL DESIGN SITUATIONS



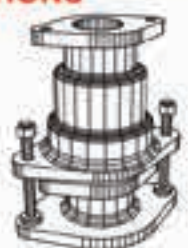
Isometric Sectional Views



2D Vector-Based Drafting



3D Solid and Surface Modelling



3D Wireframe Drafting

Benchmark chute systems and transfer points



Mark Baller, managing director of Weba Chute Systems, believes that transfer points are finally being recognised as key elements in plants. “This has seen other players enter the market as they too begin to recognise transfer points as critical to the operational success of plants,” he says.



Each Weba Chute System is engineered for the specific application and this is what accounts for the success that these transfer points have achieved worldwide.

longer the stepchild of the process plant and has been given its rightful position as an integral and important part of the operation,” Baller concludes. □

“As the market leader with more than 4 000 Weba Chute Systems successfully operating globally, we welcome legitimate competition as it keeps companies motivated and customers are ensured of continual improvement in both product and service delivery,” begins Baller. Significantly, the global benchmark for transfer points is the Weba Chute System.

Weba Chute Systems pioneered the engineered transfer point and extensive research and development by the company identified the root causes of numerous problems related to materials handling at transfer points. These include lack of material control resulting in excessive impact and poor belt loading, disproportionate wear, excessive dust emissions and spillage.

Today, the Weba Chute System is a custom engineered transfer point solution designed to address the numerous issues plants face with material movement. Each chute system is engineered for the specific application and this is what accounts for the success that these transfer points have achieved worldwide.

Baller says that what makes it difficult for new entrants to get it correct is that there are so many factors that affect the material during its movement through the plant. Added to this, he says, each transfer point will have completely different requirements depending on what stage of the process flow the material is at. “Experience cannot be underestimated when it comes to correctly engineering a chute system as each application is completely different,” he says.

“Weba Chute Systems has an enormous advantage over the ‘newbies’ given that we have over 25 years’ experience and a reference base that dates back that far,” Baller continues. Each of the chute system solutions provided by Weba Chute Systems was a custom engineered

transfer point designed to specifically deal with the exact application requirements.

During the design phase all aspects such as belt speed, belt width, material size, shape and throughput are taken into account. The custom design allows control of the direction, flow and velocity of a calculated volume and type of material in each individual application and, at the same time, drastically reduces dust. Using a ‘supertube’ or cascade scenario, 95% of the material runs on other material in a tumbling motion that further reduces wear.

“Weba Chute Systems takes great pride in fact that the transfer point is no



The Weba Chute System is a custom engineered transfer point solution designed to address the numerous issues plants face with material movement.

Game changers from SA electrical equipment OEM

At a media event at its Linbro Park, Sandton premises on January 21, 2016, Zest WEG Group Africa announced an annual 'game changer' with extended product guarantees across its product portfolio. *MechTech* attends and reports.



Louis Meiring, Zest WEG Group CEO; Gary Daines, MD of Zest WEG Electric; and Juliano Vargas, Group project and logistics director.

“Zest WEG Group Africa is known for leading industry in its thinking and the decision to extend the product guarantees is, we believe, another very important first,” begins Louis Meiring, CEO of Zest WEG Group Africa. “While the extended guarantee will cover customers for unexpected electrical and/or mechanical failures giving them absolute peace of mind, it is not going to cost them more.”

Meiring says that this was a prime consideration for Zest WEG Group Africa as the organisation is well aware of the additional financial pressures that many of its customers are operating under in the current financial climate. “By extending our product guarantees we are increasing the peace of mind that customers have with WEG products and opening the door for potential customers to examine what we know is an unbelievable value proposition.”

“Extending product guarantees is aligned with our strategy of forming long term partnerships with customers. Continuous product improvement is ongoing at WEG and indeed at Zest WEG Group Africa’s local manufacturing facilities and the benefit of this must, of necessity, be passed on to our customers allowing them to optimise their operations,” Meiring says.

Gary Daines, managing director of

Zest WEG Electric says that the company strives to identify a ‘game-changer’ every year. “During 2015, we announced that our IE2 efficiency W22 motors would be replaced by IE3 efficiency versions, at no additional cost to the customers. We also introduced a three-year guarantee on the W22 motor range in South Africa, in a bid to reduce energy costs for operators and to reinforce our confidence in the product’s

reliability,” he says.

As a result, Zest WEG has seen a shift in electric motor sales. “We were supplying 60% standard efficiency (IE1) and 40% high efficiency (IE3) motors prior to 2015, but we have since seen that reverse. We are now supplying 60% high efficiency and 40% standard efficiency motors,” he reveals.

“For 2016, we are extending the guarantees on all of our WEG products,” says Daines. “This is an industry first. Starting with the W22 motor guarantee, which is extended to five years, a guarantee period that has not been seen before on an electric motor,” he adds.

Displaying a summary of the new extended guarantees on all Zest WEG products from 2016, he says: “Extended guarantees will vary from product to product, but all customers are still assured of the same high level of in-field support for which Zest WEG Group Africa is known,” before going through the full extended guarantee list:

- WEG W22 low voltage motor guarantees are extended to five years.
- WEG variable speed drive (VSD) and soft starter guarantees are extended to two years.
- Where WEG motor and drive combinations are used, the WEG drive guarantees are extended to three years.
- Where WEG motor and soft starter combinations are used, the WEG



soft starter guarantees are extended to three years.

- WEG switchgear guarantees are extended to three years.
- WEG transformers guarantees are extended to three years.
- If WEG transformers are acquired with a WEG service plan, the transformer guarantee is extended to five years.

“We have reviewed the performance of all WEG products over an extended period and are confident that all of our range will meet their guarantees with ease,” says Daines.

Local transformer manufacture

Second, Daines presents an update on WEG Transformers Africa (WTA) Zest WEG Group’s investment in local manufacturing and support for transformers. “Our transformer business started in 2004 with imports from Brazil and, to date, we have supplied over 400 transformers into the South African market, the largest being 160 MVA, a unit that weighs around 180 t when fully assembled.

“We took the decision to become a local manufacturer of transformers back in 2010, but it took time to establish what we were looking for. In September 2013 we acquired Hawker Siddeley, a well-established local manufacturer that did not yet have a global technology partner. We were able to bring in WEG as that partner. This is important, as local manufacture cannot be sustainable with-



The full range of WEG transformers are now guaranteed for three years, with the option to extend to five years by taking out a WTA Service plan.



Above: The newly commissioned automatic foil-winding machine at the WTA Wadeville facility.

Left: Zest WEG has extended the guarantees on its WEG motor range to five years, while if bought in combination with WEG motors, its VSDs and soft starter guarantees are extended to three years.

out the new technologies, materials and optimised manufacturing techniques required to meet international product standards," Daines points out.

By linking local manufacture with WEG's global technology expertise and its R&D capability, WTA can now manufacture and offer custom-designed, oil-filled transformers of up to 40 MVA at 132 kV; mini-substations of up to 2 000 kVA; transformer repairs for units of up to 100 MVA; as well as on site service and maintenance.

"On the Engineering side, we have software that links directly to Brazil for electrical performance, modelling, wiring and accessories, for example, which enables us to design and manufacture total engineered solutions according the highest global standards," he adds.

The Hawker Siddeley factory has been completely stripped out and re-equipped to accommodate the higher quality levels required. "We have even reversed the direction of the assembly line, from west to east to east to west," Daines says before listing some of the new equipment investments: new cranes with capacity of up to 25 t; core cutting and stacking systems; new shot blasting and acid bath facilities; a powder coating bay; a new fabrication workshop; and new foil winding machines, amongst others. "And the refurbishment of the two bays of the factory was accomplished without having the halt production," he says.

Citing, in particular, the core cutting and stacking system he says: "Core cutting and stacking are labour intensive tasks, so we have installed new tables



or off site.

"Our oil purification system is one of the largest in the country and we can purify oil onsite and in situ. Also, depending on the voltage, we can even do it live," Daines notes.

WTA already employs 300 staff at its Wadeville and Heidelberg facilities, has an active skills development programme and has benefitted from total capital investment of R250-million. "We are now 100% aligned with National Treasury requirements for local manufacture of transformers, which it has identified as 'designated products'. This means that all municipalities and utilities in South Africa are mandated to use transformer products with 90% local content. WTA puts us into an ideal position to supply into this market with technology that meets the highest global standards," Daines believes.

Meiring concludes: "This is all in line with Zest WEG Group's strategy of forming long-term relationships with our customers. Last year we were 35 years old and through that time, we have always strived to offer customers absolute peace of mind.

"We plan to continue to bring innovative initiatives to market that will add value to customers' operations – and despite being part of a major global corporation, we have not lost the flexibility and responsiveness for which we have always been known." □

and an innovative stacking rod table to minimise error and improve the consistency of our transformer cores."

Also added is a R20-million state-of-the-art test facility where the performance of every transformer manufactured is measured and recorded. The testing station is directly linked to the engineering software so that performance can be automatically compared to that specified in the original design. Four test bays are available, capable of testing units of up to 100 MVA at 132 kV – and all tests are conducted in accordance with SANS 780 and IEC specifications.

In addition, Zest WEG Group acquired TSS Transformers in 2015 to bring repair and service components to its offering. "With the deterioration of the local skills base, we felt the need to compensate by offering complete maintenance and service contracts to electrical infrastructure operators," Daines explains.

Added capabilities include: transformer oil sampling and analysis; oil analysis interpretation; oil purification, regeneration or replacement solutions; and repairs and maintenance, either on

SKF and Lincoln Lubrication SA

In February 2015 SKF successfully acquired South African-based Lincoln Lubrication SA (Pty) Ltd and the company now forms part of SKF's Lubrication Systems core technology.

Lincoln Lubrication SA specialises in Asset Protection Management with Full Circle Reliability. Our understanding of assets includes not only machines, and equipment, but also staff and their safety.

Lincoln Lubrication specialises in automated lubrication systems that can be fitted to any application, machine or piece of equipment. In addition to lubrication systems and equipment, Lincoln Lubrication also offers other asset protection management technology including hose reels, liquid Fast Fill, and fire suppression systems.

As a complementary product, GreenLinc offers environmentally accredited spill kits.

For more information about the acquisition and Lincoln/SKF Products and Services, please contact your nearest SKF/Lincoln Lubrication Distributor or Branch.

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Exploiting the potential of composites

Schuler is leading a project group to improve resource efficiencies for the serial production of fibre-reinforced plastic components. Called iComposite 4.0 to reflect its use of industry 4.0 and the Internet of Things, the project is developing near net shape and additive production processes to drastically reduce the costs of manufacturing composite components.

As the importance of light-weight construction methods continues to rise, the automotive industry is increasingly considering fibre-reinforced plastics (composites), due to their high strength combined with low weight, which offer lightweighting potential that has not yet been fully exploited. Currently, however, high component costs, among other things, are preventing the widespread use of composite parts.

In response, the beginning of 2016 saw the launch of iComposite 4.0, a group project led by Schuler aimed at achieving economical serial production of components made of fibre-reinforced plastics through increased resource efficiency.

Due to the high material cost, resource efficiency opens up enormous potential for cost savings. One approach to decreasing the component cost is to drastically reduce material use and processing times in production. Current technologies are associated with significant production-related scrap. The material cut-off from semi-finished products during manufacturing can be up to 50% of the input resource, for example.

The iComposite 4.0 project aims to address these cost inefficiencies. Cost savings can be achieved by adopting near net shape processing and additive production processes (3D printing), in combination with a resin-injection method established in the industry. In addition, by networking production systems to regulate system intelligence, also known as the 'Internet of Things', better control and 'just-in-time' production can be achieved.

The starting point of the networked production system is additive fibre spraying, which is a highly productive process to generate the basic structure of the component. After this, fibre strands are applied very precisely and in accordance with the load profile in order to absorb

peak loads in the part and to compensate for part variations in the fibre spraying process. Then, during the injection of resin and shaping in the press, the die's deflection is deliberately influenced in order to obtain the desired wall thicknesses of the part.

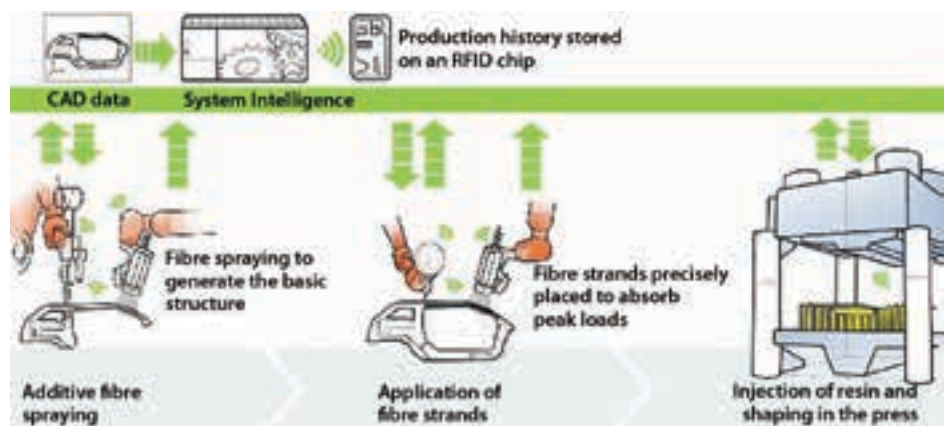
During the subsequent process steps, regulating system intelligence compensates for any fluctuations in the part's properties in order to minimise scrap. The production history is stored on an RFID chip integrated into the part. This uninterrupted quality monitoring and linking of individual systems along the production line in accordance with Internet of Things methods is ultimately aimed at achieving a zero scrap rate.

In addition to Schuler, partners of the group project sponsored by the German



The group project is aimed at the resource-efficient serial production of fibre-reinforced plastic parts. Photo courtesy of IKV, AZL.

Federal Ministry of Education and Research (BMBF) are: the Aachen Centre for Integrative Lightweight Production (AZL) at RWTH Aachen; Apodius GmbH; Broetje Automation Composites GmbH; Frimo Sontra GmbH; ID-Systec GmbH; the Institute of Plastics Processing (IKV) in Industry; the Skilled Crafts at RWTH Aachen; Siemens AG; and Toho Tenax Europe GmbH. □



A self-regulating production line makes it possible to maintain defined characteristics of composite parts.

Schuler: a market leader in forming equipment

With energy efficiency driving the development of new lightweight materials, Schuler is at the forefront of solutions for the future.

The company delivers systems, tooling, process expertise and services for the entire automotive industry and is the technological and global market leader in forming equipment, offering cutting edge presses, automation, dies, process know-how and services for the entire metal forming industry.

Its clients include car manufacturers and their suppliers, as well as companies in the forging, household equipment, packaging, energy and electrical industries.

Schuler is also a market leader in coin minting presses and supplies solutions for the aerospace, railway and large pipe industries. In 2014, Schuler posted sales of €1.18-billion. The company has around 5 400 employees and is a member of the Austrian ANDRITZ Group. □

HVAC contract for class 23E locomotives

Booyco Engineering has won the prestigious contract for the supply of HVAC systems for 240 Bombardier Transportation Traxx Africa locomotives for Transnet Freight Rail's (TFR) Class 23E locomotives.

The award of a contract to supply HVAC systems for the 240 Bombardier TRAXX Africa TFR Class 23E locomotives being built by Bombardier Transportation for TFR's General Freight Business (GFB), is testimony to Booyco Engineering's international reputation for engineering

specialised HVAC solutions.

The HVAC systems are an evolution of the previous systems that were engineered for the 15E and 19E locomotives. These systems have an established track record for reliable performance under the harsh operating conditions in South Africa, making them suitable for even the most

demanding environments worldwide.

"What is of great significance is that Booyco Engineering is dealing with sophisticated international players whose standards and specifications are at a very high level. This contract underlines our ability to perform at this level and firmly positions us to participate in the international market on an ongoing basis," says Booyco Engineering managing director, Jeremy Pougnet.

Booyco Engineering's successful track record is underpinned by verifiable data from the in-field operation of the HVAC systems, which shows that MTBFs (mean times between failures) is exceeding expectations.

The new HVAC systems incorporate a number of innovations that include an integrated fresh air control that allows the fresh air inlet to be temporarily closed when the locomotive travels through areas where the ingress of the outside air is undesirable. In addition, the maximum ambient temperature specification was raised and the condenser heat rejection capacity was increased accordingly. The 8,3 kW cooling system is rated for an ambient temperature of 50 °C, with a 4,5 kW heating system. In addition to being designed to achieve low noise levels, the Booyco Engineering units are



Booyco Engineering's technical team, from left: Clinton du Plooy, electrical team leader; Thomas Stevens, quality manager; Grant Miller, engineering manager; and Salman Pienaar, mechanical team leader.

Gas sensing made easy

Developing fit-for-purpose products that utilise sensors requires an in-depth knowledge of sensing technology as well as the ability to identify the correct sensor and integrate it with the electronics and intelligence required for the desired final product. Booyco Electronics has established itself as a provider of sensors that not only meet these exacting requirements but are also designed to operate in the often harsh operating conditions found in Africa on both underground and surface mines.

Accurate measurement of gases is made simple with the South African manufactured ESI Smart Sensor. Significantly, this compact sensing unit, weighing only 1.8 kg, has the ability to measure one of 15 different gases from a single controller. This feature sets the instrument apart from other such units currently in the market.

Gases that can be monitored using this EXia T4 intrinsically safe gas sensing instrument include oxygen (O₂), carbon dioxide (CO₂), flammable gases such as methane

(CH₄) and combustible gases such as carbon monoxide (CO). The instrument also carries SANS IEC 60079 Part 0: 2005; SANS IEC 60079 Part 11: 2007; and IEC 60529 (IP code) approvals and offers ingress protection to IP56.

The ESI Smart Sensor has a localised information display making it simple to read, and it can also accommodate other sensors with analogue outputs, such as air velocity sensors or smoke detectors. In addition, the ESI Smart Sensor can easily be connected to a fire detection system with SCADA reporting and display capabilities.

When it comes to handheld gas detection devices, Booyco's Sentient is in a class of its own. Specifically developed to improve safety in confined spaces, this handheld multi-gas sensor also measures relative humidity as a standard offering.

The Sentient is a low maintenance unit without any buttons and is operated using an innovative 'tap' sensor ensuring that the instrument remains watertight. Another unique feature is its drop protection capability that automatically switches the device off should it be dropped.



The ESI Smart Sensor.

Developed for use in underground mining as well as on surface plants, the Sentient is IP68 rated and is also available with Fire Patrol capabilities. The Fire Patrol Sentient unit has a bright red seal and is inserted into outstations located in specific areas underground or on the surface. The device then records date, time, gas and humidity measurements at that specific location.

The handheld sensor is equipped with a downloading network configuration capable of gathering information from up to 500 Sentient units in a matter of minutes. All the equipment can be connected via a

also extremely robust, affording optimal reliability and availability.

In addition to the HVAC systems for the locomotives, Booyco Engineering secured the order for the 480 cooling towers, which provide cooling for the transformer and converters on the locomotives. "It is our ability to understand heat transfer, air dynamics, fluid flows, pressure drops and structural design that positioned us to secure this additional order. Added to that, we have a solid understanding of the harsh operating conditions for rolling stock, which include shock and vibration," Pougnet points out.

"The order includes two cooling towers per locomotive and the units have successfully passed all qualifications tests to date, including thermal testing in Europe. Final acceptance will be based on the vehicle test on the locomotive," says Pougnet.

"We have leveraged our extensive expertise, experience and capabilities and increased our capacity through upfront resourcing and investment to ensure that we are in a position to deliver product expeditiously. Our responsiveness, competence and technical engineering support have been duly noted by the client," says Pougnet.

The new systems were in serial production by the fourth quarter of 2015, with the final units scheduled for delivery by the end of the first quarter of 2018. □



Booyco's Sentient handheld gas detection device.

network to a Sentient downloading server, where specialised software enables various reports to be generated, such as detailed information on gas detected in the underground environment, peak values, TWA values, pre-shift tested values, calibration reports and 'no movement reports'. In addition, Sentient software is web-based, making it possible to email these reports to relevant personnel automatically. □

Harnessing the ocean to heat and cool buildings

The V&A Waterfront's Silo District is recognised as one of the most advanced and environmentally-friendly developments in Africa. Contributing to this reputation, the completed No 1 and No 2 Silo developments use the waters of the Atlantic Ocean in the surrounding harbour to provide cooling and heating to the R2.5-billion project, which is due for completion in 2017, by when an additional four silo developments will be fully-operational.

Heating and air-conditioning solutions provider Carrier is playing a central role in the final stage of this project, with the installation of a 6.0 MW cooling plant that will provide the same cooling and heating solutions to Silos No 3 to 6. Carrier is a business unit of United Technologies Corp.

Carrier business development manager Jaco Smal notes that the AquaEdge 23XRV variable speed screw chiller is a highly-efficient cooling solution that achieves a coefficient of performance (COP) of between 10.37 and 16.04 under various conditions. COP is a measurement of efficiency obtained by dividing the cooling power output by the electrical power input. The higher the number, the more efficient the system.

"By circulating seawater through heat exchangers, the system does not require cooling towers to reject heat into the atmosphere. Instead, it rejects unwanted heat into the ocean. As a result, the system gains from the efficiencies associated with water cooling, and avoids the pitfall of water usage through evaporation in cooling towers," he says.

The Carrier AquaEdge 23XRV chiller also makes use of non-ozone-depleting HFC-134a refrigerant and next-generation, patented tri-rotor screw compressor technology.

"This unique chiller is able to use the variable frequency drive (VFD) to reduce speed and optimise operation, independent of ambient conditions. As a result, it is able to precisely match building load and conserve energy, making it the world's most efficient chiller in these conditions," explains Smal.

In addition to breaking this efficiency barrier, the AquaEdge 23XRV features robust and flexible operation with a wide operating envelope and surge-free compression. The innovative design and high-quality construction makes the AquaEdge 23XRV chiller the most modern and efficient choice in water-cooled plants. It is available in nominal sizes from 250 to 550 t (879 kW to 1 934 kW).

The Carrier cooling plant will provide cooling and heating solutions for four new developments in the V&A Waterfront's Silo District. The Silo District will introduce over 35 000 m² of mixed use, sustainable developments including new corporate offices, a residential development, a health club, an internationally branded hotel, plus over 1 050 additional parking bays.

No 1 and No 2 Silos were completed in mid-2014. Silo 1 ranks as the only South African building to receive a 6-Star 'as-built' GBCSA rating, which signifies world-leadership in sustainable development. The Silo District is also home to the Zeitz Museum of Contemporary Art Africa (Zeitz MOCAA), currently under development.

The district will sit on top of a 2 750 'super-basement' parking bay. When completed, approximately 2 500 people will work in the Silo District and, in an independent 2014 economic impact study commissioned by the V&A Waterfront, the expected nominal contribution to GDP from future developments is R29.9-billion by 2027. □



The Carrier AquaEdge 23XRV chiller makes use of non-ozone-depleting HFC-134a refrigerant and next-generation, patented tri-rotor screw compressor technology.

Fan and evaporation collaboration optimises energy efficiency

MechCaL has teamed up with I-CAT to develop a custom-designed evaporator using one of MechCaL's patented fan designs for a high-energy efficient unit with the first completed units destined for Douglas Colliery.

MechCaL and leading environmental solutions provider I-CAT have joined forces to develop an optimised evaporation canon using MechCaL's low pressure, high flow fans to evaporate mine water. The companies will work closely to leverage MechCaL's technical leadership in the use of composite materials with the I-VAP 500's ability to perform in harsh environments, while providing remarkable evaporation capability.

The aim of this cooperation is to further the efforts of both companies in bringing high performance energy efficient evaporation products to the mining industry. MechCaL's managing director, Jan du Plessis predicts that the joint venture will enable both companies to benefit from a simpler yet highly effective process for manufacturing products for the evaporation of excess mine water. "MechCaL is focused on providing the best mining ventilation and cooling solutions to help mines achieve high efficiency with lower energy usage. We expect that our



MechCaL and I-CAT will work together closely to leverage MechCaL's technical leadership in the use of composite materials for fans.

collaboration with I-CAT will streamline the process for our clients by providing them with a dual solution that is custom designed as opposed to having to secure these products separately."

He adds that MechCaL product's quality design and manufacturing also increase the product life as well as increasing the mean time before failure while reducing maintenance requirements.

The two companies have entered into a memorandum of understanding (MOA) with I-CAT being designated as the sole distributor. Six evaporator/fan units were produced at MechCaL's manufacturing facility in Pretoria last year and final assembly of the units with the intelligent weather control system was undertaken by I-CAT at its facilities.

The I-CAT I-VAP 500 was originally developed following the identification of a need for an effective and environmentally safe evaporation system that can be used to reduce excess wastewater in mines. After thorough research and development done in conjunction with the environmental department at I-CAT, a prototype of the I-VAP 500 was designed and built for trial use.

The I-VAP 500 is capable of handling 500 m³ of water per twelve-hour shift with evaporation rates measured at between 60% and 65%, depending on ambient weather conditions. In order to

ensure that the unit is light, durable and mobile, as well as being resistant to rust, it must be constructed from composite materials – the use of which is one of MechCaL's areas of expertise.

The high energy efficiency unit will have an inlet cone and nozzle configuration that is made from composite materials. The nozzle itself is designed using CFD coding to assist in an optimum flow pattern and droplet throw distance. The MechCaL manufactured I-VAP 500 will also incorporate MechCaL's patented nose and tail cones and state-of-the-art stator design, which improves air flow by reducing turbulence and promoting laminar flow.

The units are designed to be 'fit-for-purpose' with an emphasis on energy, evaporative efficiency and noise reduction. Working within harsh environments, the I-VAP 500 will ultimately manage excess water through evaporation but will also be adaptable for use in dust suppression as well as potential fire fighting applications by changing the water nozzle and pump configuration.

In commenting on the future relationship with I-CAT, Du Plessis says: "I-CAT is a prime example of an innovative company that seeks continuous improvement in environmental applications and thus the innovative nature of our two companies is a hand in glove fit." □

MechCaL and I-CAT

MechCaL was established in 2002 to design and manufacture industrial fans. The company has developed proprietary software that allows for high efficiency designs that reduce CO₂ emissions by using less energy. Out of manufacturing facilities in Pretoria, MechCaL focuses on developing specialised fans made from advanced composite materials.

I-CAT is a leading environmental management company with its primary focus on supplying products and services to assist companies in environmental compliance. The company delivers expert services and products through four main divisions: Dust Solutions, Fire Solutions, Water Solutions and Environmental Solutions. □

Ionisers remove static from manufacturing environments

Static is problematic in the manufacturing environment. Static causes dust and this, in turn comes with its own set of problems. From dealing with the nuisance of products clinging to each other, plastic sheets not separating properly and managing possible damage to electrical products. There is also the real hazard of a possible fire, which can be caused by a spark in a chemically sensitive environment.

SMC Pneumatics is able to offer a solution to these 'every day' manufacturing problems by means of the different types of ionisers available from its product range.

"When working with plastics you often have an unwanted but unavoidable charge of electricity," explains Brian Abbott, product manager for Pneumatics at SMC. According to Abbott, there are various options of ionisers available depending on the application and the environment. "The bar type is equipped with nozzles, which generate charge and air then blows this charge onto the application. This could work in a PET environment for example. It would also be suitable for lamination and web printing. The bar type varies in length and performance options. The nozzles can be equipped with condition monitoring for easy maintenance and replacement of the nozzles.

The unique thing about the SMC ioniser is that it can be ordered in a variant equipped with a sensor. The sensor has a feedback device that is able to determine if a positive or negative charge is required, which it will generate accordingly. The charge relates back to a voltage so that the unit can measure the charge. This is communicated back to the ioniser, where ions are generated to neutralise the charge.

An option without a sensor is also available. In this case the unit will generate alternate charge, which 'bombards' the application with positive and negative ions until it is neutralised. This is, however, a less energy efficient option.

According to Abbott, a local Gauteng dairy PET manufacturer is currently experimenting with this type of solution to assist in managing the static generated when the bottles come off the plastic injection moulding station and onto the shrink wrapper. The static makes the products difficult to handle because they cling to the feeding mechanism of the shrink wrapper. A bar

type ioniser will be deployed to combat this problem.

The ioniser is also available in two other variants. The fan type would generate a charge and blow it over the affected area. This would work very well especially in an area where polystyrene is involved.

The nozzle type consists of a single nozzle and is for concentrated applications where a single area needs to be neutralised. The air supply is blown onto the charged area that needs to be neutralised.

Although SMC is new to the South African pneumatics scene, it has been operating internationally since the 1950's. The company opened up their first wholly owned subsidiary on the continent in April this year. A Japanese owned company with offices in 83 countries, the company boasts more than 12 000 components in their product



SMC's fan style ioniser eliminates static for bench tops and enclosures. Unlike bar or nozzle types, this fan ioniser does not require a pneumatic air supply. The fan draws in ambient air, then ionises the air with four electrodes located around the perimeter of the discharge grill.

range and an international market share of 32%.

Its investments in R&D and new products such as ionisers has seen this Japanese multinational win the Forbes Innovation Prize three times. □



The bar type ioniser is equipped with nozzles, which generate charge, which is blown onto the application. These SMC ionisers can be fitted with sensors able to determine if a positive or negative charge is required. The appropriate charge will be generated accordingly, and in energy saving mode, the system stops generating ions as soon as the charge has been neutralised.



Lubrication management made simple

Leon Muller (left) is currently pioneering the use of lubrication management in South Africa. He talks to *MechTech* about the practical aspects of condition monitoring and the use of ultrasound to trend and optimise bearing lubrication.

Leon Muller started his career in the coal mines of Secunda as an electro-mechanical-hydraulics maintenance specialist in 1985. "After completing my National Diploma, I studied at Cranefield College in Pretoria for a postgraduate diploma in Project and Programme Management and I followed that up with an Asset Management course at the University of Pretoria (Tukkies)," he tells *MechTech*.

"But I am not a tribologist or a scientist. Successful condition monitoring is much more about the practical aspects than the theoretical," he says.

After several years working underground on machine maintenance, in 1998 Muller was asked to start doing condition monitoring on the mine's equipment and systems. "Initially, this involved oil analysis and at that time, there were no service laboratories to analyse samples for us. We purchased a microscope, a debris tester and some test patches and we started measuring the number of magnetic particles on these patches. It sounds primitive, but this simple system remains a very practical way of tracking the wear condition of gearcases, for example," he advises.

Quick diagnostic successes followed, on industrial gearcases for coal cutters, continuous miners, shuttle cars, roof bolters and section, main and inclined conveyor belts.

"We took all of the samples ourselves, did our own analysis and created trending graphs from Excel spreadsheets," says Muller, adding that the system was initiated and supported by a senior manager, which created the positive atmosphere necessary to make the system effective.

"We had to convince experienced production people that we could accurately predict an impending failure by taking a 100 ml sample of oil and then analysing 1.0 ml of that sample on a tiny patch. At first, we had to open up some gearcases to show them the physical defects, but there was an immediate

increase in equipment reliability, so our credibility grew," he recalls. Within a year, a predictive maintenance unit was formally established to operate within the maintenance department.

From its inception to late 1990s, Muller's predictive maintenance and monitoring team has expanded its scope to include: vibration analysis; thermography; laser alignment; motor circuit analysis (MCA); and ultrasound – initially as a safety tool for substations, but increasingly for monitoring and controlling lubrication levels.

Lubrication wear and friction

Citing a well established study from the 'holy grail' of lubrication texts, the American Society of Lubrication Engineers' manual by Dr E Rabinowicz, which was published back in 1981, Muller says that, even back then, the total annual tribological losses in the US due to friction, wear, lubrication, electrical contacts, adhesion and frictional electricity amounted to US\$194-billion. "Rabinowicz reported that 70% of the reason for equipment failure could be attributed to surface degradation, that is, wear of some sort, caused by contamination or excessive friction – and friction is directly related to inadequate or excessive lubrication," Muller says.

"In 2004, we started a fluid management programme and I immediately developed a passion for lubrication. Lubrication management is about how to properly manage fluids and related components, from the day they are received to their safe disposal at the end of their life. The main objectives in setting up such a programme are to establish the procedures necessary to minimise contamination and to optimise the use of lubricants, ultimately, to improve reliability and reduce costs.

"The first objective of a this programme was to create a closed loop control system for lubricants. This involved developing management procedures for our mine to guarantee contamination

prevention: bulk tanks were designed with the appropriate filters, breathers and taps; and procedures to transfer lubricants from bulk tanks to properly designed roving tanks were developed, along with those to transfer oil to mine section storage. The entire system was constructed according to the 21 Keys principle: 'a place for everything and everything in place'" Muller informs *MechTech*.

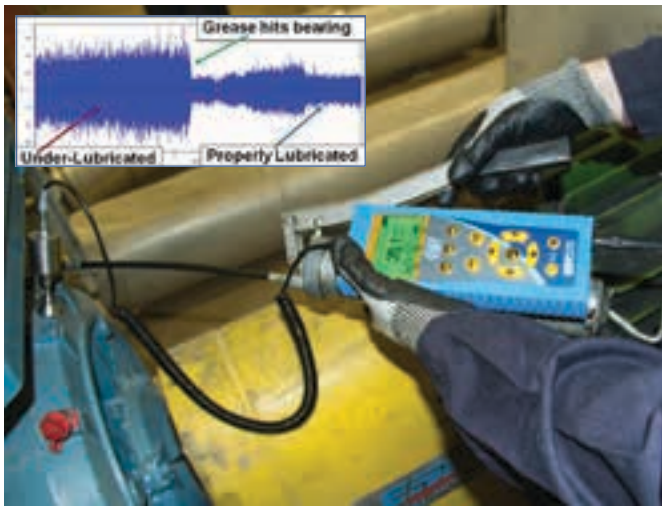
Muller established a lubrication status document that enables his team to rate an operation's performance with respect to lubrication management. It involves 26 individual criteria. "During an audit of a plummer block, for example, we will check lubrication levels, whether nipples or the grease gun nozzle are broken or damaged; and the condition of the connecting hoses, which can be broken or contaminated.

"The position of the grease point is also important. We have had cases where we have had to move the grease point so that both sides of the spherical roller bearing would be adequately lubricated from the same grease point. We find oil level inspection glass on the inaccessible side of gearcases; motors and plummer blocks mounted too high for a single technician to lubricate; and breathers positioned in the most humid area of the shaft. Issues such as these often need interventions from the OEMs, who are, more often than not, willing to oblige," Muller says.

At the pinnacle of lubrication management for bearings, however, is the optimisation of grease lubricant levels so as to minimise running friction. "Using ultrasound sensors from SDT, we conducted some research to establish the amount of grease that should be applied to a bearing and the relubrication frequency," he continues.

Ultrasound is directly related to the friction being experienced by a bearing on a rotating shaft. In principle, the bearing is greased so as to reduce its running friction. But over-greasing a bearing results in an increase in running friction, which increases the operating temperatures of rotating elements.

"Over lubrication is, in fact, the leading cause of bearing failure. By accurately determining the amount of grease a bearing actually needs, the amount



While greasing, the technician listens to the ultrasound to make sure that it is decreasing and he stops applying grease as soon as the level has reached a minimum.

of lubricant used reduces, as does the lubrication schedule. More importantly, though, the life of the bearing is maximised because it is no longer subject to unnecessarily high heating and cooling cycles.

As well as indicating the minimum friction/optimum lubrication level of a bearing, Muller says that ultrasound also gives a much earlier indication of deterioration than vibration testing will. “Once the vibration signature of a bearing is being affected, mechanical damage has already occurred. Ultrasound can pick up friction or inadequate lubrication at a much earlier stage than vibration analysis and, if remedied early, physical damage can be avoided. Vibration, however, is a better tool to identify imbalance and misalignment at an early stage.

Turning back to lubrication, he says that bearing OEMs give advice about how to lubricate their bearings and the frequency of lubrication, but this differs from bearing to bearing. “A grease guideline from an OEM for a medium sized 6322 drive pulley bearing being driven by a 110 kW motor might suggest applying 134 g every 1 500 hours. The first question I ask is, who in South Africa monitors hours on underground equipment? We measure days, weeks or kilometres.

“So typically, a job card is created and this is given to a technician, who then lubricates the bearing every two months. Whether the bearing needs it or not, he applies 10 or 20 pumps of new grease to this bearing – and we never know whether we are over or under lubricating,” Muller argues.

“As part of our lubrication programme,

we have bypassed this by using ultrasound. We have appointed a dedicated person at each of our five mines to use the SDT ultrasound instruments to monitor and grease all the bearings on our equipment,” he reveals.

The idea is to use the instrument to set alarm levels based on the running friction. Grease is only applied to those bearings with readings above the alarm level, and the grease is applied in accurate discrete quantities, with hand pumps capable of pumping 1.2 g of grease per stroke. “While greasing, the technician listens to the ultrasound to make sure that it is decreasing and he stops applying grease as soon as the level has reached a minimum. We often find that less than 5.0 g of grease is necessary,” Muller says.

“If the reading goes down, then the grease has reduced the friction. This indicates that the bearing needed greasing. When the technician gets to the same bearing a week or a month later, he can look to see if the friction level has stayed low or if it has gone up. Over time, this approach enables a history of every bearing being monitored to be accumulated, and the amount of lubricant and the frequency of lubrication can be gradually optimised for each individual one,” Muller explains.

Muller reveals some of the remarkable savings being achieved at the mines. “At the start of the ultrasound lubrication programme, we identified 945 grease



“We have had cases where we have had to move the grease point so that both sides of the spherical roller bearing would be adequately lubricated.

EP2 Grease usage					
	Drums/Month	kg/unit	kg	R/15 kg	Cost in “R”
Jul	22	15	330	850	18 700
Aug	17	15	255	850	14 450
Sept	12	15	180	850	10 200
Oct	15	15	225	850	12 750
Nov	6	15	90	850	5 100
Dec	8	15	120	850	6 800
Jan	8	15	120	850	6 800
Feb	10	15	150	850	8 500
Mar	3	15	45	850	2 550
Apr	1	15	15	850	850

Table 1: The amount of grease used and the related cost in a plant with a total of 1 012 grease points during a grease lubrication programme making use of ultrasound.

points, which were being lubricated on a time-based schedule. Initially, we had to take ultrasound measurements and grease all of these bearings, to establish low friction levels and as a starting point for trending.

“But the number of bearings needing lubrication quickly reduced. On average only 19 bearings now require greasing per week, and we used to pump all 945 of these full every month,” he notes.

“When I started doing this, the plant purchased a total of 22 drums of grease every month, each containing 18 kg. Within one month, that had dropped to 17 drums and, within six months, it was below 10 drums. The average amount of grease bought for the subsequent six months was six drums.

The technicians are now doing more monitoring and much less lubricating. And while huge savings accrue due to lower grease consumption, Muller notes that: “we now know that 95% of our bearings are operating at lowest possible friction levels and that the lubrication is as effective as it can be, which will result in significantly longer equipment life and reliability.” □

Vibration analysis, from entry level to high definition

At the starting point of BMG's vibration analysis range is the entry level and portable SPM VibChecker, designed for reliable on-site vibration measurement and assessment. "The VibChecker requires minimal operator training and supports BMG's BearingChecker, which is used to accurately assess the condition of rolling element bearings during operation in equipment such as motors, fans, pumps and gearboxes," says Carlo Beukes, general manager, Drives Belts and Ironware divisions at BMG.

"The VibChecker gives early warning signs of developing machine problems in order to prevent premature replacement of machine parts. Vibration monitoring is the most widely used preventative maintenance technique for the accurate assessment of the condition of machinery elements such as pump rotors, fan impellers, gear wheels and housing mountings.



BMG offers the full portfolio of SPM condition monitoring equipment, including the entry level VibChecker portable instrument, designed for reliable on-site vibration measurement and assessment.

"Both these instruments are instantly usable and require little training for efficient operation."

The lightweight user-friendly VibChecker has an ergonomic design, an easy button operation and user-friendly interface, which make it the perfect maintenance tool for plant mechanics, machine operators and maintenance technicians. With this device, vibration monitoring no longer needs to be a question of cost or expertise.

With built in FFT (Fast Fourier Transform) capabilities, it is also an efficient device for troubleshooting. Periodic vibration checks are easily done and reliable and accurate vibration information is delivered in seconds. Readings are immediately and automatically evaluated according to established ISO standards. These standards make the assumption that limited information – obtained easily and at low cost – is as useful as a detailed analysis, using expensive equipment and elaborate techniques.

This instrument has an internal probe and connector for external ICP transducers. The VibChecker can detect measurements of displacement, velocity and acceleration in the 10 to 1 000 Hz frequency range.

Accessories include a comfort grip protective sleeve and a small portable MEMS transducer with magnetic foot,

convenient for measurement in narrow spaces.

SPM's high definition HD technologies, on the other hand, are a further development of the Shock Pulse Method® (SPM) providing reliable information on the lubrication and mechanical condition of bearings. With sufficient forewarning, plant personnel can either perform required maintenance or schedule a planned component replacement, thus minimising repair costs and reducing downtime.

This condition monitoring system offers continuous bearing and lubrication condition information to compliment regular interruptive inspections that are legally required, by giving the responsible certified engineer critical information about the physical health of bearings while in operation.

Instant evaluation of bearing condition is given via an easily understood green, yellow or red colour code.

With the advanced digital SPM HD technique and RPM based sampling frequency, these devices are perfectly suited for measurement in a broad RPM range, including speed applications as low as 0,1 RPM.

The full range of SPM condition monitoring equipment, from basic hand held instruments to high level on-line systems, are available from BMG.

www.bmgworld.net

Cost effective high efficiency gas coalescer elements

Filcon Filters, one of the leading liquid filtration companies in South Africa and the sole agent/distributor of the products from FTC (Filtration Technology Corporation of Houston, USA) has introduced a new line of gas coalescer elements, which have been especially engineered to provide the most cost effective high efficiency liquid coalescence of gas streams on the market.

The introduction of proprietary interception, coalescence and drainage layers, pleated in conjunction with high efficiency micro-fibre media, ensures highest efficiency separation of sub-micron liquid aerosols from gas streams while minimising fluid carry-over.

These elements, available in 0.1 and 0.3 µm versions in both 99.0% and 99.98% efficiencies in four different sizes are the answer for removal of unwanted liquid contaminants such as amines, glycols, solvents, compressor lubrication oils, water, hydrocarbon condensates and other liquid phase contaminants.

www.filconfilters.co.za

Lightweight humidity verification system

Michell Instruments, represented in South Africa by Instrotech – a Comtest Group company – has introduced a new portable verification system for humidity probes – the HygroCal100. Weighing just 3.2 kg, it is less than 25% of the weight of its closest competitor and, with a battery life of up to eight hours, the unit is designed with portability in mind.

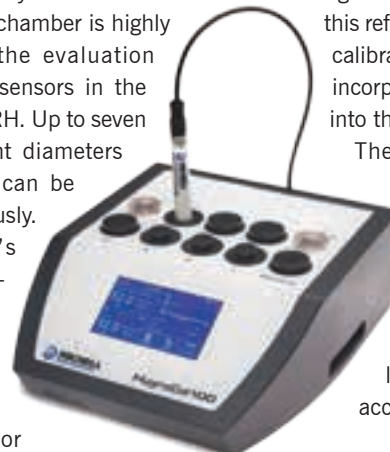
The humidity test chamber is highly stable and allows the evaluation of relative humidity sensors in the range of five to 95% RH. Up to seven probes, with different diameters and output signals, can be validated simultaneously. The HygroCal100's innovative design allows the probes to be integrated with the chamber and the user interface, enabling the operator

to easily monitor the readings of each probe during the calibration cycle. In addition, all the calibration data can be downloaded from the unit onto a USB drive for later use.

An external reference hygrometer, such as Michell's fundamental, chilled mirror Optidew Vision, can also be integrated into the system. If this reference has a traceable calibration, it allows users to incorporate this traceability into their verifications.

The HygroCal100 contains an internal polymer reference – Michell's latest generation HS3 sensor, giving the instrument class-leading ±0.8% RH accuracy.

www.instrotech.co.za



'Boilerplate' system for equipment maintenance

IRISS, the specialist in electrical maintenance safety devices, has introduced an asset tagging system with a difference. In essence, the E Sentry Connect-IR Asset Tag is a smart 'boilerplate' system that works with any make or model of infrared window.

While the majority of similar products operate using RFID technology, this new IRISS system works in tandem with a smart phone using near field communication (NFC). It is low cost and very easy to use, providing instant electronic access to inspection data to ensure quick, safe and effective thermal inspection.

IRISS E Sentry Connect-IR uses the principle of inductive coupling to transfer information between the tag and the smart phone. As the communication device powers the tag, no batteries are required.

The tag, which is activated when the phone is nearby, contains all of the information relating to the IR window and inspections that need to be completed, as well as historic data from previous inspections. It can also be programmed to automate tasks such as send a text message, go to a URL, launch an app and run a task

on a smart phone – and all stored data can be erased and re-written as needed.

The system can also back up the data, report alarms and transmit other alerts via the free IRISS app. As an option, this information can be uploaded to the cloud for easy access by asset managers. It provides a data exchange point for updating information from the inspections, for checking the assets' operational state and for setting inspection routes.

The IRISS E Sentry Asset Tag is now a standard feature on the IRISS CAP series infrared window and available as an option on the VP Systems. It can also be purchased separately to use as required.

www.iriss.com



The IRISS E Sentry Connect-IR Asset Tag is a smart 'boilerplate' system that provides instant electronic access to inspection data to ensure quick, safe and effective thermal inspection.

A benchmark in ultrasonic gas flow meters

The Fluxus G series of ultrasonic gas flow meters sets a new industry benchmark for non-intrusive clamp-on flow metering of gaseous media.

While the traditional approach has been to cater for a range of liquid to gas flow metering with a single transducer technology, Flexim has developed a specific technology to cater for the accurate and reliable ultrasonic flow measurement of gases over a wide turndown ratio.

The Fluxus G series is available from local distributor Peter Jones Electronic Equipment, which falls under the Actum Industrial division of the Actum Group. The group is a specialist distributor of niche electronics products for high-end industries and applications.

Robert Howes, technical sales manager at Peter Jones, explains that the Fluxus G series of gas flow meters is available as either portable or permanent versions. Applications are wide-ranging, from gas



The Fluxus F705 allows for bi-directional measurement of volume and mass of nearly any liquid and gaseous media.

exploration to transportation and storage, as well as industrial processing.

"The critical criteria of any gas flow meter are accuracy and reliability," comments Howes. Flexim's ultrasonic transducers are specifically matched and paired, and therefore guarantee a high zero stability, as well as high precision at low-flow velocities.

With more than 1 000 measurement

Safety locking mechanism ensures racking stability

APC Storage Solutions SA, the South African specialist in warehouse storage solutions and warehouse automation, has introduced the Mecalux integrated safety pin/locking mechanism for connector systems on racking beams. The recently developed mechanism is attached permanently to racking beams and cannot be removed accidentally or by malicious intent, ensuring improved stability and safety in all APC Storage Solutions SA's racking installations.

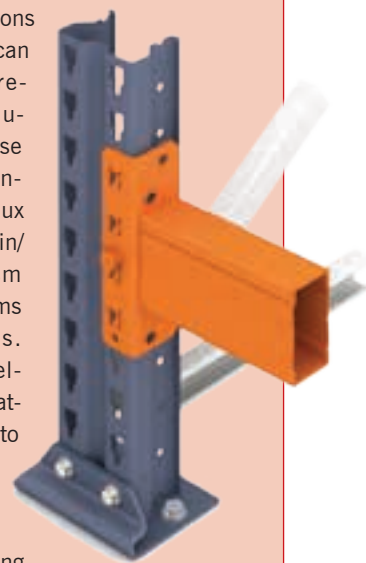
The safety locking mechanism forms part of the rack end plate. As a permanent fixture it cannot be lost or accidentally knocked out and, once the installation is assembled, it cannot be extracted without completely dismantling the beam.

Ettienne Meyburgh, KZN general manager of APC Storage Solutions SA explains: "The new safety pin is welded onto the beam so that, on installation, the beam slides easily into place. The safety pin is spring-loaded and, once the beam is in place, the pin clicks into the aligned upright slot, safely securing the now connected beam. Removing the beam is just as easy as the safety pin is released by pulling it back, enabling easy beam dismantling or adjustment."

The refined locking mechanism is now a standard feature on new installations, "at no extra cost to our customers", Meyburgh assures, adding that, "as soon as any existing facilities require upgrades or expansions, the new integrated safety pins will be incorporated."

APC Storage Solutions SA is the sole supplier of Mecalux storage solutions and accessories to southern Africa.

www.apcstoragesolutions.co.za



cycles a second and superior measurement algorithms embedded in the flow computer, together with the fact that the transducers are calibrated in-house or directly at the measurement point, Flexim's clamp-on systems are not less accurate than inline gas flowmeters, but much more reliable, as they do not suffer from wear and tear inside the pipe," explains Howes.

www.actum.co.za

Orbit personnel and material hoists for Kusile

One of the primary challenges on any construction site is the need to move both people and materials to levels where critical activities need to be performed, and to do this so as to

maximise productivity while ensuring optimum safety.

Mitsubishi Hitachi Power Systems (MHPS) Africa found the ideal solution in Orbit personnel and material hoists, which will enable the contractor to provide safe, effective and efficient services at the Kusile Power Station. The Orbit hoists will be installed at two of the boiler sites on the project.

This is according to Awie Esterhuizen, scaffolding discipline manager at MHPS Africa, who explains that, while heavy loads are moved using tower cranes, this mode of materials handling cannot be justified for smaller components such as scaffolding material. Moving such components manually was not an option as construction tasks can be unnecessarily delayed and moving people without the required materials would have resulted in avoidable standing time and loss of productivity.

“Our challenge was to find equipment that would transport both men and materials to various levels of the 110 m tall construction, thereby reducing manual handling of equipment and subsequent risk of injury, while improving productivity. And we needed to be able to do this at a speed that would be both safe and effective,” Esterhuizen explains.

He says that the vertical lifting of men and materials to levels on such a high construction is not often appreciated in terms of its complexity. “In a nutshell, the challenge is to effect this movement on an active and incomplete construction site.”

Torre Lifting Solutions was able to respond to this need and provide a turnkey best-fit solution using the Orbit personnel and material hoist. The scope of supply included procurement, transport, import, installation and commission of the hoists. Esterhuizen says that, because Torre Lifting Solutions assumed the role of a business partner rather than a single-focus supplier, MHPS was able to focus on the work at hand.

This purpose-engineered single mast hoist has two separate cages, one with a 2.0 t capacity to carry people and the other capable of carrying 2.3 t of materials. Both cages operate simultaneously and, most importantly, the configuration of the Orbit hoist allows for materials to be loaded using forklift trucks, speeding up the operation.

“The Orbit equipment is able to accept material mechanically and can cope with 5 000 pieces per lift. With a round-trip cycle time of 15 minutes, we can move all the material required for a days work within two to three hours. This is critical to productivity on site,” Esterhuizen says.

The Orbit material hoist operates at a speed of 22 m/min while the personnel cage travels at 96 m/min. The equipment is engineered with all the requisite safety features, including integral lockout mechanisms to prevent accidental operation or personal injury.

Esterhuizen says that while a technical support service is being provided by Torre Lifting Solutions to ensure continuous availability, MHPS’s pre-procurement research indicated that this specific model is both reliable and robust under a range of operating conditions. □

www.safrench.co.za



Mitsubishi Hitachi Power Systems Africa has chosen Orbit personnel and material hoists from Torre Lifting Solutions to provide safe, effective and efficient construction services to the Kusile Power Station.

Propak Africa 2016

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The show, along with its five associated conferences and workshops – the Propak Africa Packaging Conference; IPSA packaging workshops; the GAPP Print Expo Conference; Printing SA/PIFSA workshops; and the Plastics SA Conference take place from 5 to 18 March, 2016 at the NASREC Expo Centre In Johannesburg, South Africa.

Industry diary

March 2016

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Power and Electricity World Africa

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Nuclear Africa 2016

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