

## THIS MONTH:

- Engineering consultancy: avoiding mediocrity
- Commercial comfort for improved productivity
- Mining machine simulators to enhance learning
- Selective electroplating: an entrepreneurial opportunity

# MECHANICAL

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**WEIR**

**Minerals**  
[weirminerals.com](http://weirminerals.com)

**Editor:**

Peter Middleton

e-mail: peterm@crown.co.za

**Copy editor:**

Erika van Zyl

**Advertising:**

Norman Welthagen

e-mail: normanw@crown.co.za

**Design & layout:**

Darryl James

**Publisher:**

Karen Grant

**Director:**

Jenny Warwick

**Circulation:**

Karen Smith

**Reader enquiries:**

Radha Naidoo

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## Manufacturing, growth and employment

In a statement released by the Manufacturing Circle during the Manufacturing Indaba, executive director Coenraad Bezuidenhout says: “Research commissioned by the Manufacturing Circle proves South Africa’s economy needs manufacturing to grow and, for manufacturing to grow, South Africa needs a strong economy.”

This conclusion is based on a graph showing GDP growth data superimposed on manufacturing output change over the four decades spanning 1974-2014. The correlation between GDP and manufacturing growth and contraction appears obvious.

Bezuidenhout uses the correlation to argue for “ever greater alignment between policymakers and the private sector on how to keep manufacturing resilient”, along with the need to “create a positive policy environment to promote manufacturing growth”.

SA’s current challenges are well summarised in the conclusions of the Manufacturing Sector Quarterly Survey for the first quarter of 2015.

- Overall business confidence and the tempo of manufacturing activity remained flat in Quarter 1 of 2015.
- On balance, demand conditions were largely muted both at the domestic and international levels.
- High input costs, skills shortages and credit-access tightening exerted additional strain on the performance of the SA manufacturing sector in the quarter.
- Challenges in SA’s power sector pose a substantial and urgent risk to the country’s re-industrialisation drive and, by extension, to short and long term overall economic performance.

The survey reported average manufacturing growth for Quarter 1 of 2015 at -0.6%, with the most significant negative component coming from the petroleum, chemical and rubber products sector, which shrank by 2.6% on a 22.13% weighted percentage contribution to total manufacturing output. Wood, paper, publishing and printing products contracted -2.8% and furniture and other manufacturing contributed -0.3% to the numbers. And, although a relatively small sector, the 22% decline in electronics manufacturing (radio, TV, communication apparatus and professional equipment) has got to be worrying.

In response to the question: ‘How do you perceive the manufacturing sector conditions?’ 58% of polled manufacturers chose the ‘Poor’ or ‘Fragile/weak’ descriptors and only 16% responded with ‘Modest to good’ or ‘Strong’. And on employment, half of the surveyed firms expect a stagnant labour market over the next quarter with falling employment levels over the 12-month horizon.

Jeffrey Herbst and Greg Mills, through their association with the Brenthurst Foundation, have released a new book: ‘How South Africa works’, an excellently researched and comprehensive analysis of the challenges we face and how we might overcome them.

In a chapter on South African manufacturing, they quote a statistic from the *Oxford History of South Africa*: in 1924/5, 115 000 people were employed in manufacturing. This grew to 141 000 in the subsequent years and by 1931, the ‘poor white problem’ – estimated to have been at around 300 000 of a population of 1.8-million – “had virtually ceased to exist”.

This, surely, reinforces the direct link between manufacturing success, economic prosperity and employment.

But the current statistics quoted in the book are moving in the wrong direction, with manufacturing’s contribution to real annual GDP growth having fallen from 0.7% in 2010 to 0.1% by 2013 – and the sector has shed 200 000 jobs since 2008/9 with “34 000 lost in the third quarter of 2014 alone”.

Through numerous case studies and interviews, Herbst and Mills thoroughly explore the issues blocking manufacturing growth. Among these, they conclude that South Africa, with 36% effective unemployment and a largely unskilled workforce, has become “uncompetitive against many mainly Asian exports”, and that “Government-enforced high wages” adds to this competitiveness problem. Added to this, manufacturing is “stifled by regulatory compliance; the cost and reliability of inputs, especially electricity, the (un)reliability and (un)predictability of policy, corruption, competitiveness and the premium placed by BEE demands”.

How can Government help? To improve competitiveness, manufacturers are advocating “trade remedies (that standards are maintained and no illegal goods slip through), increasing the size of the local market (through local procurement and branding such as Proudly South African) and for measures to reduce the costs of compliance and the reliability of service inputs”.

With respect to labour and, in particular, the Union Bargaining Councils, the authors suggest “the present system is rigged against the unemployed” and that solutions “demand the unwinding of the cosy relationship between big business and labour”.

“Finally, we do not believe that large scale plans to promote manufacturing will work as long as the incentives facing employers go against hiring,” we read in the closing paragraph on manufacturing.

As Herbst and Mills argue, South Africa’s economic decline is not inevitable. But to compete on the world stage, as Mark Lamberti, group CEO of Imperial Holdings says, we need to: “...abandon the politics, policies and practices that are stifling growth, and with it, for millions, the hope of a better tomorrow.”

Peter Middleton





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## ON THE COVER



### Fibre-optic spreader beam weighing system for safe and efficient container handling

Powermite's Materials Handling Division, a proud distributor of Conductix products for more than 40 years, recently launched Conductix's Lasstec container weighing solution. This fibre-optic based system is mooted to make it easier for ship terminals to comply with the new International Maritime Organisation's (IMO) legislation that will make container weight verification mandatory by July 2016. *MechTech* talks to Powermite director Donovan Marks about the technology.

For more information contact:  
Donovan Marks  
Powermite  
Tel: +27 11 271 0000  
Fax: +27 11 760 3099  
info@powermite.co.za  
www.powermite.co.za

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# Fibre-optic spreader beam

## for safe and efficient container handling

Powermite's Materials Handling Division, a proud distributor of Conductix products for more than 40 years, recently launched Conductix's Lasstec container weighing solution. This fibre-optic based system is mooted to make it easier for ship terminals to comply with the new International Maritime Organisation's (IMO) legislation that will make container weight verification mandatory by July 2016. *MechTech* talks to Powermite director Donovan Marks (left) about the technology and its advantages.

“Powermite focuses on the electrical and mechanical aspects of moving machinery,” begins Marks. “We supply a wide range of products to help machines move freely and safely: mobile machinery, conveyors, cranes and bulk materials handling machines such as stacker reclaimers and ship loaders all require power, cabling and sensing solutions to allow them to function effectively,” he says.

The company was founded in 1967 with a competent team of people to service the growing need for flexible cables and power solutions for mobile machinery. “By 1981 Powermite had grown into a ‘one stop’ supplier for electrical crane materials and, today, has close to 300 people working across three divisions: Cables and Accessories; Materials Handling; and Plugs and Sockets,” Marks reveals.

Stemming from a partnership with the French multinational, Delachaux and its Conductix operation, which is dedicated to the transmission of energy and data for industrial equipment and a global supplier to the materials handling industries – drag chains, cable reelers slip ring housings, etc – Powermite became involved in supplying equipment such as ship to shore loaders and electrified rubber tie gantries (ERTGs). “We electrify the systems that pick up and move cargo with reelers or conductor bars, for example, to overcome the need to use more costly diesel-power,” he tells *MechTech*.

### Lasstec load sensing

The Lasstec load sensing system is a one of the newer Conductix innovations and is

designed to streamline the acquisition of weight data from shipping containers so as to improve port handling efficiencies. “Poor control of the weight of individual shipping containers as well as the weight distribution of containers on a loaded ship can lead to overloading and ship



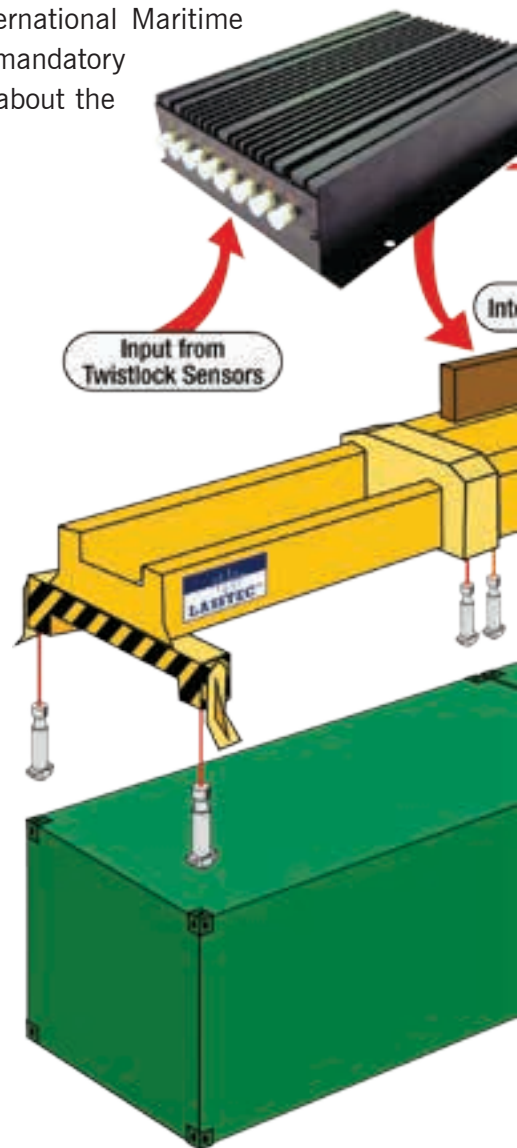
*New IMO container weight verification requirements mean that, after July 2016, every container will have to be accurately weighed before it can be loaded onto a ship.*

instability at sea,” says Marks.

New IMO law comes into force in July 2016, which includes new container weight verification requirements for entry into a ship's loading manifest prior to loading. This will mean that every container will have to be accurately weighed before it can be loaded onto a ship,” Marks reveals.

To overcome this problem, the IMO has decided to make container weight verification mandatory. The Safety of Life at Sea amendment for mandatory container weight verification prior to loading containers onto a vessel was initially accepted by the IMO back in 2013, and this amendment will enter into force in July 2016.

“The amendment makes it the shipper's responsibility to declare the correct container weight. If the shipper does not declare the correct container weight, then



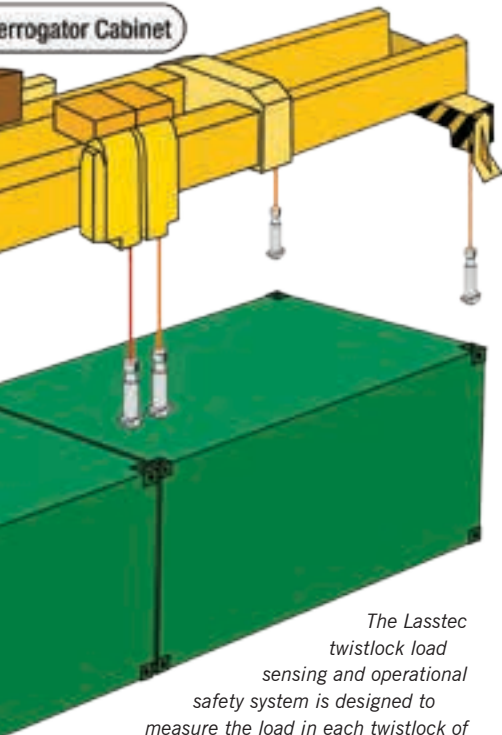
the terminal shall weigh the container and charge the shipper,” Marks informs *MechTech*.

The issue arises as to where to weigh the containers for verification purposes. Weighing containers at weigh bridges at the entry point to a harbour can be cumbersome, since it creates queues of trucks at the terminal entrance, each typically carrying two 20-ft containers. “To stop and weigh every container on entry could further delay ship loading, increasing harbour costs and reducing efficiency,” he suggests, adding that

# weighing system



LASSTEC on-board monitor



The Lasstec twistlock load sensing and operational safety system is designed to measure the load in each twistlock of single- and twin-lift spreaders. Each sensor measures the load of a twistlock, which is then sent into a central data processing unit from where the information is sent to the crane PLC and to the TOS.

weighing at the point of loading the ship might also prove too late as the stowing plan cannot easily be updated.

“Weighing in the stacking yard using twistlocks is the best option,” Marks believes. “Since all containers have to pass by the stacking yard, even transhipped containers, it is easy to weigh the containers while offloading, so that the collected data can be made available to develop a balanced stowing plan,” he says.

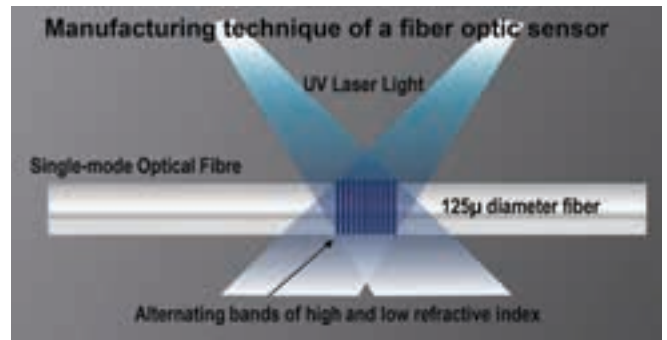
The standard way of handling containers during loading and offloading is

by means of a spreader, which is, effectively, a lifting beam with locking mechanisms called twistlocks. To lift a container, the spreader is aligned to the corners of the containers, the twistlocks are inserted into matching sockets on the container and rotated by 90° – and it is common for spreaders to have eight twistlocks to handle two 12-ft containers at a time. Once twisted, the twistlocks lock onto the container corners allowing them to be safely lifted. Spreaders and twistlocks are used on cranes, straddle carriers and on a host of other machinery designed lift and load containers.

The Lasstec load sensing system is, in principle, very simple. It measures the strain (extension) of each twistlock during a lift and uses these measurements to determine accurate load measurements from each corner of each container. “Not only does this enable the container weight to be accurately recorded, but it also provides weight distribution data, which further enhances the safety and accuracy of the stowing plan,” Marks explains.

The fibre-optic technology used to measure twistlock strain, however, is innovative. A 125 µm single strand optical fibre is attached to each twistlock. When stretched, alternating bands of high and low refractive index appear in the glass. By exposing the strained region of the glass fibre to ultraviolet light, the fibre acts as a narrowband mirror, reflecting a wavelength that varies with strain and temperature. A temperature sensor embedded in the system compensates for the temperature effect, enabling an accurate strain to be determined, which is, in turn, translated into load weight via knowledge of the stress-strain relationship of the twistlock itself.

Why use fibre optics? “First, because they are 100% insensitive to electromagnetic interference. Glass is also a very stable, robust and shock resistant material that does not corrode,” Marks responds, adding that, “unlike traditional strain gauges, the fibre remains accurate over a wide strain range and will only break when the twistlock breaks.”



By exposing the strained region of the glass fibre to ultraviolet light, the fibre acts as a narrowband mirror, reflecting a wavelength that varies with strain and temperature.

Since installation of the sensors involves only the twistlocks, Lasstec’s system is easily retrofitted into existing spreaders and cranes. An interrogator and an on-board monitor enable rapid ‘on-the-go’ weighing, without the need to interrupt terminal operations and installation can be done without any infrastructure changes. Weighing accuracy per container during twin lift operation over the full 100 t allowable twistlock load range is within 200 kg (0,2%) and the system can be fitted to every spreader brand.

Marks also lifts out the added advantage of life-cycle monitoring of twist locks and spreaders. “Because the system measures the elongation of the twistlock shaft, it can provide accurate load and safety information about the condition of the twistlock and spreader. As soon as the elongation on a given lift falls out of the safe range, the spreader and its twist locks can be brought out of service for repairs. This can replace the need for regular load testing of these systems for safety certification.

The installation of a Lasstec load testing system also offers a commercial opportunity for terminals. “The new IMO legislation makes container weight verification mandatory. Shippers will be responsible for weighing containers, but terminals are in an excellent position to provide the weighing service to the shippers and to make additional revenue as a result,” Marks points out.

“With the new IMO amendments, along with the ever increasing number of containers being shipped in and out of our ports, South African terminal operators need to install systems that offer improved container handling services and ship loading efficiencies. The Lasstec system could go a long way towards making our ports world class,” Marks concludes. □

## Chute upgrade at Mogalakwena complete

Weba Chute Systems has successfully completed a chute upgrade project at Anglo American Platinum's Mogalakwena North Mine. The chutes were originally installed in 2006 and subsequently lined with ceramic tiles in 2013 in order to cope with sticky fines material. Ted Cruickshank, project manager, says: "This project showcased the total solu-

tions approach adopted by Weba Chute Systems in being able to respond to specific client problems and challenges,"

"At the beginning of 2014 we installed a temporary bypass leg on one chute in order to bypass the material onto a stockpile," Cruickshank explains. Following this, Weba Chute Systems, under the auspices of Worley Parsons RSA, was awarded a contract to remove the temporary leg and place a permanent fixture on both chutes.

"Slight modifications had to be carried out to the existing chutes in order to incorporate the new legs, feeding the outgoing conveyors at various angles. Therefore, this was quite a complex project that required a lot of time and ingenuity on the part of Weba Chute Systems in coming up with an appropriate solution," he says.

Cruickshank explains that Weba Chute Systems' upfront involvement in projects from the design stage helps to mitigate many of the problems associated with transfer points. "Consulting with us during this vital phase means that we can bring the experience and expertise we have gained during thousands of installations to bear on an individual project," he suggests.

To date, the company has engineered over 4 000 transfer chutes that are operating successfully throughout the global mining industry. Irrespective of belt speed, belt width, material size, shape or throughput, the Weba Chute System eliminates problems associated with conventional transfer chutes as well as providing a cost effective and environmentally friendly solution for material transfer.

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



Weba Chute Systems have successfully implemented a bypass transfer solution at Mogalakwena North Mine.

## New hydrocyclone to maximise throughput

The new Cavex® 700CVX hydrocyclone from Weir Minerals can achieve up to 50% higher throughput capacity in comparison with competitor cyclones in the 26-inch diameter range, due to its larger inlet and vortex finder configuration.

According to Sheldon Gabriel (left), product manager cyclones of Weir Minerals Africa and Middle East, the Cavex 700CVX hydrocyclone has a small, more space efficient body, making it ideal for new installations. "It is also perfectly suited and sized to fit into existing cyclone clusters for easy retrofitting, adding

substantially to increased capacity. This hydrocyclone is the result of extensive research and development by the company and underlines our philosophy of driving customer centricity in all product development."

Gabriel says that Cavex is already highly regarded for its proven efficiency and high capacity performance, but the new CVX hydrocyclones are designed to

withstand severe abrasion caused by the rotational flow of solids and slurry.

Weir Minerals Africa is dedicated to ensuring its products maximise throughput both within current plants and in greenfield operations. The Cavex 700CVX hydrocyclone is typical of the company's commitment to best practice and is backed up by Weir Minerals' extensive global service and aftermarket support.

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

## Clear future ahead for filtration services

Applied Filtration Services (AFS) is a supplier of the high quality industrial filters, filtration equipment rental and oil analysis services to the energy markets in

South Africa and has a discernibly bright future mapped out.

Ameer Mohamed, general manager of AFS comments: "We started out as a division within the group, which meant that we could reach a great number of customers in the petrochemical and power generation industries. In 2012, it was our mandate to make the market, predominantly the power generation sector, aware of our oil purification machines. The push worked and we began a successful and ongoing campaign to rent out these machines to power stations."

"We're constantly strategising on how best to enhance our product offering to chemical plants and power stations so that we not only supply a product to these markets, but well-considered, customised solutions," notes Mohamed.

AFS is the exclusive distributor of Pall products in South Africa.

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



## Gothenburg investment in bearing production efficiency

SKF has invested R286-million (190-million Swedish Krona) in modernising its spherical roller bearing production systems in Gothenburg. The investment is part of the Group's ongoing pursuit of world-class manufacturing.

More modern manufacturing processes, which include intelligent grinding to enable reduced set-up times and improved production efficiency, were combined with SKF's own condition monitoring and mobile connectivity solutions. With access to real-time and remote monitoring, operators are empowered to better predict and plan machine maintenance schedules, as well as develop long-term statistical evaluations of diagnostic data.

Luc Graux, manufacturing director, Industrial Market, says, "Combining new manufacturing processes with our condition monitoring and connectivity solutions really brings us into the modern era. It will also help make our production more flexible and efficient, as we roll-out the SKF Production System in Gothenburg."

Speaking about the Group's focus on sustainability, he says: "This investment supports our continued focus on energy efficiency. Since 2006, we have reduced our energy usage by 300 GWh (16%), despite significant increases in production output."

The investments are expected to be completed by the end of 2016.

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



## Training Academy takes on air conditioning learnership

According to a Stats SA report released on 29 June 2015, Jimenez et al (2012) is quoted as saying: "Because many young people are poorly educated when they leave school, they enter the world of work without the knowledge, skills, or behaviours necessary to adapt to changes in the economy and their lives."

In light of the statement above, Bidvest Facilities Management decided to help address and alleviate the skills shortage at its Training Academy. "Critical skills shortages are a global phenomenon. We have noted that in South Africa the average age of an artisan is between 45 and 55 years. This is a major concern, as we need a younger workforce to ensure that skills do not become extinct," says Henk Benade, senior human capital manager at Bidvest Facilities Management (previously known as TFMC). "We therefore decided to expand our training services to include previously disadvantaged individuals based in the surrounding communities of our facility in Olifantsfontein," he adds.

Bidvest Facilities Management, one of South Africa's leading integrated facilities management company, established the Training Academy in 2011 to train its own employees in the electrical, air conditioning, fire and access, infrastructure



*Bidvest Facilities Management has 40 candidates enrolled at its Training Academy completing learnerships in electrical, air conditioning, fire and access, infrastructure and power generation disciplines.*

and power generation disciplines. The purpose of the academy was to upskill employees and keep abreast of new technologies by providing training according to each individual's needs.

"We currently have 40 learnerships running at our academy, which is accredited by MERSETA," adds Benade.

"This year's candidates are all N6 holders, which means they have the theoretical background on the practical training they are receiving at the academy. These individuals are compensated monthly, which lessens their financial burden. We have invested in this initiative to ensure that South Africa gets upskilled, and we are striving to enrol an additional candidates in 2016," comments Benade.

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

## Commitment to uplifting local communities reaffirmed

ThyssenKrupp Industrial Solutions recently installed flush ablution facilities at Mosima 2 Primary School in Lephalale as part of the company's continued investment in sustainable initiatives to help uplift local communities.

The much-needed growth in the Lephalale region that has led Eskom to embark upon an upliftment drive in the region and main contractors to Medupi are being encouraged to participate in



*The new containerised flush ablution facilities installed by ThyssenKrupp at Mosima 2 Primary School in Lephalale 1.*

various community projects.

"As a responsible corporate, we are committed to supporting sustainable community drives and we have thrown our full weight behind the initiatives of our key customer, Eskom," states Dietmar Jürges, CEO of ThyssenKrupp Industrial Solutions in South Africa. "Working in close cooperation with the electricity utility and the Lephalale Development Forum (LDF), we have completed a host of projects in the region over the past five years, including the construction of 60 vegetable tunnels and the donation of libraries to three rural schools in the latter half of 2014."

Says Charles Herbert: "This is in perfect harmony with ThyssenKrupp's tenets of creating sustainable infrastructures and promoting the efficient use of resources and we are very proud to have had this wonderful opportunity to make a significant difference in the lives of this small remote community."

[www.thyssenkrupp-industrial-solutions.com](http://www.thyssenkrupp-industrial-solutions.com)

## In brief

Ethics watchdog **TRACE International** has re-certified **AESSEAL South Africa** as complying fully with the association's stringent code of ethical conduct. The mechanical seals company was first certified two years ago, joining an exclusive club of between 200 and 300 firms worldwide certified by TRACE as corruption-free in all aspects of their business conduct.

**SEW-Eurodrive's** Johannesburg branch has officially combined its Variolution and Maxolution business units to form the Maxo-Variolution business unit. Variolution comprises solutions that are 80% packaged and 20% customisable, while the Maxolution suite involves fully customisable components and services for project-specific requirements.

**Multotec** is helping its customers to improve the throughput and efficiencies of beneficiation circuits with Hawkeye®, a tailored monitoring system for predictive maintenance on critical wear items such as screen panels, flotation wet ends, mill lifter bars or cyclone liners. "Hawkeye gives advance warning of potential problems or maintenance issues, allowing customers to plan maintenance in advance, reducing downtime and minimising damage," say Ian Chapman, engineering manager.

**HPE Africa**, in recognition of a need for greater assistance with on-site repairs and support, has increased its field services fleet and extended its support service throughout South Africa and into neighbouring countries. Says MD Alex Ackron: "The company now has well equipped workshops in Gauteng, Durban, Cape Town and East London, which are supported by dealers in Limpopo, Upington, Kimberley and Douglas."

Nairobi-based **GEA East Africa's** process technology and components division has notched up no less than seven new orders over an eight-month period – since October 2014 when it began its order intake under the current name.

**Pitney Bowes South Africa**, is pleased to introduce **Ideal Air Purifiers** to the South African market – an effective and easy way to cleanse and ionise indoor air. Ideal Air Purifiers use AEON Blue® technology, which are able to filter almost 100% of small particulate and pathogens from polluted ambient air.

Research commissioned by the **Manufacturing Circle** and presented by **Pan-African Investment and Research Services** chief economist, Iraj Abedian, to the governor and deputy governors of the South African Reserve Bank (SARB), and numerous prominent economists proves that South Africa's economy needs manufacturing to grow and for manufacturing to grow, South Africa needs a strong economy.



# Engineering consultancy: avoiding

Fresh Projects was founded in 2014 to assist consulting engineers to manage the financial side of engineering projects. *MechTech* talks to Simon Berry (left), the company's founder, about the dangerous and unsustainable spiral towards mediocrity associated with discounting engineering fees.

While employed at WSP, Simon Berry's key role was on the financial management side of engineering projects. "Good projects are associated with good finances and what that really means is getting the fees right upfront. But there is currently chaos in the engineering consulting industry due to the discounting of fees," Berry informs *MechTech*.

Showing a bar-chart from Consulting Engineers South Africa (CESA), Berry says that this local association has been tracking what is happening to fees in the industry since 2006. "A doctor or a lawyer will charge you a fee for every consultation or for every hour of their time, so they are compensated for every hour that they work. But engineers and architects operate on a weird principle where engineering input is calculated based in the total project cost, regardless of how much or how little engineering is required. So if the agreed fee is 10% on a R10-million project, then the engineering consultancy may only bill R1-million," he continues.

So, by installing a Rolls Royce of HVAC systems, the engineer might be paid twice as much in fees as a better engineered but cheaper equivalent, even though the effort involved in delivering the former is probably significantly less. This can lead to a "mediocrity" cycle, where consultants simply buy in known products that don't require any engineering input. "Low fees lead to a lot of passing on of responsibilities to the contractor," Berry suggests.

The CESA bar chart shows the discounts being offered against the ECSA-recommended fees. "The average discounts across all engineering consultancy sectors have been rising steadily: from an average of 15% in June 2007 to over 25% by 2015. But this also varies from sector to sector, so civil engineering contractors, for example, are having to offer discounts of 50 to 60% in order to secure projects work," he points out,

adding that HVAC and mechanical consultants are now regularly having to offer discounts in excess of 40%.

"It's a race to the bottom, with everyone undercutting everyone else and I have a theory as to why this is happening. Rather than getting paid properly for the services engineers offer, and taking that money and investing back into their people – via training and mentoring, paying proper salaries and bonus incentives – the human resources budgets are squeezed, so companies are not developing young engineers, building capacity or retaining talent. This causes our bright engineers to migrate into management consulting and financial roles, where they get paid properly and are appropriately supported and incentivised.

Showing a diagram of the "spiral into mediocrity" he says uncontrolled fee discounts result in low salaries, which cause talent flight and, ultimately, in poorer engineering. "And once a consultancy is associated with poor quality projects then it can't win tenders without offering huge discounts," Berry explains. "This cycle underlines the basic problem and will almost certainly lead to an unsustainable industry from a financial point of view," he warns. Fair fees, on the other hand, allow consultants to attract and reward talent, which enables consultants to deliver quality and innovative engineering for their clients.

In terms of the age brackets for engineers working in consulting, he shows a comparison of data from the US and South Africa. "In the US, you get a nice rising curve with the highest percentages of experienced engineers falling into the 35 to 60 age bracket. The South African profile has an odd shape with a missing 'bucket' of experience in that same age range. I see this all the time. A lot of the older experienced 'grey-haired' engineers are retiring and the new people making decisions on discounts and fees are 30 to 40 year olds. At the same time, we have a higher proportion of newly trained engineers in the 25-30 age bracket.

"The effect is – and I know this from personal experience – that young engineers get frustrated because they can't get development time with their mentors. And the reason is that the more senior engineers are so busy trying to extract some profit from the poor fees that they simply do not have time to do mentorship.

"We need more engineering 'wisdom' in the 40+ age bracket so that responsible engineers will have time to nurture young talent. Senior guys have seen it all before, they have been through recessions and come out of them. They have experiences of being cheated and bullied by clients and they know which clients manage their contracts and information flows well. So they can differentiate between the clients that can be offered good discounts and those tenders that are likely to lose the company money," Berry notes.

"Also, while it is vital to establish fair fees from the start of a consultancy, engineers like the creative side, designing and solving technical problems. They hate admin, so they generally shy away from performing cost calculations and tend to just accept whatever fees the client is offering. They can, therefore, easily end up losing money on a job," he continues.

Fresh Projects has developed a solution for engineers and architects in the built environment to help solve some of these admin problems. "We have developed an App-based online platform that is tailor made for South African consulting engineers," Berry reveals, adding that the platform does three main things:

## 1 Making sure the fee is sufficient

At the starting point of a project, "our solution makes sure engineers are establishing appropriate fees" into their projects, ie, that the consulting engineer is getting his fees right. "By using a planner and identifying who will be working on the project and the total predicted engineering time, we simplify the admin task of calculating the costs of delivering on a project.

"Then, using the ECSA fee scales, we

# mediocrity

compare the actual predicted costs to the fees payable according to project value. This quickly establishes the fee discount that can be afforded (or not afforded) for any given project. If a client insist on a 30% discount, for example, the platform will immediately calculate the profit or loss on the project,” Berry explains.

## 2 Tracking project costs

Regardless of the fee decided, the second aspect to Fresh Projects’ platform is to track the hours spent by every person involved in developing the project, along with the associated expenses, such as travel. The system allows consultants to track the expenditure on a project in real time. Costs are easily added and, on an ongoing basis, the net projected financial value of the completed project is calculated. So if the project finances are heading off-track early on, our App allows the consulting engineer to intervene, rather than be surprised by the shortfall at the end of the project. If not managed in the earlier stages of a project, engineers will typically have to start taking short-cuts at more critical times, while a building is under construction or nearing completion, for example,” he warns.

## 3 Business intelligence

The third feature of the solution gives business owners an overview of all the projects currently being implemented to get an overall picture of the state of the business, ie, which projects are on-track and off-track. “This gives an easy way of answering the questions about which clients are good ones to work for and which are not, as a substitutes for a senior engineer with experience. It also gives a picture of which engineers are commonly associated with successful projects and which need more help. So it can help towards mentoring, incentivising staff as well as avoiding unrealistic expectations.

“This is what we at Fresh Projects are passionate about and why we exist. We believe we have hit a nerve in the industry. Everyone we have shown this to has experienced the problems and can see the benefits,” Berry affirms.

“Generally speaking, engineers are



The second aspect to Fresh Projects’ platform is to track expenditure on a project in real time.



The app is able to track how individual engineers use their time and how much of that time can be allocated to projects. It can also give a picture of which engineers are commonly associated with successful projects and which need more help.



The third feature gives business owners an overview of all the projects currently being implemented to get an overall picture of the state of the business.

very analytical people and, while they are expected to want detail, the reality is that there are only three or four key financial levers that really matter on an engineering project. We are able to extract these,

take the complexity out of the financial side of engineering and, by keeping it simple and accessible, give engineers more time and money to dedicate to engineering excellence,” he concludes. □

# Selective electroplating: an entrepreneurial opportunity



With downward pressure on maintenance costs, Marlinec, a provider of selective electroplating services, equipment and electrolytic solutions, believes it has a cost-effective alternative for restoring surfaces in small areas of high-value components. *MechTech* visits the company's Silverton facilities and talks to company director, Callie Pienaar (left).

“**T**he downturn in the economy presents an opportunity for us for the surface repair of all kinds of mechanical equipment, such as: hydraulic cylinders and components; shafts; pump, valve, gear and shaft casings; bearing journals and U-tube bearing landings; wheel seats; bores; axles; and more. Our process is often able to restore worn surface coatings in selective areas in a cost window of between 10 and 40% of the replacement costs of the component – and the quality of the coating is equal to or better than an OEM replacement part,” Pienaar begins.

First established in 1975 as Jaluma to distribute selective electroplating electrolytes and equipment on behalf of its French parent, Dalic, in 1977 the company was split into two with the formation of Courier Austral (now Marlinec), to add surface refurbishment services to the offering. Marlinec experienced almost immediate success in the railway industry, refurbishing the worn surfaces of motor casings, shafts, and canon boxes. Today, the company is a 100% South African-owned micro enterprise that continues to operate as two separate entities, Jaluma and Marlinec.

“Selective electroplating is a cold surface finishing process that does not affect the base material in any way. It offers excellent (metallurgical bonded) adhesion strengths and coating densities,” says Pienaar, turning attention to the company's niche technology. “Traditional electroplating such as hard-chrome plating is a bath-based process, that requires a fixed infrastructure, considerable quantities of electrolyte and can only be used to plate entire surfaces. It is therefore very inflexible in terms of both the extent

of the repair and the composition of the coating,” he suggests.

“Our process is portable, much more cost effective and very flexible!” he exclaims. “We can plate onto any conductive material and deposit a wide variety of coatings with tailored surface properties onto small areas of components,” he tells *MechTech*.

Citing an example of a bearing running on a shaft, he says: “The shaft only wears around the area in contact with the bearing. To repair a damaged motor case, only the worn area really needs resurfacing. But with traditional ‘hot’ processes, the entire case would be built up and then machine down to OEM specs. The contact area would then have to be re-hardened for wear resistance. This is a long and expensive process.

“Using the selective electroplating process, we are able to limit the refurbishment to the exact area that actually needs it. Metal is only deposited in areas that have been worn. This minimises the amount of work, cost and time taken,” he argues.

The process uses electrical current from relatively simple dc rectifiers. The negative lead from the rectifier is connected to the component being plated and the positive lead is connected to a plating shoe or handle, which holds a custom-shaped carbon anode.

The shaped carbon anode is wrapped with a soft, felt-based absorbent cover material and saturated with the required plating solution (electrolyte). As the solution-saturated anode is rubbed over the component surface, either manually or mechanically, the electric current causes the positively charged metal ions in the plating solution to move toward the negatively charged component, where



*A surface being selectively electroplated using the brush on process. Electrolyte is passed through the positively charged anode wrapped with a soft, felt-based absorbent cover material. While being brushed around the surface being coated, metal atoms are deposited on the surface of the component, which is negatively charged (cathode).*

they gain electrons (are reduced) and are deposited as metallurgically bonded metal atoms of the required composition.

“We mask off the area around the worn component and then, by repeatedly wiping the electrolyte-coated shoe over the treatment area, metal is selectively deposited in the area that requires restoration,” Pienaar adds.

Much lower volumes of electrolyte are required because smaller areas are being treated and a bath does not have to be filled. “We can, therefore, use much more expensive, exotic and complicated electrolytes. Depending on surface characteristics, we offer over 100 different elements and alloys, including copper, cadmium, nickel, nickel cobalt, nickel tungsten, tin, silver, gold and many more. Deposits can be produced that are hard, fine grained, corrosion and abrasion resistant and with very low porosity, offering, for example: erosion, abrasion, scratch and pitting wear resistance; low electrical and/or thermal contact resistance (good conductivity); chemical and pitting corrosion protection; and surface lubricity (anti-friction coatings),” he tells *MechTech*.

“We are currently looking at a job at one of the new power stations. One of the aluminium busbars coming out of the generator has been damaged. To repair it, there are several options. The component can be sent in for repair, where the



After starting the process manually, the plating is mechanised by attaching the two plating shoes to a rotating beam. The total electrical energy in kWh is used to determine the coating thickness for a given area to a thickness accuracy of better than 99%.



Refurbishment of the Transnet traction motor casings can be done with the field coils intact and the change in coating area around the profile (left) is easily accommodated by the process.

damage will be cut away before a new section is welded on. This has potential consequences with respect to distortion and may potentially affect the current carrying capacity.

“Using our cold selective electroplating process, however, we can take all of the necessary equipment onto site and complete the repair *in situ*. Without dismantling anything at all, we will build up the damaged aluminium section and we can then coat the surface with silver. I am certain that we can do this job at a fraction of the cost of sending the whole component out for a traditional repair,” Pienaar reveals.

The equipment needed is relatively simple: a dc rectifier; the anode applicator with its copper shoe and felt covering; a solution tray to capture and recycle electrolyte; a small variable flow pump to recirculate the electrolyte; and the electrolytic solution itself. For coating circular components, it is also possible to automate the process to some extent, by rotating either the component or the shoe so as to maintain brush-like contact.

The plating control unit is equipped with an amp-hour meter with a six-digit impulse counter to ensure precise plating deposits. Pienaar explains: “The deposition rate for this process is directly proportional to the current density. This is because there is an exact relationship between the number of electrons flowing into the cathode and the amount of metal deposited. The total electrical energy in kWh therefore relates directly to deposit

volume, so it can be used to determine the coating thickness for a given area.

“We have developed plating characteristic data for all of our electrolytes and, for any given application, these can be used to determine the quantity of electrolyte required, the plating current and voltage and the total energy required to achieve the necessary thickness. On a 100  $\mu\text{m}$  thickness, we will be accurate to within 0.01  $\mu\text{m}$  or within 99% of the specification,” he assures, adding that no post finishing is required once the process is completed. “The finished surface does not look as bright as those coated in an electroplating tank, but measurements show that the selective electroplating process produces higher surface smoothness than traditional electroplating.”

In addition, all the electrolytes are manufactured in South Africa and the intellectual property associated with the characteristic data is South African owned. “But the idea is not to sit on this technology as an exclusive service provider. We aim to help small businesses to set up local selective electroplating and refurbishing services all over the country,” Pienaar continues. “Cash flows in current times are being squeezed and we believe that greater access to this process can save clients significant amounts of money in the long term.

“On the Transnet traction motor



The journal-bearing surface of a shaft coated with a nickel cobalt hardened layer.

casings, with field coils intact, it costs something like R100 000 for a strip out and repair using fusion-based processes. We are able to avoid having to remove the coil while repairing the casing and journal bearing bores, completing the equivalent job at a fraction of the cost,” he says.

Of the six main Transnet workshops: Koedoespoort, Bloemfontein, Durban, Germiston, Salt River and Uitenhage all have invested in their own selective electroplating equipment. “We have equipped these Transnet facilities with the rectifier and rotating equipment required and we supply the electrolytes for them to refurbish all of their rail axles for themselves.

“We see this as an ideal model to take to other industries in South Africa. Whether as part of small engineering shops or as mobile service providers operating onsite or out of containers, we see this process as an ideal entrepreneurial opportunity. As well as reducing maintenance costs for industry, the process can help to create jobs and improve the economy,” Pienaar concludes. □

# Investment in latest diagnostic equipment

Andrew Yorke, operations director, at Metric Automotive Engineering, talks about this companies ability to cost effectively remanufacture diesel engines to world class standards.

**M**etric Automotive Engineering is positioning itself as a “world class remanufacturing centre” says Andrew Yorke, operations director, at Metric Automotive Engineering.

“Some companies believe that diesel engine component repair or remanufacture can only be done properly in Europe or America. This is not true. We have facilities and competencies that are comparable to anywhere in the world. In addition, it is far more cost effective to carry out such repairs or remanufacture locally due to the exchange rate,” he explains.

The company is South Africa's most comprehensively equipped diesel engine component remanufacturer. Established as a family business in 1969, Metric Automotive Engineering has an operating philosophy of investing in the latest technology and quality equipment. Yorke says that it is critical to stay abreast of changes in industry – such as the move towards much larger heavy diesel engines.

“Larger engines mean larger components and two of our most recent investments in new equipment are the largest crankshaft grinding machine in Africa and a state-of-the-art new generation three axis CNC machine,” Yorke says.

The crankshaft grinding machine is capable of grinding shafts of up to 4.7 m long and with weights of up to 5.0 t. It will allow the grinding of crankshafts from industrial compressors right through to the V16 locomotive diesel engine. Improved grinding



*The largest crankshaft grinding machine in Africa is hard at work at Metric Automotive Engineering.*

tolerances will be achieved as the machine is paired with set of compensators, which will help to eliminate ‘ovality’ and taper.

The CNC machining centres is the only machine of its kind in Africa. This machine is capable of line boring, surfacing and blue-printing blocks up to 6.0 m in length, and has boosted Metric Automotive Engineering capacity to handle the huge engine blocks that are found in the railways, marine and heavy equipment sectors.

Metric Automotive Engineering has an established reputation for the quality remanufacture of diesel engine components and offers services which include cylinder head remanufacture, cylinder block line boring, milling, honing and boring, camshaft grinding, crankshaft grinding, engine assembly and dynamometer testing.

On the fuel injection side, Yorke says that the technological focus is on fuel economy and emissions levels. “There have been huge advancements with this technology and it is important that companies offering services in this field stay up to date with the latest international trends.

South Africa has a distinct advantage



*Metric Automotive Engineering invested in a new state-of-the-art CNC machining centre.*

**pays off**



The state-of-the-art clean room at Reef Fuel Injection Services where assembly is done.



Reef Fuel Injection Services offers a full diagnostic and fault analysis service.

in being able to access the latest advances once they have been through the developmental stage in the international arena. This means that the adoption of new trends is far easier and efficient.

However, Yorke is quick to point out that not all global technology is applicable to the African market. "Harsh operating conditions and remote locations add to the challenges in Africa and fuel contamination is a major problem, whether it is dirt and water in the filling station tanks or buying blended diesel

at the roadside because it is cheaper," he explains

Reef Fuel Injection Services offers a full diagnosis and fault analysis service to help customers get to grips with these operating conditions. Yorke points out that while older fuel systems could tolerate a certain level of fuel contamination, the newer systems comprise advanced electronics and are much more susceptible to fuel contamination.

The company has invested in the latest diagnostic equipment and its team

has the necessary technical skill to assist customers. It offers Bosch, Delphi and Denso approved fuel injection services and is acknowledged as a specialist in CAT fuel systems.

Looking at growth opportunities, Yorke says that both companies are well placed to service customer across Africa. "Africa is a growth area for us and we have the necessary infrastructure and skills in place to service multi-national companies that operate in the region," Yorke concludes. □



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# Quick wins in predictive maintenance

In the Mario on maintenance column for this issue, Mario Kuisis discusses the pitfalls in adopting predictive maintenance strategies and how to avoid them. He goes on to suggest some quick-win techniques that can be easily adopted to garner management support for the principle.

In the last article of this series we discussed the evolution of the various maintenance strategies commonly in use (passive, reactive, preventative, predictive and proactive). We also considered how maturity must be developed in an organisation by progressively embracing these over time in order to arrive at an optimum, sustainable mix. All of this must of course form a complementary part of a well thought out and structured asset management programme for the organisation as a whole, but our particular interest is proactive maintenance.

One of the more difficult stages to break through and succeed with in proactive maintenance is that associated with predictive maintenance. Unfortunately many individuals are sold on the concept and embark down the path with great enthusiasm and good intentions, but abandon it when they become disillusioned with high costs, difficulty with respect to support, indifferent results and questionable value. There are many reasons for this, of

which the following are very common:

- Costs are underestimated because renewal of software licenses, training, calibration, time to implement, resource requirements and/or technology upgrades are partly or wholly overlooked.
- The equipment requirements are not properly specified up front so it is ill matched to needs.
- The in-house champion who went for the training leaves the organisation and the successor is disinterested.
- Even worse there is no champion at all.
- The condition monitoring team works in a silo. Corrective action is not taken timeously, if at all.
- In spite of considerable effort and investment, the apparent yield in meaningful 'saves' is low.
- When there are meaningful 'saves', they are not well publicised in the organisation.
- Management only sees the expense and not the avoided costs when there are 'saves'.

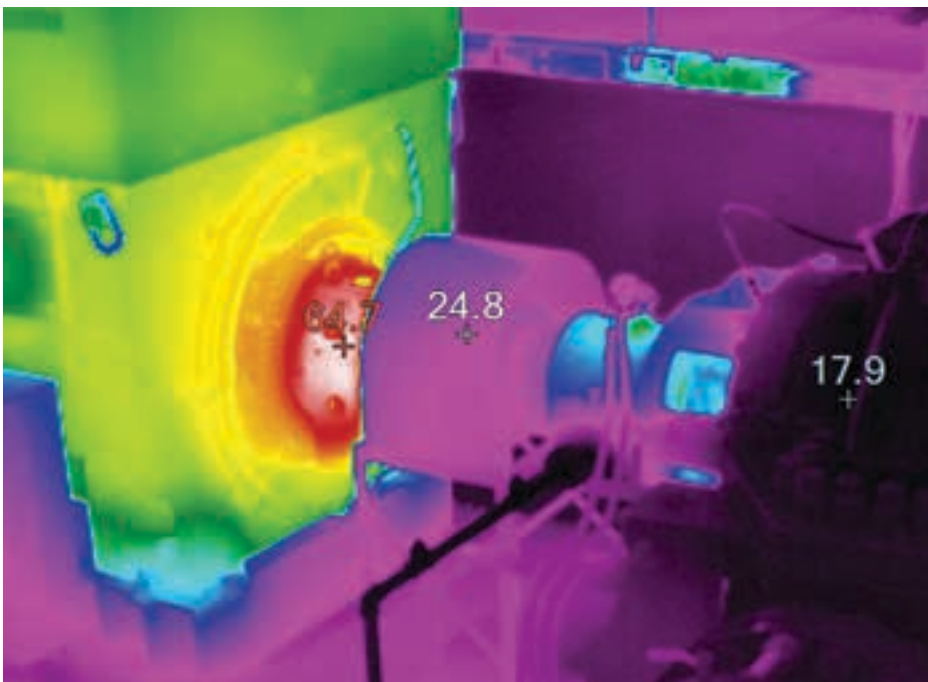
- False positives undermine belief in the approach and/or the technology.
- The necessity and importance of training is overlooked or underestimated.
- Outsourced services avoid many of the above problems, but result in data overload and real value remains elusive.

Fortunately, there are also many success stories where organisations have realised great benefits over extended periods of time. So what makes the difference? Words like foresight, planning, perseverance and the right combination of people, equipment and circumstances come to mind. These are all essential, but perhaps none is more important than management commitment. An attitude that says "I know it can be done, I want it done, get out there and do it and I will support you in it."

Of course this will eventually get the right result, but it can be made that much quicker and easier if a good starting point is chosen. A few quick wins that demonstrate what can be achieved validates management decisions, pumps up the champion, encourages the team and begins the process of winning over the ever-present doubters and unbelievers. You may well ask, does such a thing exist? If you have plant and machinery to take care of, you better believe the answer is almost certainly yes, regardless of your situation.

Take note that management commitment is not only important for launching the initiative but also for sustainability, because management can access information that quantifies and proves the ongoing value to the business. Like everything else, you can only manage what you can measure, so too with predictive maintenance. The best systems weigh investment in predictive maintenance against avoided costs. The results are reported regularly in financial terms and discussed monthly in meetings involving top management.

Now if truth be told, every peddler of predictive maintenance wares has



Thermography is an ideal quick-win technique for detecting faulty steam traps, heat loss to defective or inadequate lagging, overheated bearings, motors with bad cores, heat loss and leaks in buildings.



untold stories of prospective clients, upon being shown the latest offering, saying something like “So that is what that thing is!”. Invariably this is followed by scratching through a cupboard in a back room somewhere, dusting off an infra-red camera, vibration analyser or ultrasonic detector with long-dead batteries with an “Aha! I thought I saw one of those here somewhere.” At this point the salesman knows he is in for a hard sell. Any one or more of the reasons mentioned above will have tripped up the organisation and experience will be negative. So how do you prevent yourself (and your organisation) from falling into the same hole, or getting out of it if you are already there? Getting out is worse!

As always, the key lies in careful research and planning. Do your homework. Know where you want to get to. Identify and anticipate the hurdles and don't underestimate them. Ensure there is visible management support and commitment. Build a solid foundation. Look for the quick wins that are meaningful and will give the initiative the boost it will most certainly need. But, you might ask, where to look and for what? So let's consider what could make for meaningful quick wins in today's economic climate and business landscape.

First, be reminded that predictive maintenance starts with condition monitoring, but there are two aspects to plant condition. The most common is health status, which is linked to reliability. This is very, very important and is a foundational pillar supporting predictive maintenance, but there is another that

is often overlooked and can be the key. This is plant performance. When plant performance is routinely measured and monitored as part of the production process it is automatically taken care of. Deficiencies show up quickly and the need for corrective action is obvious and usually taken care of.

However, when aspects of plant performance are not routinely measured and monitored and deterioration occurs, the consequences can be very significant and nevertheless go undetected. This is because many degradation processes are slow and insidious. The worst is when the deterioration leads to rising operating costs that eat into the bottom line to an ever increasing degree. The effects of reducing efficiency can be particularly pernicious, especially when it occurs in items like pumps, fans, compressors, boilers and their associated distribution networks. In these situations it is not unusual to find that, eventually, the avoidable energy loss exceeds the energy consumed. The cost to the organisation, the environment and the country is huge. In addition, plant in this inefficient state requires more maintenance and is less reliable.

So – the quick wins we are looking for lie right here.

**Think thermography** to detect faulty steam traps, heat loss to defective or inadequate lagging, overheated bearings, motors with bad cores, heat loss and leaks in buildings.

**Think ultrasonic detectors** to locate and quantify compressed air, gas and steam loss to leaks and faulty traps, passing



Ultrasonic detectors can locate and quantify compressed air, gas and steam loss to leaks and faulty traps, passing process valves, cavitating pumps, over lubricated bearings and more.

process valves, cavitating pumps, over lubricated bearings and more.

Most findings in the above categories are associated with quick, easy and low discovery costs. Similarly the corrective interventions are usually simple and low cost, yet yield significant benefits. These are quick wins that will easily earn recognition and support by rapidly helping your organisation's bottom line.

These two technologies are so well suited to finding low hanging fruit because of their versatility. Look for this when evaluating your starting point and consider both plant health and performance. With many strings to your bow you are a lot more likely to hit a target that will add value and put you on a sound footing. □



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<b>Level 2</b>	7 – 9 September 2015
<b>Tank Test Training</b>	7 – 9 September 2015
<b>User Group</b>	10 <sup>th</sup> September 2015



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# Towards compliance with waste management regulations



Rachelle Stofberg, environmental manager at I-CAT.

Although South Africa has made some great strides in addressing key issues experienced in waste management over the past 20 years, the industry remains problematic, unsustainable and unable to achieve legislative goals and targets in its current state, says Rachelle Stofberg, I-CAT environmental services manager.

According to 2012 statistics released by the Department of Environmental Affairs, about 108-million t of waste is generated nationwide. General waste accounts for around 59-million t; unclassified waste for about 48-million t; and hazardous waste accounts for the remaining one million t. Of all this waste, only 10% is recycled – the rest is land-filled, she says.

With a continuously growing population and economy, waste generated in South Africa is expected to double to about 216-million t by 2025. “Our current lack of recycling facilities and great dependency on landfills – most of which are not compliant – means that we are rapidly running out of space to contain our waste,” predicts Stofberg.

“Additional challenges include: increased complexities of waste streams; historic backlogs of waste services; and a limited understanding of waste flows and SA’s national waste balance. Underpricing is a major issue in local waste management, and there are also few compliant hazardous waste management facilities.”

In response to these challenges, the National Waste Management Strategy

(NWMS) was developed and subsequently implemented by government in 2012. It is a legislative requirement in the National Environmental Waste Act (NEMWA) of 2008 to achieve the following objectives:

- Promote waste minimisation, re-use, recycling and recovery of waste.
- Ensure the effective and efficient delivery of waste services.
- Grow the contribution of the waste sector to the green economy.
- Ensure awareness of the impact of waste on people’s health, wellbeing and the environment.
- Achieve integrated waste management planning.
- Ensure sound budgeting and financial management for waste services.
- Provide measures to remediate contaminated land.
- Establish effective compliance towards the enforcement of the Waste Act.

A variety of tools have been developed to assist in achieving the goals set out in the NWMS. These tools include:

- Waste classification and management systems.
- Norms and standards.
- Licensing.
- Industry waste management plans.
- Extended producer responsibility.
- Priority waste.
- Economic instruments.

Stofberg explains that the Waste Classification and Management System provides a methodology for the classification of waste and provides standards for the assessment and disposal of waste for landfills. To this effect, the Waste Classification and Management Regulations came into effect in August 2013.

Under these regulations, all waste generators are required to classify each waste stream according to the SANS 10234 globally harmonised system of classification and labelling for chemicals.

SANS 10234 establishes criteria for the classification and labelling of hazardous substances and mixtures, including waste, to ensure safe transport and disposal. Under SANS 10234, it must be established whether waste is hazardous based on physical, health and environ-

mental hazardous properties (hazard classes), and the degree or severity of the hazard posed (hazard categories).

Stofberg indicates that most of the timeframes for achieving goals set out in NWMS have not been met.

“In cases where particular standards have been developed, we are observing a slow progression by industry to comply with the latest regulations and standards.”

She adds that hazardous waste is not being classified in accordance with SANS 10234 nor classified within 180 days of generation. “General, hazardous and recyclable waste continues to be mixed and, unfortunately, this demonstrates little commitment to compliance.”

Stofberg attributes this lack of compliance from industry to a variety of factors: A lack of understanding of the new regulations and the incorrect interpretation of roles, responsibilities and compliance timeframes associated with regulations.

“This is further compounded by financial costs associated with new waste management infrastructure, record keeping, and SANS 10234 classifications, together with limited compliance enforcement from the regulating authorities. Certain compliance, such as the NEMWA Waste Classification and Management Regulations, must be complied with within three years of promulgation. This means that mandatory compliance is about a year away.

I-CAT offers a comprehensive range of services to assist its clients in complying with the new Waste Classification and Management Regulations, which include:

- Waste licensing applications.
- Integrated waste management plans.
- SANS 10234-accredited waste classification and management.
- Integrated waste and water management plans.
- Waste assessment for landfill disposal.
- Industry waste management plans.
- Waste inventory management in accordance with the National Waste Information System.

“I-CAT Environmental Solutions assists various operations in the industrial and mining sectors by offering specialist services in waste classification and management, environmental compliance monitoring (water, dust, noise), environmental authorisation processes, and comprehensive annual audits and reviews,” Stofberg concludes. □

## Latest turbo machinery solutions showcased

**S**KF launched its latest magnetic bearing E300V2 control cabinet at this year's Hannover Fair. There was a virtual display of the new system, showing the advantages of SKF active magnetic bearing technology for use with a wide range of turbo machinery. The new E300V2 is a digital electronic control cabinet that replaces an earlier version and 650 units have been installed at different sites around the world.

The E300V2 is a modular system for improved reliability and maintenance and incorporates a number of important new features. These include remote monitoring and diagnostics, redundancy of key components, backup UPS and a high-resolution data acquisition system. The latter monitors operating conditions – such as rotation speed, vibration and temperature – in real time, allowing engineers to visualise rotation orbits with 3D waterfalls and graphs showing spectral analyses, time snapshots and other critical parameters.

It has embedded tools, qualified on sub-sea projects, for remote access that allows performing analysis and adjustment of operating parameters.

Askar Gubaidullin, business development manager for SKF Magnetic Mechatronics, explains, “For many years, SKF has worked closely with the world's leading manufacturers and operators of onshore, offshore and sub-sea turbo machinery. The new E300V2 is the culmination of this knowledge and experience, offering the opportunity to minimise costs while improving reliability. Its optimised control system reduces commissioning time of the rotating equipment. Moreover, the new system provides plant operators with high degrees of autonomy,” explains Gubaidullin, adding that these advantages are extended still further through the use of SKF S2M magnetic bearings.

“These can increase the operating range of turbo machines, allowing rotation at higher speeds with much greater operating flexibility. When used in integrated motor compressors, they eliminate the need for lubrication, thereby reducing the carbon footprint and maintenance, and also eliminate gear boxes, seals and auxiliary cooling systems, which cuts capital and operating costs,” concludes Gubaidullin. □



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# Early engineering for Ivanplats Platreef

To facilitate the design of the headframe structure by Murray & Roberts Cementation, FLSmidth has recently completed the early engineering contract for the production, service and auxiliary winders for Ivanplats Platreef Project No 2 Shaft. The solution involves two 6.0 m diameter Koepe winder installations at 90° to each other, with the auxiliary winder being installed on a lower level.

**M**ark Sheward, sales manager of mine shaft systems for FLSmidth, says that the Platreef minewinder engineering contract award was based on the company's 60-plus years' of experience and an extensive reference base of installations. The largest Koepe winders previously supplied by FLSmidth are the two 6.5 metre diameter units at Impala 16 shaft and their successful implementation forms the basis of the design and engineering undertaken for the Ivanplats Platreef Project winders.

"Experience is critical in projects of this nature and the ability to adapt to changing conditions is one which differentiates FLSmidth. Each of the two 6.0 m diameter Koepe winder installations with drums, brake systems and drives needs to be accommodated within the constraints of the headframe dimensions. The solution we provided involved installing the two Koepe winders at 90° to each other, with the auxiliary winder being installed on a lower level," Sheward explains.

During the early engineering phase,

FLSmidth made use of Finite Element Analysis (FEA) to establish and verify the stress loading in the final design. Other supplied data included dimensions, loads, required tolerances, stiffness requirements and the position and length of the anchor bolts, as well as the mass and dimensions of the major components to be lifted into the headframe.

Both the production and service winders are four rope friction winders. The production winder will hoist two 40 t skips, while the service winder will be equipped with a man/material cage and counterweight. The rock or production winder is being designed for a rope speed of 18 m/s while the man/material winder will operate at 10 m/s. The auxiliary winder, with a rope speed of 6.0 m/s, will be a 2.4 m diameter, 1.2 m wide single drum unit and could initially be ground-mounted and used for shaft equipping before being relocated to the head frame on completion of shaft sinking.

The shaft depth is approximately 1 050 m and braking will be effected on all three winders by a four-channel

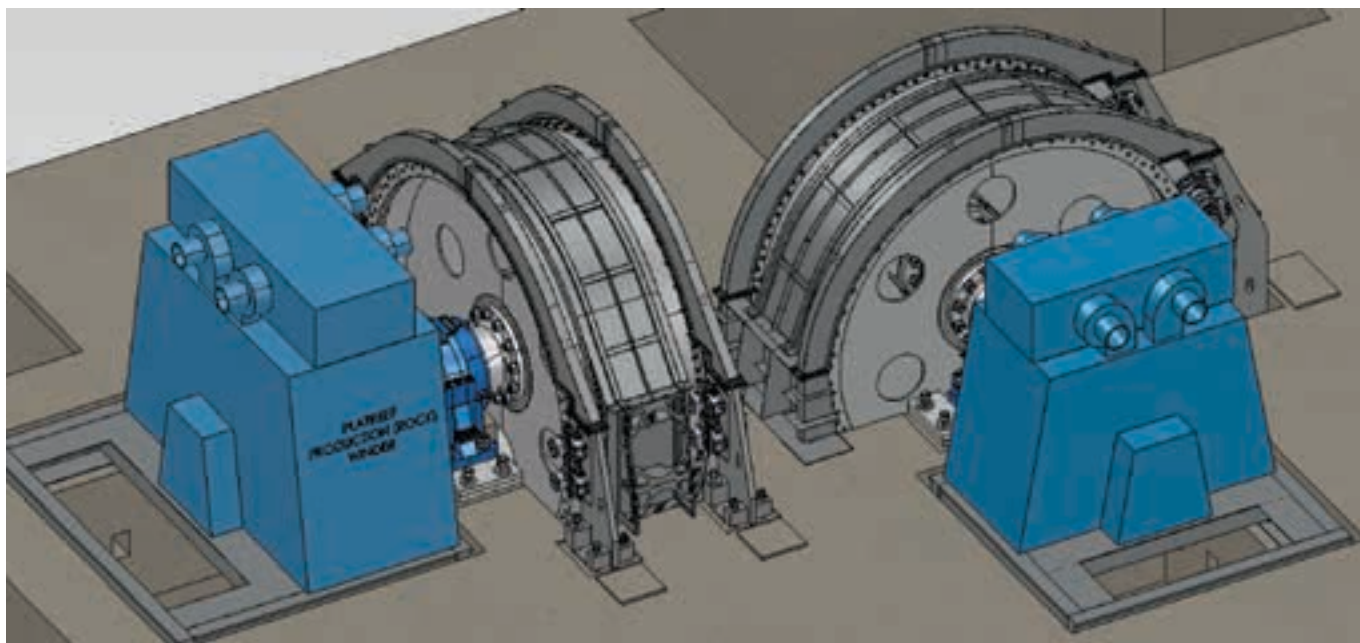


*The FLSmidth 6.5 m Koepe Winders at Impala 16 Shaft showing the 90° orientation for space saving.*

closed loop hydraulic system incorporating disc brakes.

## **New small winder design**

The auxiliary winder forms part of the new small winder design, which FLSmidth has been developing over the past year. This ongoing development work allows design optimisation and a



*The Ivanplats Platreef production and service winder engineering solution involves two Koepe winders at 90° to each other.*

# project winders



reduction in the weight of the actual winder, as well as the simplification of the clutch design.

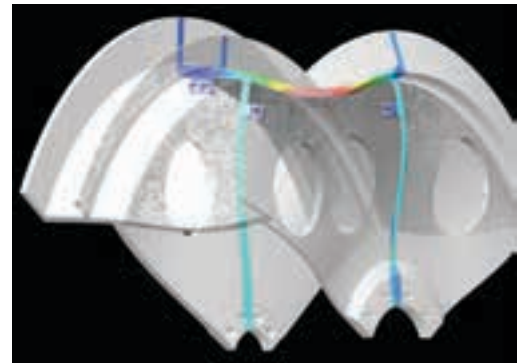
During the design stages, extensive use was made of software programmes, including FEA. “Best practice benchmarking was used and this allowed for the formulation of a parametric model which can be either up- or down-scaled

to accommodate specific application requirements. This has dramatically reduced the engineering time required and ultimately translates into the facilitation of faster responsiveness to customer requests for design/engineering on small single drum and double drum winders (with clutches) of up to 3.66 m in diameter,” says Sheward.

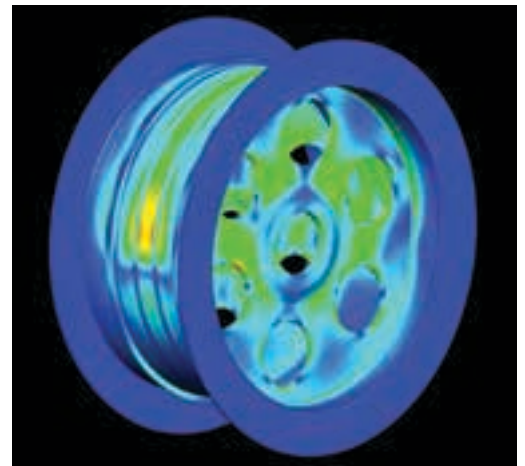
He points out that FLSmidth’s South African office is the global technology centre for all winders within the entire international organisation and Africa has the largest installation base of winders. This provides customers on the African continent with a distinct advantage, as all engineering for winders is undertaken in the Johannesburg offices. This close proximity to customers aids information flow and facilitates faster responsiveness.

In addition to the early engineering for the winders, FLSmidth also secured the contract for the design and engineering of the conveyances for these winders. This contract comprises the detailed design of the two 40 t skips for the production winder and a 40 t double deck cage and cage counterweight for the man/material hoist. The skips will incorporate hydraulic dump mechanisms.

All work for the skips and cages will be undertaken at the FLSmidth technology



A typical FEA rendering showing a single drum stress plot including exaggerated deflection.



An FEA rendering showing a Koepe drum stress plot.

centre for conveyances in Orillia, Canada, where engineers have access to the latest technical information.

Ivanplats (Pty) Ltd is an Ivanhoe Mines Company reading as IVN on the TSX. □

## FLSmidth nextSTEP™ rotor/stator combination

The FLSmidth nextSTEP rotor/stator combination represents the newest design in forced-air flotation technology and offers major advantages to the market. The latest solution demonstrates significant improvement in both metallurgical performance and energy efficiency over traditional forced-air designs.

The design of the stator was re-examined during the development of nextSTEP. Slots were added to the stator, making energy dissipation more uniform, which results in a higher probability of bubble particle contact during the flotation process.

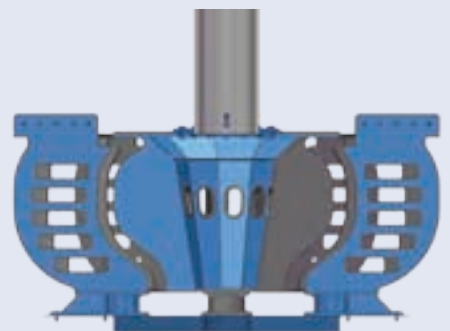
Dariusz Lelinski, flotation development manager at FLSmidth, says that the FLSmidth nextSTEP rotor/stator offers the lowest operating power of any forced-air flotation mechanism on the market and provides significantly better metallurgical performance. This is mainly due to the slots in the stator as well as the shape of the rotor, which produces a wider stream of

slurry with bubbles leaving the rotor blades. Adding slots to the stator increases recovery and boosts overall flotation efficiency, in part due to the higher energy dissipation that occurs.

Matching the shape of the rotor with the shape of the stator has facilitated better pumping performance and ensured more efficient use of energy within the cell itself. The perfect matching of the rotor and stator ensures that the widest possible flow is delivered and the highest area of stator is utilised. In addition, a power consumption saving of at least 15% can be readily achieved.

The superior metallurgical performance of the nextSTEP machine produces an increase of up to 5% in recovery rates, a result of the dramatic improvements in the mineral-bubble attachment rates. Furthermore, it provides stronger air dispersion near the rotor/stator region as well as increased pumping below the rotor.

“In addition, it is also relevant to note that the mechanism provides better wear distribution for increased rotor/stator life. This will have a positive impact on the long term operating costs and can benefit both new and existing installations. In summary, this new rotor/stator design has the ability to revolutionise performance in forced air flotation cells,” says Lelinski. □



The FLSmidth nextSTEP™ innovative rotor and stator combination offers better pumping performance and ensures more efficient use of energy within the flotation cell.

# Rapid set up of full-scale crushing and screening plant

Metso, a leading company in the mining and aggregates industries and in the flow control business, has introduced the Metso NW Series crushing and screening plant solution to the global market. The solution enables plant setup in less than 12 hours without heavy cranes, allowing customers to make the most challenging crushing sites more profitable and to move to another site more easily.

**T**he Metso NW Series is the first and only wheel-mounted crushing plant on the market that fits compactly into standard 40 ft (12 m) containers so that it can be shipped quickly and cost efficiently overseas or via a railway network.

## A complete plant in a single day

The combination of Metso NW106 primary jaw crushing plant and the NW220GPD secondary cone crushing plant with a large dual-slope screen has been optimised to be relocated regularly. Hydraulically fine-adjustable support legs, hopper walls and screen lifting facilitate fast installation and dismantling. The plant has also been designed to be “easy and safe to operate and maintain on site”, explains Eric Lavieville, global product manager, portable plants at Metso.

“Setting up a conventional portable crushing and screening plant often requires preparations with foundations and other site conditions. The new Metso NW Series plant solution is designed to avoid all these challenges, and only mini-

mal preparations on site are required,” Lavieville continues.

“Metso’s completely new plant conveyor design with fewer support legs makes setup quick and simple. No heavy cranes or concrete foundations are needed. Service platforms on the conveyors make daily operations easier and safer,” he adds.

## Increased production and full process control

Typical capacity of the Metso NW Series portable plant with very hard feed material and four calibrated end products is 20% higher when compared with any conventional solution now available in the same size class. The increased capacity is mainly achieved by the powerful Nordberg GP220 cone crusher and the new



*The combination of the Metso NW106 primary jaw crushing plant and the NW220GPD secondary cone crushing plant with a large dual-slope screen requires no foundations and has been designed to be “easy and safe” to operate and maintain on site.*

dual-slope screen. The screen enables higher screening performance, and the whole process can be precisely adjusted by Metso’s new process control system.

The new Metso IC50C process control system is designed to form a seamless combination between the primary crushing stage and the secondary crushing and screening stage of the plant. The whole process can be started and stopped by the push of a single button, making daily operations easy and safe.

“The IC50C system has been devel-



*A 20% higher capacity is being achieved, mainly because of the powerful Nordberg GP220 cone crusher and its new dual-slope screen.*

oped to meet customer expectations for consistent production, safety and easy control of the whole process. Feed and discharge conveyor control, wear compensation, auto setting adjustment and computer remote control are just a few of the many benefits the system offers. The innovative Metso IC50C system comes standard with the Metso NW Series crushing and screening plant,” concludes Lavieville. □



*The Metso NW106 wheel-mounted portable jaw crusher is designed to fit into a standard 40 ft (12 m) container.*

# Record-breaking belt reeler assembled

Conveyor fastening and accessory specialist, Flexco, has manufactured the world's largest vertical belt reeler for Sasol's Impumelelo decline shaft.

The world's largest vertical belt reeler has been manufactured for Sasol's Impumelelo Colliery in Secunda where it will be used to store and unspool 2 195 m of conveyor belting when the mine's main decline shaft becomes operational.

Once delivered, the 9.0 m diameter reel, which weighs more than 185 t when full, will be installed on top of the shaft and will enable the 150 t belt to be unspooled in a single operation. Thereafter, the reeler will be re-spooled with spare belting to be used for critical repairs, as well as general maintenance of the conveyor, when required.

Designed by conveyor fastening and accessory specialist, Flexco, the breakthrough design overcomes previous barriers that had prevented the use of vertical reelers on large-scale projects and has allowed Flexco to manufacture a smaller and simpler mechanical structure. The uncomplicated nature of the design also ensures it has improved reliability over horizontal equivalents and a price tag that is considerably less.

## Meeting the challenge

According to Flexco project engineer, Simon Curry, the main challenge of the project was the sheer scale of the task: to store more than 2 000 m of 1 800 mm wide conveyor belting, 22 mm thick and weighing 70 kg/m. In addition, with limited space and a tight budget, the reeler had to withstand the vertical storage and the possible compression damage caused by the sheer mass of the belt compressing and overstressing the belt at the core of the reel.

"We also needed to ensure the reeler is able to operate at the highest possible availability as the Impumelelo decline shaft is aligned with the mines' requirement to employ a single arterial conveyor rather than the usual double system that was previously required on its mines. This means that any belt damage or problems need to be addressed quickly and may require the reeler to spool and unspool replacement belt in order to keep production flowing.

"Although it's primary job is initially to spool the new belt onto the conveyor, it then has the very important role of storing replacement belt that can be quickly utilised to replace damaged areas or even the whole belt if required. This means that it has to be always available and ready to perform when needed," explains Curry.

## Technical requirements

Flexco Engineering manager, Neil Cochran, says after much deliberation it was decided that the most versatile option would be for a vertical belt reeler with a large enough drum diameter to prevent compression damage. "Our calculations showed that it was possible and feasible to build a vertical reeler and after confirming with belt supplier, Veyance, that the belt would not be damaged and would still be covered by the full guarantee during storage, we were satisfied to go ahead," he says.

"The operation of the machine is straight forward. A PLC-controlled variable speed drive motor is used to wind the belt on and to rotate the drum from time to time to alleviate compression on any one given part of the belt for prolonged periods. The full weight of the belt is fastened to the base of the drum with a specially designed 1.8 m fastener designed by Flexco to withstand the substantial forces that will be exerted by the pull of the 150 t belt.

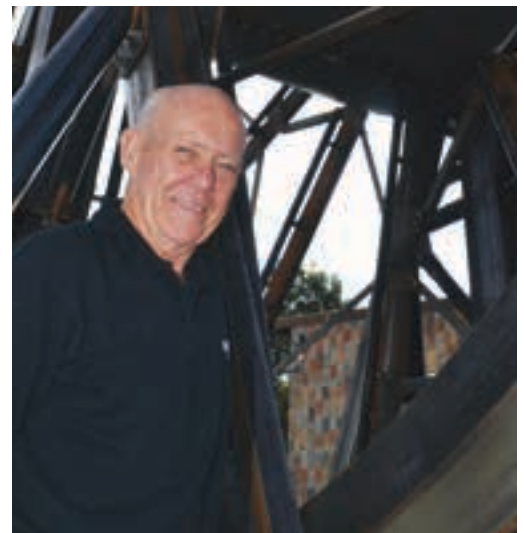
"In operation the reeler makes use of a pair of functional brakes that allows the belt to be released down the shaft in a controlled manner, even as the full length begins to weigh down the system as it extends down the shaft. The system has an additional pair of fail-safe brakes to stop the reel in case of an emergency or failure of the main brakes. The PLC has a system of sensors that controls the torque of the motor in the initial phases to unspool the belt until its weight takes over and gravity pulls the rest of the belt out under braking," says Cochran.

## Team work

The project forms part of Sasol's Im-



Simon Curry of Flexco indicates the impressive diameter of the vertical belt reeler manufactured for a colliery in Secunda.



Flexco Engineering manager, Neil Cochran, at the base of the world's largest vertical belt reeler.

pumelelo project and required close cooperation between Sasol staff along with ELB Engineering Services (ELB) and Flexco technical teams. In addition, materials and design criteria had to be closely met by the fabricators, Bosworth, who built the reeler, which will provide accurate schematics to the final installers, ELBCON, ELB's in-house construction company.

"Thanks to the combined efforts of our teams, as well as independent engineering experts Deon Niemann (structural engineer) and Roland Friesenecker (mechanical engineer), the winder was recently constructed and pre-assembled successfully at the Bosworth factory," Cochran concludes. □



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# The digital mine of the future

Speaking during the opening session of the Mining into the Future conference held in Boksburg recently, Bekir Genc of the School of Mining Engineering at the University of the Witwatersrand talked about the digital future for mining industry.

amount of work, but some parties have started trying to establish these systems.”

In the first phase of the project, the School built a mock-up of an underground tunnel. This allows Wits to simulate an underground mining environment that can be used for teaching, learning and research. The 70 m tunnel cost around R15-million, and features a stope, rescue bay and lamp room, built with sponsorship from Goldfields, New Concept Mining and Sibanye.

Research is being conducted into smart surveying and mapping (visualisation) systems; climate control systems and energy savings (particularly important in deeper-level mines); smart rock engineering systems, which can monitor rock mass movement and predict seismic events; and smart data processing, which can locate people and assets and monitor their performance, recognise actions and detect abnormalities – such as recognising that someone is ill. Smart mine design, mining planning and decision-making are also being studied.

The Digital Mine project involves four phases, Genc says. Phase One – the building of the mock-up mine for research, teaching and learning – is complete. Phase Two – the building of a laboratory hosting digital technologies inside the mine – is in the advanced planning stages. Phases Three and Four – monitoring an underground environment for optimised mine design and processes, and having a digital mine integrated with a digital city and communities – are mostly conceptual, he says, and will require further funding to develop.

Genc expects the Digital Mine project to benefit the mining sector through providing access to a safe, smart mine laboratory reaching into the surrounding community on a multi-sensor GIS platform (once the lab has been developed), and providing knowledge to industry so that it can collect appropriate and accurate information to optimise mine designs and processes. This will enable continuous and predictive operations, while having a positive impact on mine

efficiency and security. The latter is of particular relevance to gold mines, which face dangers to both mineshafts and mine employees as a result of the activities of illegal miners.

With digitisation, notes Genc, the concept of a Mine-to-Order (or Demand Mining) becomes a real possibility, contributing to productivity, mine bottom-line and transforming the mining industry through information technology. Perhaps, most importantly, a digital mine will accelerate the process of reaching the industry's zero-harm goal.

A variety of technologies that are under development will help make the digital mine a reality. Underground communications systems will enable real-time intervention to manage all types of risk. Underground drones will be able to see, map and collect data, and communicate it, and can also be used to map abandoned mines that are too dangerous to send people into. Smart data processing and 3D modelling is planned in the future, and will require participation from various Schools across various faculties at Wits.

The Mining into the Future Conference was held on July 1 and 2 at the Birchwood Conference Centre in Boksburg. The theme for this year's conference is *“Improving productivity in a time of low commodity prices”*. The conference offers delegates key insights and solutions, with the focus on such topics as machine fleet selection for either underground or surface mining; the latest trends on telematics and automation; preventative maintenance interventions; budgeting and planning; and parts inventory management. □

*“Digital technologies are fundamental for efficient and safe mining where all systems are optimised,” says Genc. “This requires clarity of multiple sources of underground data, communicated to a surface control room and back to the workplace in real time.”*



*Dr Bekir Genc of the School of Mining Engineering at the University of the Witwatersrand speaking during the opening session of the Mining into the Future conference in Boksburg. The conference is a collaborative partnership between Caterpillar, Barloworld Equipment (as the Cat southern African dealer), the Wits School of Mining, and the Wits Centre for Mechanised Mining Systems (CMMS).*

The future of the mining industry in South Africa is digital, says Dr Bekir Genc of the School of Mining Engineering at the University of the Witwatersrand, and information technologies will help the sector achieve its goals of better working conditions and improved mine economics. Genc was speaking during the opening session of the Mining into the Future conference in Boksburg.

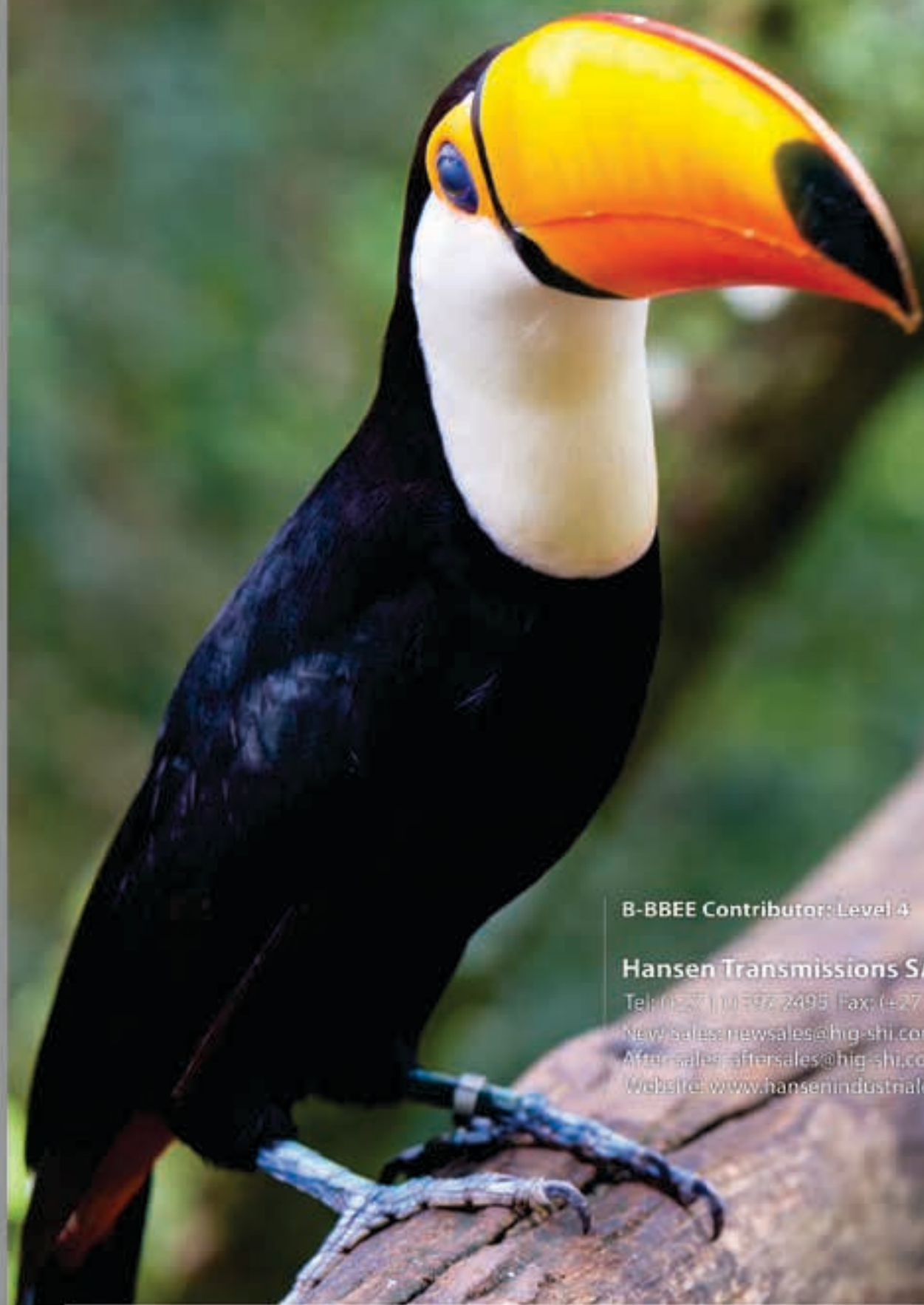
The conference is a collaborative partnership between Caterpillar, Barloworld Equipment (as the Cat southern African dealer), the Wits School of Mining, and the Wits Centre for Mechanised Mining Systems (CMMS).

Genc says the digital revolution is happening everywhere, and that it is soon going to happen to the mining industry – “if not today, tomorrow”. In recognition of this, the Wits School of Mining Engineering established a Digital Mine project to support the existing strategy of the mining industry to continuously improve working conditions and mine economics.

“Digital technologies are fundamental for efficient and safe mining where all systems are optimised,” says Genc. “This requires clarity of multiple sources of underground data, communicated to a surface control room and back to the workplace in real time. This is not happening yet. It requires an enormous



# Think precision!



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# Mono-rail system for the local automotive industry

Demag project engineer and technical sales representative, Niki Mizen, talks about the company's Demag mono-rail system (DMS), already successful in the South African automotive industry and now attracting interest from as far as Egypt.

For the past decade, the Port Elizabeth branch of Demag, a specialist crane and component manufacture, has supplied its unique Demag mono-rail system (DMS) to the South African automotive industry – which has specific needs for robust and heavy-duty linear overhead materials-handling solutions.

DMS has been developed specifically as a modular solution to meet such customer requirements. "When we designed the system initially we were looking to cater for increased throughput in terms of cycle times, while taking safe working loads into account," Demag project engineer and technical sales representative Niki Mizen begins.

"Our success with the system over the past decade has marked our long involvement with many of the major automotive OEMs in South Africa," Mizen says. "This success has largely been attributable to our focus on being innovative and flexible."

DMS is complementary to its KBK light crane system, which consists of suspension monorails for overhead materials handling requirements.

The main features of DMS are:

- Ease of installation due to light aluminium construction.
- Silent and smooth operation from polyurethane wheels running on aluminium (no metal flaking).
- High transfer speeds.
- Accuracy of positioning.
- Low maintenance and running costs.
- Locally manufactured to European standards.

Low maintenance requirements are due to the fact that there is no metal-to-metal contact on any moving parts. This, in turn, enhances the robustness of the entire system. "Our aluminium system uses polyurethane tyres to prevent metal-on-metal flaking, which makes it ideal for applications such as automotive body shops and paint shops," Mizen explains, adding that the system developed by

Demag Port Elizabeth has been supplied worldwide for many years.

"The quality of the system has generated invaluable global exposure for us. This is a total solution for the automotive industry that has stood the test of time," Mizen adds.

Another feature of DMS is that it can be fully or partially automated. "We can supply a total solution for whatever components need to be picked up, for any end-products that need to be transported or assembled. DMS is fully customisable to utilise specific branded components required by the end-user, such as switchgear and PLCs. Industrial wireless communication allows for seamless integration between the hoist and the main control panel."

The fact that this is a modular system means it is flexible enough to cater for a range of parameters. Such modularity also allows for easy transportation or shipping via 12 m shipping containers. "This is a solution-orientated system that can be designed to fit any factory layout," Mizen continues.

"Our considerable success in this regard has been due to the fact that we

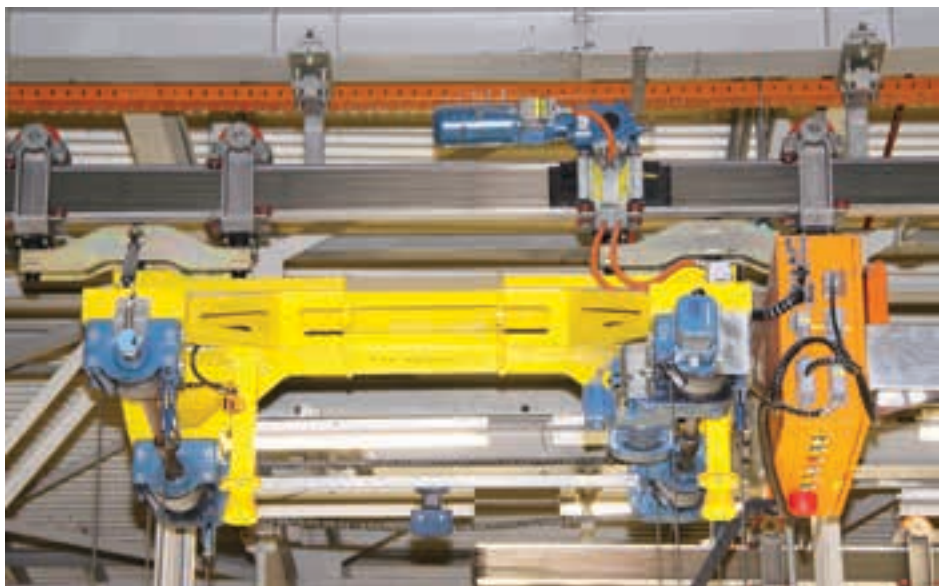


*The DMS uses polyurethane tyres to prevent metal-on-metal flaking.*

not only supply the best solution for our customers, but that we are able to offer a total turnkey system, including all the conveyors and accompanying storage retrieval machines."

Demag Port Elizabeth's first major international customer was General Motors Egypt. "When the General Motors global operation heard what we had achieved in South Africa, it immediately directed an enquiry for a specific solution from the Middle East to us.

"This not only entrenches our reputation for quality technology, but also consolidates our presence as a major international player. The fact that we can carry out complete turnkey projects means that Demag Port Elizabeth is in the unique position of being a one-stop shop," he concludes. □



*The Demag mono-rail system (DMS) is ideal for robust and heavy-duty linear overhead materials-handling requirements at manufacturing facilities such as automotive assembly plants.*

# Distribution centre enhances customer

Willie Nel, Atlas Copco distribution centre manager, talks about the value of consolidated service delivery for the high-quality products from three Atlas Copco business areas, namely Compressor Technique, Construction Technique and Mining and Rock Excavation Technique.

**A**tlas Copco South Africa's Jet Park Distribution Centre (DC) ensures the streamlined delivery of world-class product and service solutions to south and Southern African mining and industry.

The global industrial group serves customers by "delivering sustainable productivity solutions through the supply of compressors, vacuum solutions and air treatment systems, construction and mining equipment, power tools and assembly systems" according to Willie Nel, Atlas Copco DC manager. "Atlas Copco considers customer service excellence as fundamental to its sustained success," he adds.

"To achieve excellence in this field, our service and after sales service must match our world-class product quality every step of the way," says Nel. "This is where our massive, highly organised and reliable DC – located at our state-of-the-art 78 000 m<sup>2</sup> facility close to OR Tambo International Airport – takes centre stage. The DC enables us to enhance our customers' service experiences across the board through the delivery of high

quality, end-to-end product and service solutions.

"The DC has made it possible for us to consolidate the warehouse and logistics and to centralise and support three Atlas Copco business areas, namely Compressor Technique, Construction Technique and Mining and Rock Excavation Technique, which includes Rock Drilling Tools (RDT) and Exploration Products Africa (EPA)."

The Atlas Copco business areas benefit greatly from the DC's capabilities, which include parts and equipment distribution to local and neighbouring countries, export to various destinations and the supply of a consolidated storage and distribution service locally and to neighbouring countries. "We also operate a structured system whereby customers can collect from one central point," adds Nel.

The DC supports national and regional activities including regional workshops and adds value for Atlas Copco branches through parts replenishment. The centre currently handles a total of 15 000 product lines for the three business areas



*Christopher Ngubane, a material handler, operating one of the Hubtex forklift trucks in the Atlas Copco Distribution Centre.*

with another 2 500 lines for the mining business area to be added. Nel explains that personnel at the DC endeavour to dispatch all items on the same day they were picked and pick slips are batch-released twice a day to ensure as many back orders are covered as possible. Special care is also taken to ensure that all breakdown deliveries, emergencies and special requests are handled as per customers' requirements. "In other words, the DC enables us to standardise on high levels of service and ensure that all customers from all the business areas are treated equally."

The DC comprises a total area of 20 800 m<sup>2</sup> of which 9 750 m<sup>2</sup> is under roof, where smaller product lines, accessories and spare parts are stocked. The remaining 11 050 m<sup>2</sup> is yard area with ample space for storing a wide range of capital equipment for all the business areas including surface and underground drill rigs and various other mining equipment, compressors, generators, exploration equipment, road building machinery and pedestal booms.

The DC presented Atlas Copco with an ideal platform to create jobs and embrace good Employment Equity and B-BBEE practices. All supervisors and the majority of managers are Employment Equity personnel.

The entire DC team consists of 40 employees: 33 members are on the floor to take responsibility for picking, packing and dispatching and seven people look after administration and management.



*The Atlas Copco Distribution Centre Team is responsible for the streamlined delivery of world-class product & service solutions.*

# service experience



An assortment of some 15 diesel and electric materials handling and lifting equipment including forklifts, reach trucks, order pickers and pallet ride-ons are operated in the DC, which features two 15 m vertical storage units (VSUs), 13 m high racks and 9.0 m high cantilevers.

Four dock levellers enable off-loading directly into the DC and two dock levellers in the yard are used for off-loading capital equipment. There is a separate oil store for Hazchem products.

All operators have undergone an intensive six months training period to ensure they are equipped with the neces-



*Penny Vilakazi operating an electric pallet ride-on.*

sary skills to operate the various types of forklifts and lifting equipment.

"SHEQ is something we take very seriously and this training is an ongoing action at the DC," concludes Nel. □

## Rugged and efficient PowerROC T50 drills

Atlas Copco South Africa has set a benchmark in the large top hammer market sector with the introduction of the PowerROC T50. High performance and penetration, quality holes, fuel efficient, durable, easy operation, safety and comfort – this drill rig ticks all the boxes for end-to-end drilling solutions in the African market.

The T50 has been specially built to meet the unforgiving conditions of the African continent head on. "Uncomplicated surface drilling technology meets Atlas Copco's superior quality design and engineering standards in this drill rig," states Hedley Birnie, business line manager – surface exploration drilling (SED) for Atlas Copco Mining and Rock Excavation Technique.

"And the result of this perfect combination is a high performance, rugged and reliable machine that drills bigger holes faster, requires very little maintenance and maintains high production levels for the lowest overall cost of ownership."

The straightforward modular design includes simplified hydraulic and electrical systems for easier operation and maintenance. "What makes the drill rig particularly attractive, especially in this tough economic climate, is its fuel efficiency," continues Birnie. The machine's effective management system allows for low fuel burn at full production, giving fuel burn as low as 27 l/hr on large holes which, according to Birnie, "is unmatched by machines of similar size in the industry."

The machine's Tier 3 diesel power pack delivers 261 kW at 1 800 rpm and provides more tons per litre of fuel, which has a direct and positive result on productivity. "We have found a seamless balance between

efficient operation and high performance, while also caring for the environment by conforming to emission standards," says Birnie.

The drill rig's high penetration capability comes from the powerful COP 3060 30 kW hydraulic rock drill, a proven high performance unit in the Atlas Copco range. While output is dependent on mineral type and location, the drill rig/rock drill combination's output capabilities are extremely impressive, ranging from 200 m/hr in medium rock (coal) to 70 m/hr in hard rock. "Even in the most extreme environments and the hardest of mineral, the machine is capable of a remarkable 40 m/hr," adds Birnie.

In terms of hole diameter, the machine is capable of remarkable power and output, drilling holes that range from 102 to 152 mm in size and 35 m in depth. When it comes to hole quality, the PowerROC T50 turns the large top hammer market on its head. The motor driven aluminium feed delivers a maximum feed rate of 0.7 m/s and achieves straighter and more consistent holes compared to any steel feed. The double dampening system ensures constant hole bottom contact. Hole quality is further assured by the constant and sufficient supply of air delivered by the Atlas Copco screw-type air compressor. Furthermore, the optional COP Logic system gives anti-plunging, anti-jamming and collaring for optimum hole quality.

Safety and comfort go hand in hand and here too, the PowerROC T50 does not fail to impress. A comfortable operator is a safe and productive operator; the ergonomically designed ROPS- and FOPS-certified cabin provides added operator comfort with great

visibility and extra vibration dampers. All vital functions are at the operator's fingertips for excellent drilling control.

Weighing only 22.8 t (without consumables), the compact drill rig's high ground clearance and tracks ensure easy manoeuvrability and transportation, while the extendable boom system aids quick positioning – "all factors that contribute to keeping uptime to the max," adds Birnie.

Delivering everything the customer, fleet owner or end user wants from a drill rig, namely high performance, efficiency and availability, the T50 is designed to work anywhere in any industry to meet the most demanding drilling applications: Road building, trenching, construction, open pit mines as well as limestone, cement and aggregate quarries.

"Building on the quality and success of Atlas Copco's previous large top hammer range, the new PowerROC T50 will enable us to secure a strong foothold in this lucrative market and gain significant market share to complement our other areas of business," concludes Birnie. □



# Beneficiation technology group appoints new CEO

MBE Minerals SA's parent company MBE Coal and Mineral Technology (CMT) GmbH has appointed Hans George Schnabel as global CEO, an appointment expected to renew the focus on global growth and expansion.

**H**ans Schnabel, CMT Group's new global CEO, is a graduate engineer from the Technical University of Cologne and has 40 years' experience in the minerals and metals industries. Formerly head of Andritz Separation GmbH, he has been instrumental in growing the business threefold over the last six years, with a main focus on Africa as a key area of growth and expansion.

Schnabel was previously managing director of KHD Humboldt Wedag's South African operation from 1988 to 1992. From 1992 onwards he worked for six years as a board member of KHD, Germany. His extensive portfolio also includes stints as managing director of Eisenbau Ferrostaal, Essen from 1998 to 2000 and President of Outokumpu Technology from 2000 to 2003.

MBE Minerals SA is a leading supplier of iron ore and coal beneficiation

technology offering basic and detailed engineering components for complete plants and systems, including modernisation and capacity increase measures as well as automation and process control equipment.

In addition, MBE Minerals SA offers a full scope of services including feasibility studies, raw material testing, financing concepts, erection and commissioning, personnel training and pre- and after-sales services. "We have an extensive reference base throughout Africa and in all the major commodity sectors. Our technology has set the benchmark in many instances," Johannes Kottmann, managing director of MBE Minerals SA says. Kottmann will report to Schnabel.

MBE Minerals SA receives expertise and technical support from its worldwide network including the MBE Coal and Minerals Technology's R&D centre in Cologne, Germany. The R&D centre con-



sults with customers from all parts of the world with regard to optimum processing.

This service is backed up by an in-house laboratory facility and pilot test work capabilities. The centre is also used as a training facility for customers, either on general mineral processing or on the operation and maintenance of specific MBE equipment.

## Extensive, field tested product range

Focused on delivering best practice solutions to industry, MBE Minerals has a range of products designed with high quality levels, reliability and durability in mind. "Pneufлот® technology from MBE Minerals SA continues to attract global attention as a flotation technology of the future, already surpassing the popularity of conventional technology, with 82 installations in coal globally and magnetite and haematite (itabirite) flotation in South Africa," Kottmann says.

The Pneufлот flotation cell improves product quality and recovery, delivering lower capital and operating costs, as well as significantly lower wear costs and higher efficiencies, which are key criteria in the African mining industry as major mining houses seek to boost productivity and cut costs.



*BATAC® jig technology has excellent separation accuracy, is relatively small in footprint and has a comparatively low capital cost.*



MBE Minerals SA's BATAAC® jig technology delivers higher efficiency, huge economic benefits, better product quality, better machine availability and higher throughput rates. Advantages derived from using this technology are excellent separation accuracy, a relatively small footprint and comparatively low capital cost. Accuracy is achieved through electronic control of the air pulse generator and sensing of the thickness and densities of the material layers being separated.

MBE Minerals SA's ROMJIG® is particularly suited to the reliable and economical de-stoning of raw coal. Due to the lower percentage of refuse in the washery feed, there is a resultant reduced wear on machinery and transporting equipment, less grain degradation, less dust and slurry and reduced consumption of flocculation and flotation agents in downstream fines recovery circuits.

Operating at up to 14 500 Gaus, the company's robust Jones® Wet High Intensity Magnetic Separator (WHIMS) offers a high throughput capability, coupled with simple maintenance and lower energy consumption. The WHIMS is perfect for treating feebly magnetic minerals with a particle range from 20 microns up to 1.5 mm and unit throughput capacities

**Above:** *Pneufлот® has positively demonstrated its efficiency in many coal applications around the world.*

**Above left:** *BATAAC® jig technology delivers higher efficiency, better product quality and higher throughput rates.*

**Right:** *A double deck linear screen with modular polyurethane screen decks.*

from 500 kg/h up to 250 tph.

The Permos® Medium Intensity Magnetic Separator (MIMS) drum type unit is suitable for materials which can be attracted by a field strength of between 2 000 and 5 000 Gaus. Designs for both dry and wet feeding are available from MBE Minerals SA.

The Palla Mill® is suitable for both wet and dry applications in primary and secondary grinding and for pulverising materials of any hardness. It is capable of grinding more than 100 different materials, including a range of minerals and commodities previously considered unviable due to the costs involved.

A variety of vibrating screens are available in widths of up to 3.6 m and lengths of up to 6.75 m in single or double deck configuration and with either circular or linear motion. Screens can be provided for sizing, scalping, dewatering and media recovery, and feature an innovative side plate mounted drive that

makes them lighter than those using vibrator motors.

The TESKA separator from MBE Minerals SA performs dense media separation in a suspension of finely ground solids and water. In this kind of media, particles of high specific gravity settle at the bottom, while particles of lower specific gravity float, such as coal.

Flexibility in design, centred on market needs, is complemented by a focus on manufacturing to the highest possible quality standards. MBE Minerals South Africa's future growth trajectory is directly aligned with its ability to adapt to application-specific requirements and to drive pioneering technology for the mining and quarrying sectors. □

# Tube bender eliminates waste for exercise machines

A Unison tube bender with a unique swing-away wiper die that facilitates waste-free bending of short and complex tubular shapes has been chosen by Cybex International, the manufacturer of physical exercise equipment.

Unison has won an order for a custom-designed tube bending machine and special tooling from Cybex International, a manufacturer of physical exercise equipment. Incorporating a unique servo-driven wiper die mount, the machine has been specifically designed to enable Cybex to reduce waste material costs by eliminating the need to cut shorter tubular parts to length after bending.

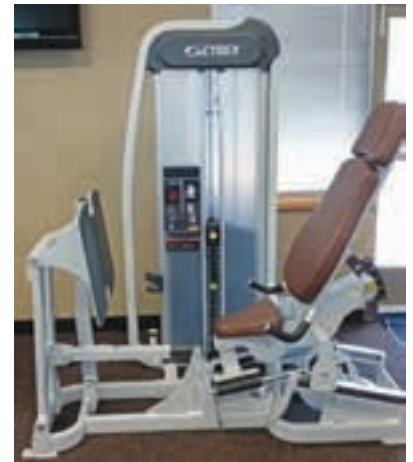
Cybex produces a diverse array of physical exercise machines at two large state-of-the-art manufacturing facilities in Medway, Massachusetts and Owatonna, Minnesota. Its unique machines are developed with the help of exercise science principles to be biomechanically correct and generate optimum results with minimum stress on the body.

Nearly all Cybex exercise equipment is based on high quality tubular steel framework, most of which is produced at the Owatonna plant. The framework is a highly visible part of the brand image and

therefore needs to combine an aesthetic look and feel with structural strength. To achieve this, Cybex constructs frames from three different sizes of robust 11-gauge steel tubing, using a variety of proprietary tube profiles including flat-sided oval and compressed octagonal shapes. Producing smooth, wrinkle-free bends in these types of tubular profile is technically challenging and demands considerable expertise.

Cybex currently uses hydraulic tube benders to handle the bulk of its production needs, together with a single all-electric CNC machine for more complex parts that require multiple bends with different radii. The tube parts range in length from two to 10 ft and involve a diversity of bends – from shallow curves to tight bends with a centre-line radius as small as 4.8 inches. Most parts require bend accuracies of  $\pm 1.0^\circ$  or better, to help achieve end-to-end positional tolerances as tight as 0.03 inches.

After bending, the parts are welded,



*Cybex will use the Unison tube-bending machine to produce high quality tubular steel framework for a diverse array of physical exercise equipment.*

cleaned, shot blasted and powder coated. To ensure that the final product is unblemished, every stage of this process is subject to stringent quality control.

Parts with complex bend shapes are produced in small batch sizes – typically of between 12 and 30 – on the company's existing CNC bending machine. Like most rotary drawtube benders, this is fitted with a stationary wiper die to help control material flow and prevent tube collapse during tight radius bending. The permanent presence of the die imposes a limit on the minimum length of tube that can be bent. This means that to produce short parts, Cybex has to use overly long tubes and then cut them to length after bending. This has several drawbacks: it is time-consuming – it is much more difficult to cut a formed part than a straight tube – and demands additional processing and quality control stages. It also creates material scrap, which is expensive and at odds with the company's commitment to environmentally responsible manufacturing practices.

The custom-bending machine that Unison has designed will bend these complex and short tube shapes without generating cut-off waste. Instead of a stationary wiper die, Unison's machine uses a unique swing-away tool mount, which – like all motorised axes on the machine – is driven by a software-controlled servomotor. Moving the wiper die away from the pressure die towards the end of the bend cycle allows the tube feed mechanism to be driven closer to the rotary bending head, facilitating fully automated production of short parts.

The new machine is based on a 4-inch (100 mm) all-electric CNC tube bender from Unison's Breeze range. It has also



*Unison is supplying Cybex with a custom tube bending machine that will be based on a 4-inch multi-radius Breeze model, with multi-stack tooling, laser spring-back correction and a unique swing-away wiper die.*



been configured with multi-radius bending capability and multi-stack tooling to allow complex parts to be produced in a single, uninterrupted machine cycle. The precision of the new machine is also aided by a unique laser-based system that automatically measures and adjusts bend angles to compensate for tube spring-back after bending.

Cybox cites fast and repeatable software-controlled set-up, bend accuracy and low power consumption as key reasons for its choice of a Unison tube bender. Other factors include very favourable comments from machine operators and Unison's willingness to develop a custom tube bending machine specifically to help improve the flexibility and efficiency of manufacturing small parts.

As Jim Saynor, Unison's senior commercial manager, explains, "We have worked closely with Cybox and our tool manufacturer to ensure that the machine we deliver will provide a right-first-time manufacturing solution, from the moment that it is installed. Every iota of Cybox's specialist know-how is encapsulated in the design of the tools, machine and tube bending methodologies." □

## Car manufacturer needs met via automated 1 600 t servo press

Ever smaller batch sizes and increasingly frequent product changes: this is the challenge facing many of today's part suppliers. As the variety of car models increases, so too does the range of parts needed. In order to win a contract and reach profitability, suppliers must not only reach the highest possible output levels but also offer the widest possible spectrum of parts. And this is exactly what the automotive part supplier Kemmerich in Attendorn, Germany, has achieved with its 1 600 t servo press from Schuler.

The servo press is the largest of its kind in Attendorn – home to numerous suppliers of metal parts. The type TSD 4-1600 press with a bed size of 6.0 by 2.5 m was put into operation almost a year ago. Schuler also supplied the coil line with a fine levelling machine and a tri-axis transfer system with active vibration dampening.

Owner Josef Kemmerich is convinced that "ServoDirect Technology is technically way ahead of other solutions. In order to reach its full potential, Schuler helped us optimise the forming process by examining the components." These findings were immediately put into practice in the company's own die construction shop. "I particularly appreciate

Schuler's reliability and the punctuality of its deliveries," says Kemmerich.

Extensive technical know-how and fast decision-making laid the foundation for the rapid growth that Kemmerich has enjoyed in recent years. The company soon recognised the potential of ServoDirect Technology and was one of the first companies in the industry to use it. Today, the group already has several Schuler servo presses at its production halls in Germany and the Czech Republic.

The newly founded facility in Auburn (Alabama) is also equipped with a highly automated 630 t Schuler press. It is one of the first lines with ServoDirect Technology in the North American part supplier industry. □



The type TSD 4-1600 press boasts a coil line with a fine levelling machine from Schuler.

Photo: Schuler.

# DISCOVER YOUR TRUE POTENTIAL. CHANGE THE COURSE OF YOUR FUTURE.

The Southern Africa Stainless Steel Development Association (Sassda) is committed to the development of the industry and its people. The Fundamentals of Stainless Steel is one of the six interactive courses Sassda has to offer.

## FUNDAMENTALS OF STAINLESS STEEL

This is an intermediate course aimed at people who have acquired a basic understanding of stainless steel through workplace experience and/or from completing the Introduction to Stainless Steel e-learning course. The targeted audience would include newcomers to the industry, as well as persons requiring a more in depth knowledge of stainless steel, such as salespersons, supervisors, managers, specifiers and end users.

Carries 1 CPD point from SAIMEchE and SAIIE

### This course covers:

- Who Sassda is and the role they play in the industry
- Understanding what makes stainless steel unique
- The basic advantages and classifications of stainless steel
- Identifying the main classifications of stainless steel as well as the basic grades, composition, properties and uses of each
  - The principles explained in the "Spider"
  - Identifying the top 20 alloys
- Corrosion: how to avoid it, differentiate between the different types of corrosion and how each affects stainless steel
  - The physical and mechanical properties of stainless steel
- The difference between the type, form and finish of stainless steel
- Familiarising with the SA primary producer manufacturing process
- The difference between flat, long products, castings and tube & pipe
  - Identifying the different types of stainless steel contamination
- Being familiar with the process of the restoration of the passive layer
  - Understanding how to clean, store and maintain stainless steel

Terms & Conditions apply for all course bookings and cancellations.

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# Commercial comfort for improved productivity

Johnson Controls has announced an innovation that it calls 'Commercial Comfort Systems', which seeks to use its comprehensive range of products and control solutions to customise workplace environments to best suit comfort and efficiency requirements.

**A** correct heating, ventilation and air conditioning (HVAC) management strategy can make a facility more than just suitable for occupation; it can drive productivity and cost savings. To help organisations refine control of indoor environmental quality, Johnson Controls has introduced a welcome innovation in managing HVAC systems – Commercial Comfort Systems.

Says Neil Cameron, general manager, Johnson Controls Building Efficiency: "Facility and energy costs make up a large percentage of company costs but research shows that organisations spend almost 72 times as much on people. Even a small percentage improvement in productivity through improved indoor environmental quality can thus make a significant impact on a company's bottom line. Our Commercial Comfort System approach is designed to help companies achieve this."

Indoor environmental quality encompasses air temperature and humidity, lighting, acoustics and air quality. The costs of getting this wrong, either through bad building design, operational strategies or inappropriate HVAC solutions, can be counted in absenteeism, health costs and productivity loss – all of which impact the performance of the business.

Johnson Controls' Commercial Comfort Systems combine the company's HVAC solutions and control systems with its deep sector knowledge, skills and process expertise to give users more options.

The Commercial Comfort System offers a holistic HVAC approach that:

- Supports achievement and productivity via occupant comfort.
- Provides the economic benefits associated with efficient operation and energy savings.
- Delivers financial value – affordability and reliability.

Explains Cameron: "To our broad range of mechanical systems, we add integrated controls for the building environment. Whether our customers use disparate lower specification solutions like our rooftop and split system units, or higher spec equipment, or both, we can integrate these solutions using our extensive range of HVAC controls.

"Our customisable packages are as easy to set up as a home entertainment system. The controls offer greater flexibility in meeting heating and cooling needs, helping our customers achieve the comfort and performance benefits of a totally integrated system."

Among the features offered by control systems are:

- Time scheduling to maximise effi-



*Johnson Controls' Commercial Comfort Systems combine the company's HVAC solutions and control systems with its deep sector knowledge, skills and process expertise to offers holistic HVAC approaches that promote productivity, efficiency, affordability and reliability.*

ciency and minimise energy use – e.g, by setting equipment to work only during business hours.

- Trend reporting – e.g, on humidity and air quality) enables facility management to adjust HVAC equipment to maximise efficiencies and comfort, and ensure health standards or regulations are met.
- Zoning features, which allow zoning of areas for independent control of clusters of equipment – e.g, on different aspects of the building, in areas where sensitive equipment is used, or where specific activities demand different treatment.

"In the majority of companies, the people are the business," emphasises Cameron. "Improving employee engagement, satisfaction, productivity and loyalty are important to the performance of the organisation. Our Commercial Comfort Systems make it easier to leverage that advantage," he concludes. □



*Johnson Controls introduces York LX Series packaged units, a new standard in residential and commercial heating and cooling.*

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An advertisement for Verder pumps. It features a blue background with the text "WE PUT OUR HEART INTO PUMPS" and "VERDER passion for pumps". Below the text are four pump models: VERDERHUS, VERDERFLEX, VERDERAIR, and VERDERMAG. To the right is a diagram of a human heart and circulatory system.

## Safe disposal of contaminated refrigerant

Sub-Saharan gas market leader, Afrox, showcased the full benefits of the Zugibeast – a portable, high-speed decontamination unit – at the 2015 FRIGAIR Africa exhibition that recently took place at the Gallagher Convention Centre in Midrand.

As a signatory to the Montreal Protocol on Substances that Deplete the Ozone Layer, South Africa has implemented strict laws that are designed to reduce the production and consumption of ozone depleting substances.

From January 2013, government targets are to reduce ozone-depleting substances by 5% per annum and, by 2040, to be phased out entirely. HCFC gases, regarded as having high ozone depleting potential, are still widely used in the local refrigeration industry.

R22 is the most commonly-used HCFC gas, and Afrox is able to assist refrigeration companies in dramatically reducing their environmental impact and overall operational costs by offering a highly specialised refrigerant recovery, reclaiming and recycling service, not only for R22 but for all other synthetic refrigerants.

Afrox business manager for special products and chemicals, Jaco Coetzee, says that Afrox is “the only company in Africa to make use of the technologically advanced and patented Zugibeast, a portable, high-speed decontamination unit that extracts contaminated oil, moisture and other non-condensibles from refrigerants.



*R22 is the most commonly used HCFC gas. By offering refrigerant recovery, reclaiming and recycling services for refrigerants, including R22, Afrox is able to assist to reduce environmental impacts.*

ants. And the Zugibeast system operates at speeds three times faster than any other technology currently available in South Africa.”

As part of this unique offering, Coetzee says that Afrox is able to undertake the service for clients at their premises, or at its specialised facilities. “Clients provide us with the contaminated refrigerant in either cylinders or drums, and we will handle it in a responsible and safe manner,” he explains.

As part of the offering, Afrox can also provide recovery cylinders and drums to customers who can return the contaminated product to Afrox for safe disposal through the extensive Afrox national footprint in southern Africa. □



*The Zugibeast is a high-speed decontamination unit used to extract contaminants from refrigerants.*

## De-dusting contract for PPCs De Hoek plant

ACTOM Group business unit, John Thompson Air Pollution Control, was recently awarded a multi-million rand contract by leading cement producer PPC to replace the original Finishing Mill 6 electrostatic precipitator (ESP) with a bag filter at its De Hoek factory in the Western Cape. The reverse-pulse bag filter will reduce dust emissions to the required legislative limits.

The replacement of the ESP with a higher performing dust control system is similar to an upgrade John Thompson APC – then known as ACTOM Air Pollution Control – performed at De Hoek three years ago to enhance the de-dusting system of its Kiln 6 and Raw Mill 6.

As with the earlier upgrade, the new contract has been commissioned to ensure that dust emissions from Finishing Mill 6 are maintained at less than 30 mg/Nm<sup>3</sup> in accordance with the current environmental regulations. The contract was awarded in November last year for completion in March 2016, with a phased implementation due to cement demand.

The new bag filter, which will have a design air-moving capacity of 41 000 actual m<sup>3</sup>/h, will incorporate a variable speed drive induced draft (ID) fan and materials handling equipment consisting of a screw conveyor and rotary valve that will discharge the collected dust into an existing product conveyor.

ACTOM (Pty) Ltd is the largest manufacturer, solution provider, repairer and distributor of electro-mechanical equipment in Africa, offering a winning and balanced combination of manufacturing, service, repairs, projects and distribution through its 40 distribution outlets throughout Southern Africa.

ACTOM is also a major local supplier of electrical equipment, services and balance of plant to the renewable energy projects. It also holds numerous technology, distribution and value added reseller agreements with various partners, both locally and internationally. □



*The bag filter John Thompson APC has been contracted to install at the De Hoek factory's Finishing Mill 6 will be similar to that shown above, which the business unit installed at PPC's Slurry factory's Finishing Mill 4 two years ago.*

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# Durban mall's highly efficient air con system

The upmarket Pavilion shopping centre in Durban is currently in the process of upgrading its air conditioning system, by replacing its existing units with energy-efficient Carrier 19XRV centrifugal chillers.

**P**hase 1 of the air conditioning upgrade at Durban's Pavilion shopping centre involves the installation of three Carrier 19XRV centrifugal chillers, which boast a total cooling capacity of 10 050 kW. Carrier is part of UTC Building and Industrial Systems, a unit of United Technologies Corp.

Shopping Centre investor Pareto, which owns the Pavilion, procured the new air conditioning system from an environmental sustainability perspective. "As a company committed to the basic principles of water conservation and energy and operational efficiency in all our centres, we were satisfied that the system fulfilled our requirements," says Mark MacKaizer, The asset manager at the Pavilion shopping centre.

"We were also happy with the price, and with the guarantee and maintenance support provided by the suppliers. Our mechanical engineers advised us that these chillers have been used at various sites, without any defects and with low operating costs. The system sounds technically promising and we look forward to seeing how this new technology delivers at the Pavilion," he adds.

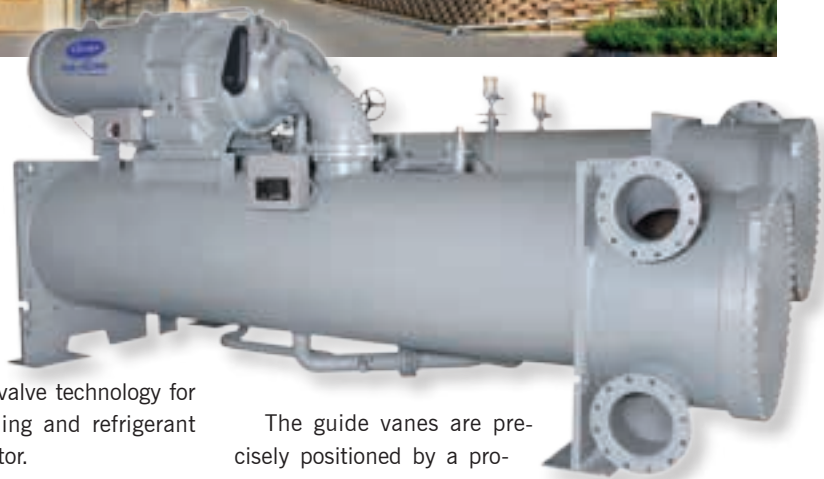
The advanced Carrier 19XRV centrifugal chillers provide exceptional value, with energy efficiency ratio (EER) levels as high as 6.8, by utilising proven technology designed specifically for chlorine-free refrigerants (R134a). The 19XRV units consist of a single stage aerodynamic impeller; tunnel diffusers based on aircraft engine technology; and a motor cooled by refrigerant gas injection.

The compressors are controlled using a unit-mounted variable frequency drive to maximise the chillers' energy efficiency. This is used in conjunction with high-efficiency evaporator and condenser tubes, an expansion sub-cooler integrated into the condenser,



**Above:** The upmarket Pavilion shopping centre in Durban.

**Right:** Three Carrier 19XRV centrifugal chillers, which boast a total cooling capacity of 10 050 kW, have been installed in Durban's Pavilion shopping centre.



and patented float valve technology for optimised sub-cooling and refrigerant level in the evaporator.

The single-stage hermetic compressor increases product reliability by eliminating the additional moving parts associated with multiple-stage machines, such as additional guide vanes and complex economisers.

The Carrier 19XRV chillers are also equipped with a compressor variable frequency system. By changing the compressor operating mode, this system considerably reduces power consumption based on the motor's rotational speed.

In addition, the variable frequency drive control box is cooled by refrigerant, minimising size and ensuring optimal component cooling for an extended operating life. This concept makes water-cooling unnecessary, and eliminates the associated maintenance cost and power consumption of the water pump.

Capacity control is achieved by means of variable inlet guide vanes located at the impeller inlet. Load modulation ranges from 100% to 15% of the full compressor load, under nominal ARI conditions.

The guide vanes are precisely positioned by a proportional integral derivative (PID) control algorithm to ensure precise and quick control of the desired chilled-water temperature, without hunting or overshooting the set point.

With the variable frequency drive, the compressor speed is regulated by the control of the voltage-frequency values applied to the motor. The voltage applied, generated by pulse width modulation, is proportional to the frequency.

The feedback calculation of the water temperature parameter deviation results in an adjustment of the cooling capacity through a simultaneous and co-ordinated action on the guide vane opening and the compressor speed.

The 19XRV centrifugal chillers were supplied to the mall upgrade project by AHI Carrier South Africa, and were sourced from Carrier's factory in Charlotte, USA.

Built on Willis Carrier's invention of modern air conditioning in 1902, Carrier is a world leader in heating, air conditioning and refrigeration solutions. □



# Mining machine simulators to enhance learning

Virtual learning and the use of simulators have become extremely widespread on a global platform. However, research shows that most mining companies do not use simulation to its full capacity, often just going through the motions to acquire basic skills. This is according to Tony Pretorius, risk manager at the Murray & Roberts Cementation Training Academy.

Virtual learning and the use of simulators have become extremely widespread on a global platform. However, research shows that most mining companies do not use simulation to its full capacity, often just going through the motions to acquire basic skills. This is according to Tony Pretorius, risk manager at the Murray & Roberts Cementation Training Academy.

“At Murray & Roberts Cementation we take a more targeted and holistic approach by applying simulators in a blended learning experience. This approach is in line with the situational leadership development model of ‘Tell, Sell, Participate and Delegate’. For example, learners complete structured e-Learning modules, then visual training and then pre-simulation training. Thereafter, they undergo simulation training, followed by in-workplace learning using an actual machine under the direct supervision of a competent person,” he says.

ThoroughTec Simulation, the largest global supplier of both surface and underground mining simulators, has acknowledged the Murray & Roberts Cementation Training Academy’s training styles and methodologies as industry best

practice. “We have set the benchmark in Africa and played a role in the design and development of the proficiency scorecard for future simulation models with ThoroughTec,” says Pretorius.

The Murray & Roberts Cementation Training Academy subscribes to an applied competency model. This entails using e-learning to cover the foundation competence component and then advancing into a visual-based training environment to ascertain reflexive competence. “Reflexive competence is not only coupled to visual based training, but also to simulation to a large degree. E-Learning considers knowledge acquisition, while a visual-based environment brings about understanding, through virtual training or simulation that measures performance against a set of practical outcomes.”

Learners at the Murray & Roberts Cementation Training Academy begin with a series of generic modules on the simulator that indicate basic machine operation behaviour. Typically, simulation covers start-up of the machine, testing of the brakes, tramming to the workplace, the operational function of the machine, for example load-haul-dump, drilling and/or bolting, and then



*Simulation significantly reduces risk and accelerates the turnaround time of learner operators in training.*

trucking back to the surface.

There are a number of feedback results provided by the simulator that will indicate whether the individual is a safe worker and will be able to meet production requirements. The feedback can also be used to assess whether an operator’s habits could lead to unnecessary damage to equipment during operation. This information is useful for mitigating and correcting undesirable operational habits.

The Vienna Test System, the international standard for assessing fitness to drive, indicates if an individual has specific psycho-motor deficiencies such as hand eye co-ordination, depth perception or concentration issues. This knowledge will allow the training provider to provide additional exercises on the simulator to address and rectify any deficiencies.

“Once we have a basic idea of the kind of learner with which we are working, we can set a specific development programme on the simulator for that individual learner. This will allow the learner to acquire the necessary skills required for the desired performance. On exit from the programme, a proficiency scorecard, detailing the habitual skills of the operator, is provided for the work-



place supervisors,” Pretorius points out.

Simulators are not just used for assessing and training novices but are also very useful for refresher training and in scenarios where companies wish to eliminate the bad habits that some operators have developed over many years of operation. In addition, simulators can be used to mimic accidents and incidents. This is particularly useful in instances where an unfortunate event has occurred, as it allows companies to take all the

operators through a simulated event to prevent a recurrence of the event.

Simulation significantly reduces risk and accelerates the turnaround time of learners in training. “The end result is an operator who is considered to exhibit safe workplace practice due to the fact that one is able to identify and respond to various operator habitual skills in a ‘what if?’ or emergency scenario. It is also possible to identify those operators with the desired innate skills needed for emergency

**1,2:** Murray & Roberts Cementation Training Academy uses simulators to enhance the learning experience. Both underground and surface mining operations are covered.

**3,4:** Typically, simulation covers start-up of the machine, testing of the brakes, tramping to the workplace, and the operational function of the machine, for example load-haul-dump, drilling and/or bolting, and then trucking back to the surface, during the day or the night.

responses. This provides companies with an up-front due diligence approach that is considerably better to the approach adopted by the average mining training provider,” says Pretorius. □

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## IGBT mine traction battery chargers

Becker Mining South Africa's recently launched IGBT mine traction battery chargers have been designed to charge underground traction batteries in the shortest possible time, at the lowest



Becker Mining South Africa's recently launched IGBT mine traction battery chargers have been designed to charge underground traction batteries in the shortest possible time, at the lowest possible temperature, to ensure optimum battery.

possible temperature, to ensure optimum battery performance.

"The most common causes of battery failure and reduced service life are associated with incorrect charging techniques," says Andrew Trentelman, senior general manager: electronics, Becker Mining South Africa. "Becker Mining's new IGBT mine traction battery chargers, which utilise insulated-gate bipolar transistor (IGBT) technology for quick on and off switching, are more efficient and cost effective than conventional transducer controlled, oil-cooled traction battery chargers.

"These IGBT battery chargers are lightweight air cooled units, which are controlled by an intelligent microprocessor circuit that acts as the main control computer, responsible for the logging, charge functions and controls.

"Becker Mining's new chargers utilise Delta Volts/Delta Time (DV/DT) for the precise detection of a battery's gassing stage so the charger can terminate the

second rate charge more rapidly. This technology, which prevents over-charging often associated with conventional battery chargers, ensures reduced charging times and lower power consumption. By reducing the charge current once DV/DT is reached, batteries are also charged at a significantly lower temperature."

With an improved power factor of 0,8 and maximum input current reduced from 42 A to 32 A, these energy efficient battery chargers offer power savings of up to 10 kVA at maximum output current.

For the efficient management of mine traction batteries, Becker Mining's robust chargers have an integrated power line communication (PLC) identification system, which automatically logs the serial number, as well as the charge history related to that specific battery. The chargers are also equipped with Wi-Fi to facilitate future downloading of data, errors and the charge history of each battery, for viewing or analysis on the surface.

[www.za.becker-mining.com](http://www.za.becker-mining.com)

## Low headroom hoist for confined spaces

The ultra-compact Tusker low headroom, steel wire rope hoist, one of the newest additions to the Elephant Lifting Equipment range, is suitable for lifting in areas where height restrictions or confined spaces are an issue.

This lightweight hoist's design allows it to be run on a smaller beam, without compromising lifting capacity. The new hoist has its crawl motor and hoist motor balanced on either side of the beam, an innovative engineering design that sees the reeving system mounted in the centre of the unit. "This has resulted in a gain of 600 mm, further reducing the space requirement," Elephant Lifting

Equipment managing director, Grant Walton says.

Another unique feature is that the hook can be retracted into the body of the hoist, further eliminating wasted headroom. The unit is extremely competitively priced and is driven by an energy efficient motor, resulting in reduced energy consumption. It is supplied standard with a soft starter, which reduces swaying, and it is equipped with overload protection to meet OHS Act legislative requirements.

Simple to install and maintain, the Tusker Low Headroom hoist is designed to accommodate a wireless remote sys-

tem with digital readout capability that indicates the hoist's load range limiting features. In addition, an advanced electro-mechanical braking system ensures minimum impact on the gearing when the motor stops and acts as an additional safety mechanism, stopping automatically if the power fails and preventing the load from running.

The Tusker low headroom hoist is available in working load limits from 3.2 t up to 12.5 t and uses standard steel wire rope, which is available ex-stock from the distribution network of parent company, Torre Lifting Solutions.

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



The ultra-compact Tusker low headroom hoist is reputed to be the lowest headroom hoist available on the market.

## Biometric control system attracts widespread interest

Booyco Electronics' biometric control system was developed specifically for the local operating environment and uses fingerprints to authenticate licensed machine operators.

Personalised smart cards, which store individual operator's fingerprints and other relevant data such as licensed capabilities and expiry dates, provide the ideal solution for allowing controlled access to moveable items such as earthmoving and mining equipment, blasting boxes and carts, as well as conveyor starter panels.

An operator gains access to and can oper-

ate a given machine or piece of equipment by validating his fingerprint on the scanning device on the machine. This same level of control can be applied underground in other control environments, such as access to explosive magazines and underground substations.

Booyco Electronics has an established reputation in the mining sector for engineering fit-for-purpose monitoring and controls systems that assist companies to maintain optimum safety under all operating conditions.

[www.booyco-electronics.co.za](http://www.booyco-electronics.co.za)



## Compact full-feature professional thermal camera

FLIR Systems has launched the FLIR C2, the first fully-featured, pocket-sized thermal camera designed to help building professionals identify hidden heat patterns to clearly show where problems are, such as sources of energy waste, signs of structural defects, plumbing issues and more.

Its compact and slim design enables the FLIR C2 to fit comfortably into any pocket, available for use to uncover invisible building issues and to show customers where potential problems are located. At 125×80×24 mm and 130 g, the sleek architecture makes the C2 the most convenient, full-feature thermal camera available on the market.

Featuring FLIR's patented MSX® real-time image enhancement and a brilliant, simple-to-use touch screen with auto orientation, the camera creates thermal images with stunning details to help identify problem locations more easily. MSX also adds key details, captured by the onboard visible camera, to the C2's thermal images, so numbers, letters, texture and other features are clearly recognisable without compromising the thermal image.

The C2's 4800-pixel resolution high sensitivity detector captures and displays subtle thermal patterns and small temperature differences – useful in building applications. The 41° field-of-view frames a wider scene and the C2 includes a built-in work light and flash that helps



*A FLIR C2 being used to locate an insulation void in a bedroom wall.*

illuminate poorly lit areas common in building inspection environments. The extra illumination also ensures that a brighter visible photo can be captured to go along with the C2's thermal image.

The JPG images can be downloaded later using the free FLIR Tools software, which allows the user to adjust thermal image levels, isolate and add temperature measurements, change colour palettes, and create persuasive reports.

"By offering the FLIR C2 for less than R12 000, we hope to put this powerful tool into the hands of more professionals – building industry experts, contractors, energy auditors, retrofitters, inspectors, roofers, HVAC technicians or plumbers," says Reynhard Heymans, business development manager for sub-Saharan Africa.

[www.flir.com/C2](http://www.flir.com/C2)

## Paint manufacturer expands speciality coating offerings

International paint supplier, Beckers Industrial Coatings, is turning its attention to the local industrial market where it is liaising with the country's largest manufacturers to begin locally developing and manufacturing paints to suit individual requirements.

Becker Industrial Coatings is a leading manufacturer and developer of high-tech coatings to several major market sectors including trucks, agricultural equipment, trains, industrial machinery and more. Already an established supplier to the African coil coatings industry, the company recently introduced its highly successful range of specialised industrial coatings into the local market.

According to Eric Fouissac, Beckers vice-president, ACE (agricultural, construction, earth-moving) and trucks, the company provides bespoke coatings

solutions for customers across diverse businesses including ACE, transportation and automotive plastic exteriors. The company is currently growing the industrial coatings segment globally and hopes to provide customers with protective, durable coatings that increase the sustainability of their products.

Beckers' managing director, sub-Saharan Africa, Willem van Heerden, says high level discussions are already taking place with manufacturers in the



*The famous AGV train is coated with a special Beckers Industrial Coating product.*

## Digital pressure gauge for refrigeration monitoring

Keller, leading manufacturer of measuring technology such as isolated pressure transducers and transmitters – represented in southern Africa by Instrotech – has on offer a digital pressure gauge for refrigeration systems.



The exact vapour pressure curves of five different refrigerants are stored in Keller's dV-2 Cool digital pressure gauge. This enables the prevailing cooling temperatures in closed cooling circuits to be derived and displayed by the integrated microprocessor. Two versions of the digital pressure gauges with stainless steel measuring cells are available: for absolute pressures within the ranges of -1.0 to 40 bar, and -1.0 to 80 bar. These measure within the compensated pressure range of 0 °C to 50 °C with extreme accuracy and with a full scale tolerance of ±0.1 %. Because of the high resolution of 1.0 mbar and 2.0 mbar, the dV-2 Cool pressure gauges can also be used for measuring leaks in a vacuum.

The measurements are clearly legible on the LCD display, which can be rotated to the best viewing direction after installation. Depending on the environment, a special rubber surround is available for protection. Two buttons (Select/Enter) are available for operating the instrument and setting parameters (e.g. selecting the type of refrigerant). Users can also switch between units of bar/°C and psi/°F. After switching on, the battery-operated instrument remains active for a period of 15 minutes and then goes into standby mode. Continuous measurements can be made for approximately two months without changing the batteries.

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

transport, earthmoving, mining and agricultural equipment manufacturing industries, while discussions with others in the truck body, trailer and other allied large-scale manufacturing industries are already well advanced. "In fact we are starting to supply a range of customer approved coatings to the new Gibela Rail Transport Consortium for local train projects project from our Vereeniging factory," he says.

[www.beckers-group.com](http://www.beckers-group.com)

## Condra delivers Sinclinorium headgear cranes

Condra has completed load tests on two 25-ton headgear cranes manufactured at the company's Germiston works for Mopani Copper Mines' Sinclinorium shaft.

The tests were witnessed by a representative from Mopani Copper Mines (MCM) during June ahead of delivery during July to the Nkana Mine, near Kitwe in Zambia, where the new shaft is scheduled for commissioning toward

the end of this year.

The two headgear cranes are part of a bigger order that includes two 70 t maintenance cranes for the project's winderhouse. Condra will begin work on these in August.

MCM's headgear cranes were manufactured as identical machines with very high lifts of over 80 m. They feature high tensile ropes and incorporate materials of the best possible quality on critical components. Gearboxes, for example, are made of 36B case-hardened stainless steel. Live axle drives have been used throughout.

Condra has manufactured several cranes for Mopani Copper Mines over the years, including overhead cranes, high lift machines and hoists.

Managing director Marc Kleiner says that this customer had named reliability and rapid service response among the reasons for awarding the order for Synclinorium's headgear and winderhouse cranes to Condra, which submitted a tender price higher than those of two rival bidders.

Rapid response is supplied by company agent EC Mining, which is based in the Copperbelt and able to react quickly to service calls using spare parts held in stock. Kleiner adds that competitor manufacturers in the northern hemisphere generally found it difficult to respond promptly to service requirements in Zambia.

"Last year, we lost the order for Synclinorium's workshop cranes to a European company, but there have apparently been long waiting times for spare parts for these cranes when they were needed," he says.

"Copper mining companies need maximum production because of the currently depressed copper price, but this is dependent on the reliability of all machinery installed in the mines. There is no margin for excessive machine downtime.

An interesting aspect of manufacture of the MCM cranes was the flexing of factory production schedules in order to meet time-to-site requirements. According to Kleiner, this is something that Condra is accustomed to doing, whereas most rival companies tend not to be as accommodating.

Africa's market for very high-lift cranes such as those for MCM has for many years been dominated by Condra, which

designs these machines around the company's durable and robust K-Series hoist range, proven to be dependable under conditions of increased mechanical strain associated with high-lift applications.

Condra uses silumin rotor cores to enhance K-Series motor-starting torque in the high-lift role, and has developed variable speed control levels on the drives to enable precise load positioning even on lifts of 100 m and more. Hoist speeds of between zero and 18 m/min and travel speeds of between zero and 200 m/min are possible.

Condra manufactures to ISO 9000 standards, and complies with the standards of ISO 14000 and ISO 18000.

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



Load testing on one of the two 25 t headgear cranes manufactured by Condra for Mopani Copper Mines' Sinclinorium shaft.

### Bauma Conexpo Africa 2015

The first Bauma Africa event took place in 2013 at the Gallagher Estates and was supported by 754 exhibitors from 38 countries and attended by 14 700 visitors from over 100 countries. At that time, Messe München and AEM announced their intention to set up a joint venture in Africa, which has culminated in the upcoming Bauma Conexpo Africa.

Dennis Slater, president of AEM, comments: "Africa offers tremendous opportunities for North American companies in particular. We are pleased to be supporting our members as they enter or expand in this market."

This International Trade Fair for construction machinery, building material machines, mining machines and construction vehicles will be held from September 15 to 18, 2015, at the Johannesburg (NASREC) Expo Centre in Johannesburg. [www.bcafrica.com](http://www.bcafrica.com)

### Industry diary

#### September 2015

##### Pump Efficiency & Reliability Workshop (3 Day)

28-30 September  
Durban, Protea Hotel  
Phindi Mbedzi: +27 11 325 0686  
phindi@2kg.co.za  
[www.2kg.co.za](http://www.2kg.co.za)

#### October 2015

##### ALUEXPO, 2015, International Trade Fair for Aluminium Technology

8-10 October  
Istanbul Expo Center, Turkey  
Süphan Ilker:  
silker@ankiros.com  
Monika Brandt,  
Monika.Brandt@messe.de

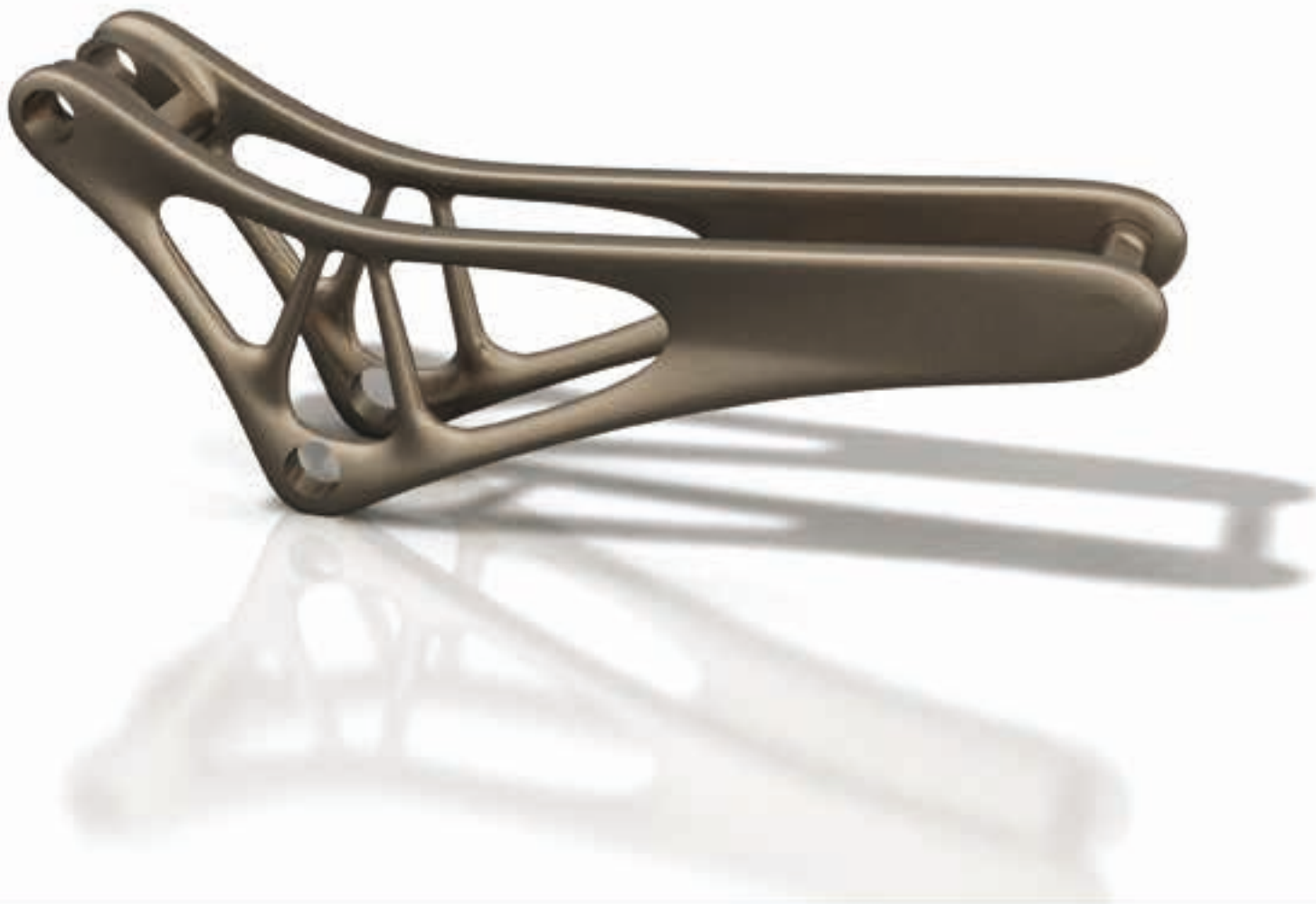
##### Valves Selection, Installation & Operation (4 Day)

12-15 October  
Johannesburg, Cedar Park  
Phindi Mbedzi: +27 11 325 0686  
phindi@2kg.co.za  
[www.2kg.co.za](http://www.2kg.co.za)

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