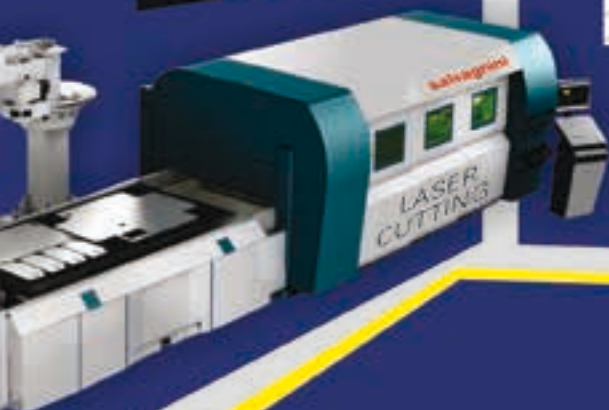


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- Heat exchanger desalination
- MBSA Learning Academy launched
- Optimised designs of take-up trolleys and ore skips
- SA lighting manufacturer adopts state-of-the-art technology

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The 'leading goose' of Africa?



In a press release published in advance of next month's Infrastructure Africa Business Forum taking place in Sandton from 9-10 June, Nigel Gwynne-Evans, chief director for African Industrial Development with the Department of Trade & Industry (the dti) warns that Africa and its 34 least developed countries urgently need to find the best ways to industrialise their economies to avoid being further marginalised and excluded from the global economy for yet another decade.

"Africa is de-industrialising and has skipped a vital industrial revolution such as the one Asia experienced in the 1970s," says Gwynne-Evans.

He quotes an article published by the *Economist* in November last year: '*Industrialisation in Africa: More a marathon than a sprint*': Many countries de-industrialise as they grow richer, reads the article – growth in service-based parts of the economy, such as entertainment, helps shrink manufacturing's slice of the total.

In contrast, according to the *Economist*: many African countries are de-industrialising while they are still poor, raising the worrying prospect that they will miss out on the chance to grow rich by shifting workers from farms to higher paying factory jobs.

The article lists some stark statistics:

- From 1980 to 2013 the African manufacturing sector's contribution to the continent's total economy declined from 12% to 11%, leaving it with the smallest share of any developing region.
- In most countries in sub-Saharan Africa, manufacturing's share of output has fallen over the past 25 years.
- In Africa, manufacturing provides just over 6% of all jobs, a figure that has barely changed in three decades, while in Asia, the figure grew from 11% to 16% over the same period.

And while other developing countries in the world are also experiencing de-industrialisation – partly because technology is reducing the demand for low-skilled workers – de-industrialisation appears to be hitting African countries particularly hard.

This is first because weak infrastructure drives up the costs of making things and exporting them – high electricity costs, poor roads and congested ports, for example.

Africa's second disadvantage is, "perversely, its bounty of natural riches". In periods of "booming commodity prices" economies benefit from increased exports, which drive up exchange rates. This makes it cheaper to import manufactured products and harder to produce and export locally manufactured ones – a phenomenon known as 'Dutch disease' for some obscure reason.

Africa's third snag, according to the *Economist* article, is its geography. East Asia's string of successes happened under the 'flying geese' model of development, where a 'lead' country creates a slipstream for others to follow. In the 1970s, for example, Japan moved labour-intensive manufacturing to Taiwan and South Korea.

"We don't have a leading goose," says Ngozi Okonjo-Iweala, Nigeria's former finance minister. And while light manufacturing is leaving China for neighbouring Bangladesh and Vietnam, none is coming to Africa, despite its cheap labour.

Ethiopia's manufacturing is bucking the trend with average manufacturing growth of over 10% a year in the 2006-14 period, albeit from a very low base. Why? "Partly, because it has courted foreign investors": Holland's horticulture; China's textile and leather factories and Turkey's garment manufacturers. "Now we're bringing in German and Swiss pharmaceuticals," says Arkebe Oqubay, a minister promoting Ethiopia's industrialisation.

Says the dti's Gwynne-Evans: "There's no doubt that what is known as the 'fourth industrial revolution' brings advanced technologies to bear in all aspects of life: improved telecommunications, internet, banking and retail services. Africa is adopting these new technologies exceptionally fast, in leap-frogging to a more advanced world. The big but, and it's a big one, is that without a strong manufacturing sector, these services will largely be provided by global multi-nationals, with an increasing loss by governments of the levers to transform their economies."

He cites the adoption of the 2030 Agenda for Sustainable Development, the Sustainable Development Goals (SDGs), the African Union Commission's 2063 Agenda and the COP 21 Paris climate change agreement in 2015 as initiatives that have given new impetus to the call for industrialisation to transform Africa, especially in its least developed countries.

A 2015 UNIDO report to the China G-20 Development Working Group reads: "Rarely has a country progressed and become developed without sustained structural transformation from an agrarian or resource-based economy towards highly productive agriculture and a sophisticated industrial or service-based economy. Industry, by providing decent jobs and by expanding the fiscal revenues needed for social investments, can boost capacity for inclusive development."

Shouldn't South Africa be striving to become the 'leading goose' of Africa? We have the infrastructure and significant engineering, industrial and manufacturing expertise.

With a stronger focus on local empowerment in terms of skills, along with a renewed effort to develop cooperative relationships between industry, unions and government, we could reduce our dependence on commodity fluctuations and become Africa's flying, re-industrialising goose.

Peter Middleton

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ON THE COVER



Sheet metal enclosures: SA's benchmark manufacturer

World Power Products (WPP), with over 50 years of experience in sheet metal manufacturing, has modernised and re-positioned itself to best meet the needs of an increasingly competitive marketplace. *MechTech* visits the company's newly streamlined facilities in Johannesburg and talks to managing director, Jan Görtzen.

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Sheet metal enclosures: SA's benchmark manufacturer

World Power Products (WPP), with over 50 years of experience in sheet metal manufacturing, has modernised and repositioned itself to best meet the needs of an increasingly competitive marketplace. *MechTech* visits the company's newly streamlined facilities in Johannesburg and talks to managing director, Jan Görtzen (left).

WPP was originally brought into being in 1963 by Peter Bahlig, following his arrival in South Africa after leaving East Germany. In the 1980s, the company was an early adopter of laser cutting technology, which quickly led to its pioneering role in the design and manufacture of sheet metal enclosures for the electrical industry.

The company was run as a family business for over 50 years, with Peter Bahlig at the helm until his death in 2008. "I joined in November 2013 after Peter's wife, Elizabeth, passed away. The family link continues, though, through their son, Mark, who remains part of our leadership team," says Görtzen.

With a background in mechanical engineering, Görtzen was immediately charged with modernising the business to restore market share in increasingly tough economic conditions. "We analysed every aspect of the business in order to identify what processes could be streamlined, where we could work smarter, where we could improve efficiencies and where we could save time and money to offer our customers the best value," he says.

The company's extensive sheet metal processing operations – CNC laser cutting, punching, bending, MIG and TIG welding, powder coating, gasketing, CNC milling and turning and assembly, as well as electroplating, tool making, die casting and plastic injection moulding – used to be spread across five different factory sites. "This comprehensive set of capabilities sets us apart from our rivals. While anyone with a bending brake and a punching machine can make an enclosure, because of our capabilities, experience and expertise, we are able to offer far more in terms of added services and in-house capabilities," notes Görtzen.

Citing gasketing as an example, he



An overview of WPP's dedicated punching area in the sheet processing facility. **Inset:** A Trumpf CNC punching machine being used to perforate a panel.

says that many competitors offer stick-on gaskets, "but ours are polyurethane foam gaskets fitted during the manufacturing process using our CNC gasketing machine. These are an integral part of our designs and give us a genuine IP65 ingress protection rating for every enclosure," he says, adding that IP65 certifies that the enclosure isolates live wiring and moving parts and is ingress-protected against dust and water sprayed from a hose or nozzle.

WPP is also the only enclosure manufacturer that makes its own locks and hinges. "Over the years, we have developed a robust range of locks that have been widely copied overseas. Even compared to these modern imports, though, ours remain as good as you can get in terms of value. They meet all client expectations, including price expectations, and are even used in the enclosures manufactured by competitors," Görtzen tells *MechTech*.

To gain better control and to streamline its manufacturing processes, WPP

consolidated its manufacturing operations into two adjacent properties in Side Road, Turffontein, Johannesburg. "This has given us better control over our processes, which has resulted in faster turnaround times for our customers," he says. "We have become a much leaner operation with all our resources streamlined to maximise productivity and minimise idle time," he adds.

Dedicated punching, laser cutting and bending areas have been established to improve process control and material flows. Sheet material deliveries now directly enter the sheet processing facility, where the laser cutting and punching processes are completed. Flat components are then moved across to the second factory, with the CNC bending area at its starting point. Welding, grinding and – downstairs from there – powder-coating processes are completed in this facility, followed by assembly. "We also have a separate plating plant, along with a machine shop – for components such as pins, fasteners and busbars – which are

fed into the assembly area as needed," Görtzen explains.

"We have modernised our entire operation without having to buy any new buildings or machines. With four laser cutting systems, five CNC punching machines, ten large Trumpf press brakes, 10 bending machines for smaller components and under-roof workshop space of 17 000 m², we can now put through more work more efficiently, which reduces processing time and, therefore, lead times," he reveals.

In addition, "skilled personnel are fundamental to producing quality products and delivering high levels of service," continues Görtzen. "We implemented training programmes to develop a highly qualified team of experts armed with the necessary knowledge and know-how to take care of any project, from design to final delivery."

WPP has two distinct avenues to market. "The first is the standard enclosure business, where we produce orange or grey boxes in standard sizes and various materials – powder coated mild steel, 3CR12 as well as 304 and 316 stainless steel – and 304 and 316 stainless enclosures can also be supplied with a brushed finish. These are mostly for electrical wiring, switchgear or control circuitry and are sold off-the-shelf via electrical wholesalers in every region of South Africa.

"Any electrical contractor responsible for an installation can purchase these from a local distributor or wholesaler and we offer a whole matrix of standard sizes to meet the common needs that have evolved over the years. Every junction box, soft starter or switching circuit for every pump, fan or conveyor requires an electrical enclosure to protect the connecting circuitry," he explains, adding that, as well as the standard enclosures, WPP's Perano-branded locks and hinges are also available off-the-shelf through wholesalers.

"Custom-built enclosures, however make up over 75% of our business. We offer a customisation service from design to manufacture for any enclosure or enclosures, no matter how many are needed or how complex the design.

"We have four SolidWorks workstations and customers can come to us with a design – anything from a sketch to a fully developed 3D CAD model – and we will be able to manufacture the enclosure



Above: WPP's CNC gasketing machine enables polyurethane foam gaskets to be fitted during the manufacturing process. **Below:** Enclosures in standard sizes and various

materials for electrical wiring, switchgear or control circuitry are manufactured in WPP's Johannesburg facility for sale via electrical wholesalers in every region of South Africa.

at a competitive price," Görtzen assures.

Notable projects include the power switchgear and control panel enclosures for the 86 MWp Prieska solar power plant in the Northern Cape province, the third solar power plant constructed by SunPower under the South African renewable energy independent power producer procurement programme (REIPPPP). "Part of this project was the copper busbars, which had to be tin plated. We have this capability. So for three-phase switchgear, we can supply enclosures with the required busbars machined, coated and already fitted, which adds significantly to the value of our offering to the electrical industry.

"We also make the housings for fuel pumps on the forecourts of South African service stations," he continues, "and for many smaller companies and systems' integrators that populate panels as their core business, for individual machines and automation systems, for example. Applications for enclosures are surprisingly widespread, from small pool-pump covers to multi-million Rand plant control rooms," Görtzen informs *MechTech*.

"Customised projects are always time critical. Not only do we meet deadlines but we also make the process 100% transparent. Customers can come here and see the progress that is being made at any time. We strive to offer the shortest lead times possible and we are sure



we can better those of our competitors," he claims.

Talking about company ethos, Görtzen says that WPP stands for four essential principles: "The first is guaranteed quality. Our philosophy is to get the quality right first time so that problems don't occur. Second, we stand for competitive pricing. We strive to ensure that we offer the best value – benchmarked against local and imported competitors.

"Third, we aspire towards short lead times – we try to surprise customers with our turnaround times. And the fourth is passionate service, not only with regard to our dealings with customers, but also with each other. We strive to change mindsets so that our people are passionate: about themselves, amongst themselves, about their work, the products they make and the success of customers' endeavours. And we want our people to feel this passion, not to pretend because they have been told to feel it," Görtzen concludes. □

'Feed a Farmer/Voer 'n Boer' initiative

BMG exhibited its extensive range of agricultural components at Nampo last month focusing on its 'Feed a Farmer/Voer 'n Boer' initiative. "This drought relief assistance programme, which was launched recently in conjunction with Agri-SA, is helping to sustain farmers, farm workers and their families, who are severely affected by the crippling drought," says Carlo Beukes, agricultural manager, BMG.

"BMG agricultural branches throughout the country are collection points for non-perishable food items, which are then distributed to farming communities in dire need. This interminable drought – the worst in more than a decade – is having a devastating effect on producers. We know that each food donation is greatly appreciated by those in need," he explains.

"BMG's 'Smart Farming' concept, which was introduced three years ago, was also highlighted at this year's Nampo show. This project, not only en-

ures the right product, for the required application, at the right time, but also constructively interacts with the entire farming process. By working closely with farmers, BMG's agricultural experts fully understand changing requirements in the local farming sector.

"This event not only highlighted our extensive product portfolio, but there was also a focus on practical working demonstrations of how components oper-

ate together to form an efficient system that enhances productivity and energy efficiency."

"With strategically positioned outlets throughout Africa, our team of agricultural experts offers farming sustainability solutions that focus on effective food production, the use of correct equipment and the application of technology to maximise scarce resources of water, electricity and labour," Beukes concludes.

www.bmgworld.net

Reaching out to South Africa's future leaders

Atlas Copco South Africa's participation in Career Indaba 2016 demonstrates the company's unwavering commitment to South Africa's youth in finding suitable, secure and successful careers.

Career Indaba, considered to be South Africa's number one education and career guidance event, took place at the Sandton Convention Centre in Johannesburg on 7 and 8 March 2016. Interactive workshops and two days of networking with top corporate companies and further education institutions present an ideal opportunity for students, parents and teachers to gain practical knowledge on how students can succeed in their lives after school.

Upon visiting the show in 2015, Atlas Copco South Africa's sub-Sahara communications manager, Kgothatso Ntsie, recognised that Career Indaba would serve as an ideal vehicle to explore alternative ideas as part of Atlas Copco's



Atlas Copco's Kgothatso Ntsie (centre) with two students at Career Indaba 2016.

Employer Branding strategy. "In order to get a feel for the exhibition, we decided to kick off our first support year with branding in the form of exhibitor bags."

"The fact that entry is free of charge means that this important event is open to all and the high attendance figures bears testimony to this," continues Ntsie. "With well over 5 000 learners attending Career Indaba 2016, our support of the event proved to be a resounding success."

www.atlascopcogroup.com

Top mining brand in Brazil

A survey conducted by Brazil-based 'In The Mine' magazine recently ranked Metso as one of the top brands in the Brazilian mining sector. Metso was number one in the categories of crushing and maintenance of minerals processing plants.

Marcelo Motti, senior vice president, sales in Brazil, responds: "We thank our customers and professionals in the mining sector for this recognition. I see this award as the result of Metso's continuous aim to help drive sustainable improvements in performance and profitability in our customers' businesses."

Motti says that Metso's solutions are built with technological excellence and the highest safety standards, not to mention decades of experience.

www.metso.com



BMG's stand at Nampo 2016, where its 'Feed a Farmer/Voer 'n Boer' initiative was promoted.

Healthy increase in orders and profitability

Royal HaskoningDHV is in good shape, having expanded its order book by 27% and increased net profits by 87% in the 2015/2016 financial year. The 2015 results show that the strategy is working successfully. More focus on leading services, selected geographies and key clients is generating growth and increased profitability.

Efforts have been focused on developing existing business and seeking growth within countries and markets where the company already has a strong position. Client satisfaction remains consistently high and a new integrated approach to project management has been introduced to further raise the bar on project success. In a move to encourage closer internal collaboration and faster decision making, the company structure has been streamlined from eight to four business lines. The new structure supports delivery of increasingly integrated solutions to solve the

complex challenges faced by society.

After difficult market conditions the previous year, the South African operation recovered in 2015, while part of the UK business struggled. The company reports healthy cash flow and a small increase in utilisation rate.

Erik Oostwegel, chairman of the executive board says: "We are halfway through executing our strategy 'Vision 2018' and feel confident about the second half. Our company is in good shape to face the challenges of the future and we look forward to the year ahead with confidence and optimism. We achieved much in 2015 and continue to adapt and change our business to remain focused on success and to deliver added value to our clients. In 2016 our drive for increased efficiency in operations and sales will help to further improve profitability."

www.royalhaskoningdhv.com

Women in shipping

From carpentry to procurement, welding to training – the women at Elgin Brown & Hamer (EBH) Namibia are working hard and having fun. Having found themselves in a tough industry, one that has been traditionally dominated by men, these women all have one thing in common: they like to stand up and be counted.

‘Be yourself’ and ‘stand up for what you believe in’; ‘hold your head up high’ – these are common phrases uttered by EBH women, who all pay tribute to a company that, far from being discriminatory, actively encourages career development among all its employees, men and women.

“As women at EBH we are given the chance to study and grow in our careers. We feel honoured, and empowered to make decisions,” says Klaudia Shitthigona, acting technical training officer in the HR department at EBH Namibia.

“In a globally competitive industry such as shipping, where world-class standards have to consistently be achieved, the skills of each and every



With the right ‘can-do’ attitude and an eye for opportunity, women will continue to enjoy fulfilling careers in the shipping and marine industry.

individual, regardless of gender, have to be nurtured and maximised,” says Uys. “EBH Namibia has made significant headway in empowering women in the maritime sector, thereby bridging the gender gap,” says Hannes Uys, CEO at EBH Namibia. “As long as the employee is physically and mentally capable of performing a job, gender should have nothing to do with opportunity,” he adds.

“We believe that our drive for equal opportunities and the value we place on training and skills development makes EBH Namibia an employer of choice,” he concludes.

www.ebhnamibia.com

Flexibility reaps rewards for OEMs and quarries

It is not only large blue-chip mining companies that are opting for a premium product and technical after-sales support from Weir Minerals Africa. Small mining operations in its sub-Saharan African and Middle East territories are also partnering with the original equipment manufacturer (OEM). “These operations include aggregate and sand producers, who have become a very strategic growth market for Weir Minerals Africa,” says Rene Calitz, the company’s head of strategy and marketing.

She reports ongoing success with the company’s Trio® comminution equipment, especially in the quarrying environment.

The company recently received a contract for a 300 t/h plant in Zambia, followed by its latest comminution project in the Middle East, a 400 t/h crushing and screening operation in Saudi Arabia.

She says the success that Weir Minerals Africa is enjoying in this market can be attributed to the company’s commitment to lowering the total cost of ownership of its customers’ operations. The OEM achieves this through its extensive research and development programme that is geared to improving



Trio products include crushers, screens, feeders and chutes.

longevity of wear items, while constantly improving the overall performance of existing solutions.

Complementing this strategy is the solid footprint that Weir Minerals Africa has developed on the continent. It has facilities in all the major mining centres in sub-Saharan Africa. This infrastructure is being used to support those quarries operating in countries across South Africa’s borders where aggregate and sand is in high demand for large infrastructure delivery programmes.

Weir Minerals Africa’s policy of providing the same level of service to mines and quarries of all sizes is paying off.

www.weirminerals.com

In brief

AZ Armaturen South Africa has invested in a new multiple axes CNC lathe and milling machine with live tooling. The state-of-the-art machine will allow AZ to increase productivity, flexibility, improve the quality of their plug valves as well as further expand the skill-sets of its staff on world-class technology.

Instrotech, distributor and manufacturer of a large range of process control instrumentation and specialised systems, has merged with **TIA Online** to form the **Instrotech’s Test & Measurement division**. Agencies now represented include Rycom Instruments, Time Electronics, Scope T&M, Kehui and Seaward.

Master Power Technologies, the power solution and data centre specialist, has recently opened a branch in Windhoek Namibia as part of its plan for growth in Africa. The operation officially opened on 1 March 2016.

Rockwell Automation has announced that its board of directors has elected Blake D. Moret, a 30-year veteran of the company, as president and chief executive officer, effective July 1, 2016. Keith D. Nosbusch, 65, who has been in the role since 2004, will continue as chairman of the board.

Engen Petroleum, a leading producer and marketer of fuels, lubricants and oil-based products has recognised Upington as a welcome refuelling and refreshment stopover on the routes of long haulage companies and their drivers. The new truck port can comfortably cater for 100 overnight stopovers and offers restrooms, showers, a laundry, an ATM, a take-away and biltong shop and an OK Express supermarket.

Goscor Access Rental is the preferred supplier of equipment for the construction of Mr. Price’s new national Distribution Centre (DC) in Keystone Park, Hammersdale, KwaZulu-Natal. With an ingenious in-house designed bracket for the safe and efficient lifting of piping, the rental company has also solved a problem that has plagued the industry for years.

Leading southern African supplier of sensing, measurement, counting, switching, monitoring and positioning instrumentation, **Countpulse Controls**, has released the new Hengstler Tico 772 multifunctional counter into South Africa. Engineered for simplicity and reliability, this electronic preset counter is suitable for time control, position indication, control of rotation speed and batch counting.

Leading materials handling equipment solutions provider **Goscor Lift Truck Company (GLTC)** has appointed Windhoek-based **Barex Equipment** as its new dealer in Namibia. Erich Bartsch, MD of Barex Equipment says he is delighted to have been given this opportunity to distribute such a world class range of products.

MBSA Learning Academy launched

On the same day that Mercedes-Benz South Africa (MBSA) released its 2015/2016 annual results, it also officially launched a R130-million state-of-the-art Learning Academy to boost skills in the Eastern Cape region.

Mercedes-Benz South Africa launched its state of the art Mercedes-Benz Learning Academy (MBLA) on March 17, 2016. The Academy is a culmination of a R130-million joint investment by MBSA and the National Treasury's Jobs Fund, which was signed in 2014.

The grant agreement signed by the two parties has seen the transformation of the MBSA Technical Training Centre into a fully-fledged and world-class Learning Academy. The MBLA is destined to be a strategic service provider in MBSA's holistic approach to further education and training with an ultimate objective of helping the region in the continuing fight against high unemployment.

It was in July 1981 when the MBSA Technical Training Centre first opened, as one of the first multi-racial training facilities in the country. For more than three decades, the centre has been MBSA's think-tank and the main feeder of the technical workforce for MBSA's East London plant.

During this time, the MBSA Technical Training Centre made a significant contribution in affording opportunities to people who would otherwise not have received technical training. In the process, a continuous feed of artisans into the East London manufacturing plant was ensured.

The pool of skilled personnel that has been provided by the then Technical Training Centre have placed the East London plant amongst the best, allowing it to be a valued contributor in the global production network of Mercedes-Benz cars. It is also such training initiatives that have contributed to the plant's proud heritage and history of almost seventy years in the country.

The centre, which has now been transformed into a Learning Academy, currently boasts some 180 learners and is expanding its numbers in order to have surplus capacity as well as to better pro-



Students undergoing introductory shop floor skills training, which targets unemployed school/college leavers.

vide artisans for the broader community. This is over and above the company's internal needs.

"The Mercedes-Benz Learning Academy aims to be the most advanced automotive training facility in the country. We will do this by continuing to provide high-quality technical training, which will produce skilled artisans in our continuing bid to curb unemployment, particularly amongst the youth in the region. This is being done in partnership with government and its initiatives for job creation. Through the academy we also aim to provide our people with a sense of purpose by giving them confidence in what they do," says Mercedes-Benz CEO and executive director for manufacturing, Arno van der Merwe.

"Education and skills development is of paramount importance to the business and the sustainability of our company and the communities in which we operate. To this end the company has over many years showed its commitment to participate in the national collaborative effort to ensure skills transfer and job creation for workers in the automotive sector – not only for our plant but for the broader industry," adds Van der Merwe.

As such, the joint agreement with the Jobs Fund came at the time when the rapid advancement of technologies had placed enormous training demands on both the MBSA manufacturing plant and the industry in the region, exposing a widening gap of technical training expertise.

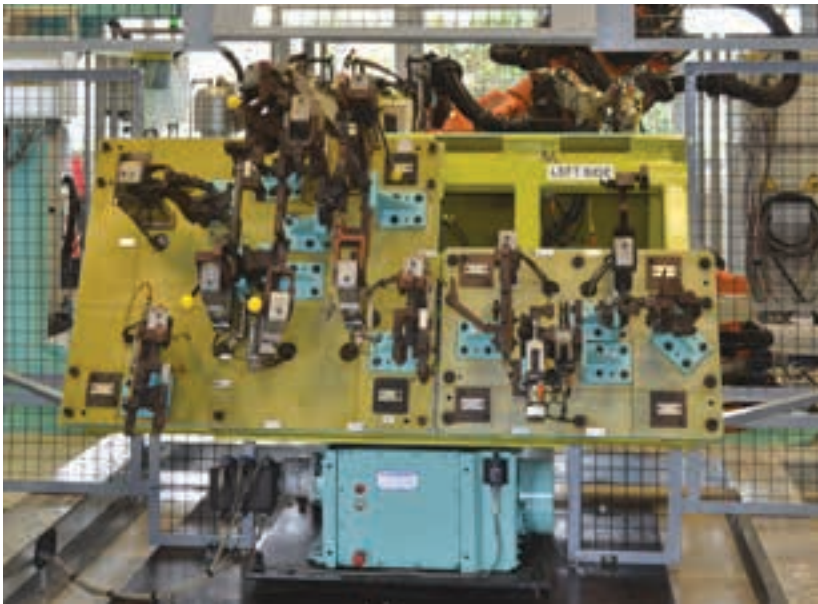
"The Jobs Fund partnered with

Mercedes-Benz South Africa because the project satisfied two critical criteria for us. First, the intervention would respond to a specific need in the labour market and it would improve the pipeline of appropriately skilled artisanal labour that could be deployed, not only at Mercedes-Benz South Africa but also within the broader labour market. Second and more importantly, Mercedes-Benz South Africa also guarantees employment contracts for many of those completing the training programme. The Jobs Fund is appreciative of the positive collaboration it has shared with Mercedes-Benz South Africa," says Najwah Allie-Edries, head of the Jobs Fund.

In the immediate future, the MBLA aims to be an externally accessible training facility that will offer trade tests, training and, essentially, placement of unemployed persons to the industry, thus bridging the gap between jobseekers and industry.

Accordingly, the MBLA has increased the current training staff complement from 10 to 14 technical instructors. Plans are also in place to increase the number of trades that are currently facilitated by its accredited Trade Test Centre to include all major trades, including: automotive electrician; millwright; fitter and turner; motor mechanic; and mechatronic technician.

There are three categories of trainings currently offered by the MBLA. These are the shop floor skills training targeting unemployed school/college leavers for



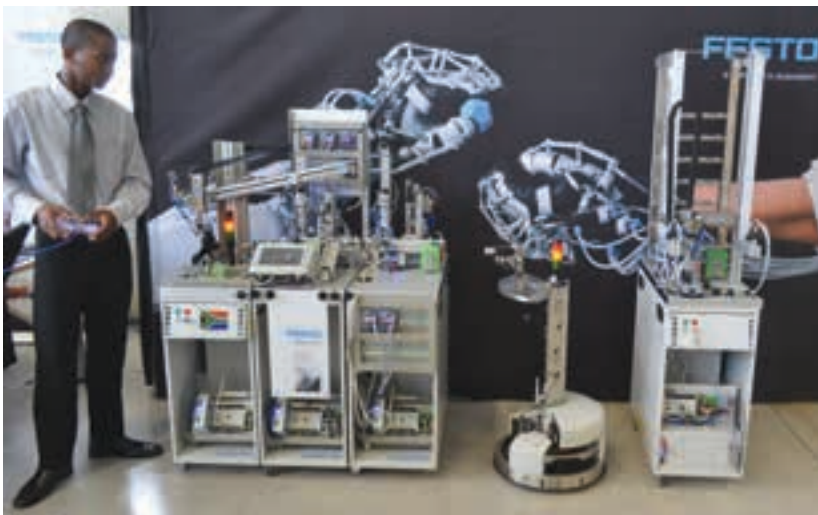
A robotic cell with a rotating jig in the MB Training Academy, designed to exactly mimic those used on MBSA's East London production line.



Advanced technology training upskills existing artisans with advanced technologies, such as mechatronics, PLCs and automation.



Mercedes-Benz South Africa's East London plant manufactured a record-number of its new W205 C-Class units from its plant in East London, most destined for export. In total 102 200 C-Class units rolled off the line in 2015.



A Festo Installation being used as an introduction to robot programming.

industry; apprenticeships for artisans focusing on qualified unemployed school/college leavers; and advanced technology training, which upskills existing artisans with skills and advanced technologies, such as mechatronics, robotics and automation.

The state of the art MBLA is equipped with cutting-edge advanced technology, ranging from robotics and plant automation to metal joining technologies. There is also a variety of robot cells with some stand-alone robots as well as those equipped with other technologies such as grippers, weld guns, stud welders and more. In addition, the MBLA's automation laboratories feature programmable logic controllers (PLCs) and simulators together with the learning units.

MBSA is also piloting digital transformation, through virtual commissioning technology, which is being researched.

The MBLA will develop modules and a virtual commissioning lab, which will enable it to offer facilities and training to employees in industry and local assembly line builders and systems integrators. Benefits include: management of changes in production, reduced commissioning time and impact to production, as well as improved proof of concept and safety.

"Being part of the group of learners who receive training at the Mercedes-Benz Learning Academy has been one of the best experiences of my life. I have been prepared for the work environment and have established values and morals that I can carry even beyond industry to my own life as well. In addition, our instructors always emphasise that there are many people who have been here before us that have gone on to achieve greater things in life and this is something that inspires me to give my best,"

A summary of MBSA 2015/2016 results

- Total annualised revenue for the group at R65.8-billion – 45% up on the previous year – due to the expected increase in production volumes out of the East London plant and the increase in export volumes.
- Earnings before interest and tax (EBIT) improving by 52% to end at R4.67-billion.
- With total sales of 24 608 Mercedes-Benz cars, the company is more than 3 000 units ahead of its nearest competitor.
- Daimler Trucks and Buses (DT&B) remained market leaders with unit sales of more than 5 300.
- DT&B is first to market with compressed natural gas buses and opens a new Regional Centre Southern Africa.
- Mercedes-Benz Financial Services, with acquisitions surpassing all records, secures 7% growth to end above R10-billion.
- A further investment of R498-million was made in the East London C-Class plant.

says 22-year old Jiovanni Bossr from King Williams Town, one of the current trainees at the academy.

The MBLA aims to continue unlocking opportunities by providing the best possible people development initiatives in the region. □

Lubrication management in the food

“The seven most expensive words in business are ‘we have always done it this way,’” says Jan Backer, SKF South Africa’s lubrication manager. “Lubrication management can make or break asset performance. Get your lubrication management right and you have a sound foundation for asset reliability. Get it wrong or manage it incorrectly and you will be paying expensive consequences,” he adds.

There are many technologies available in relation to lubricants and lubrication that ensure the right amount and type of lubrication is applied at the right time. In the food industry, however, the identification of potentially negative impacts on HACCP (hazard analysis and critical control points) has led to the emergence of a different approach to managing lubrication proactively.

Lubrication practices are not always effective and costs can be daunting. While good lubrication practices are widely accepted to be fundamental to plant reliability, the question is not about re-lubricating, but about the choices made to achieve the right outcome.

So how effective are current lubrication practices? If manually lubricating – do people know how much, with what and how often?

Some typical answers throughout the industry are: ‘I re-lubricate when I feel it is the right time’. How much? ‘It depends on the size of the man using the grease gun’. What with? ‘It depends on what grease cartridge is in the stores’. In other words, in the food and beverage industry, re-lubrication can be still an ad-hoc activity and not scientifically applied.

Why should one be concerned? The consequences of ineffective lubrication can be: excessive downtime; high spares consumption; food and operator safety risks; and ultimately, an expensive toll on the maintenance budget. In other words, lubrication actions can often cause as many problems as they solve:

- **Costs:** Frequent re-lubrication increases grease and labour costs and is associated with the need to purge grease from all bearing positions.
- **Contamination risks:** over-lubricating can often compromise Food safety.
- **Operator safety:** Re-lubricating often needs to be done in hazardous working areas with difficult access. Additionally, leaking seals can cause slips and trips causing high costs of absenteeism due to injuries.

- **Resources and skills:** There is a skill-level challenge the industry. People that can re-lubricate machines correctly are in short supply and retaining the necessary knowledge and skill has become difficult.

The industry is sending warning signs

Ever tightening food industry safety regulations are demanding different ways of managing lubrication. Very often, lubrication management reviews are part of HACCP certification and are checked by third party regulators, which can be employed by the producer or imposed on them by their customers, often retailers. The new Food Safety Modernisation Act (2011) for example is designed to prevent contamination in the food chain, rather than define reactive procedures for dealing with problems once they arise.

Companies certainly would not wish to be one of those faced with a recall due to food safety issues.

As a result of safety or health-related recalls of food products:

- 55% of customers would switch brands, at least temporarily.
- 16% would never purchase the product again.
- 17% would avoid any product from the recalled brand (Harris Poll, 2014)

Furthermore, companies are pressured to set targets for the environment and sustainability, which can be impacted by the way lubrication and re-lubrication is executed. Zero landfill is one of the common KPIs to follow and the trend is to change from disposal-oriented to avoidance-focused environmental strategies. (*The Zero Landfill Initiative*)

For example, it is common practice to re-lubricate bearings after each wash down. During this process, excess grease is discharged past the bearing seals (purged). This can compromise food safety, people safety and of course asset reliability. During the next wash down cycle, the grease is washed away and into the plant’s wastewater.



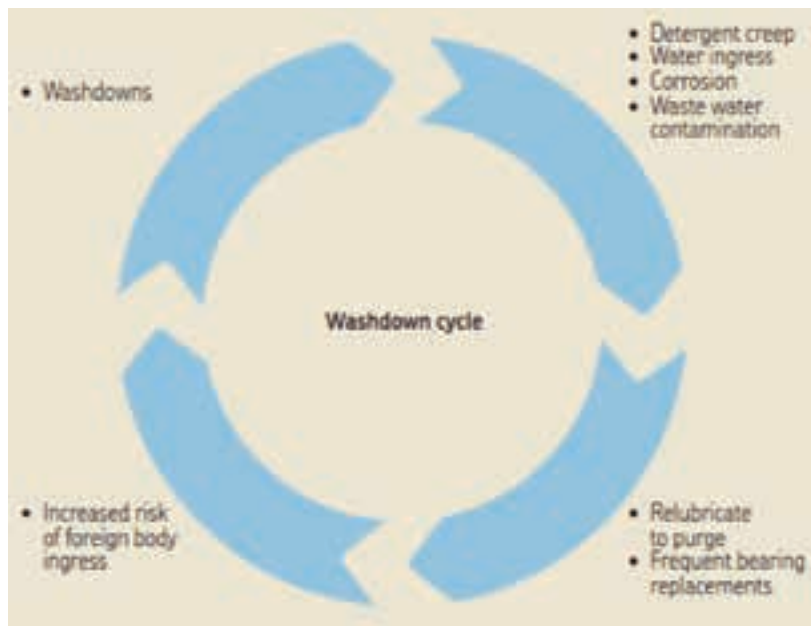
SKF’s new range of Food Line stainless steel deep groove ball bearings (VP311) meets two key requirements of the food industry: the seals are made from synthetic rubber compliant with US Food and Drug Administration (FDA) as well as European Community (EC) requirements and are coloured blue for optical detectability, should they be damaged; and they use high quality grease, suitable for food and beverage applications – registered as NSF category H1.

Lubrication as a strategy instead of a management practice

It is now time for the food and beverage industry to reconsider the way lubrication is practiced on sites and to look into alternative technologies that can simultaneously provide food and operator safety, optimised costs and environmental benefits.

Among the dedicated technologies available to support the management of the lubrication of food and beverage processing machinery, re-lubrication-free bearings and advanced sealing systems have emerged as potential solutions that can mitigate against the risk of food and operator safety, while also avoiding excess lubricants being washed into the

industry: a different approach



Above: The traditional wash down and relubrication cycle presents risks to both bearing service life and the environment. **Left:** In the food industry, for processing fish, for example, SKF has developed solutions that fulfil FDA and EC requirements. These bearings feature Re-lubrication free bearing technologies; high efficiency seals that keep lubricants in and contaminants out; and the use of corrosion resistant stainless steel materials.

wastewater stream or disposed of using grease cleaning wipes.

At the starting point, operators should proactively assess costs, risks, opportunities and benefits of managing lubrication as a broad strategy.

At SKF, we have found that a technical assessment of a production process provides the structure to readily identify potential issues, risks, opportunities and benefits in moving from current approaches. And the good news is that it does not require much time and from the assessment results, it is usually easy to plan short, medium and long-term activities.

Challenge the 'always done it this way' attitude

Identification of potential negative impacts on HACCP can lead to areas for improvement where SKF offers a range of technology and service offerings dedicated to helping to manage lubrication. These cover for example

- Re-lubrication free bearing technologies.
- High efficiency seals that keep lubricants in and contaminants out.
- Lubrication management: we can review and optimise lubrication strategy

and lubrication routines in order to: apply correct amounts of lubricant at correct intervals, either manually or through automatic dispensing systems; use correct tools that allow correct methods to be followed; and set up an appropriate training programme for maintenance technicians and operators.

- SKF can also offer smart ways to detect poor lubrication condition by analysing vibration data through 'vibration parameters'.

There are different ways to meet these challenges. "At SKF we can offer more than the traditional lubrication management approaches that look only at lubricants and the way to apply them. We can bring technologies that take away the need to re-lubricate, adding value from a food safety, cost, reliability or environmental perspective. What makes the difference is our deep knowledge of rotating equipment, industry experience and commitment to reduce costs of ownership," Backer concludes. □

SKF's new Food Line family

The SKF Food Line family includes 19 different standard sizes of deep groove ball bearings from SKF's extensive range, in diameters ranging from 8.0 to 40 mm.

"Both the blue seal and the lubricant were developed for use in food and beverage applications," says David Oliver, SKF Europe industry manager Food and Beverage. "The overall bearing meets the highest standards of food management systems and regulations. This offer is unique to SKF, none of our competitors can offer the full package of food grade grease, plus FDA and EC approved blue coloured sealing in their stainless steel deep groove ball bearings."

Food safety management systems such as HACCP are placing greater importance on

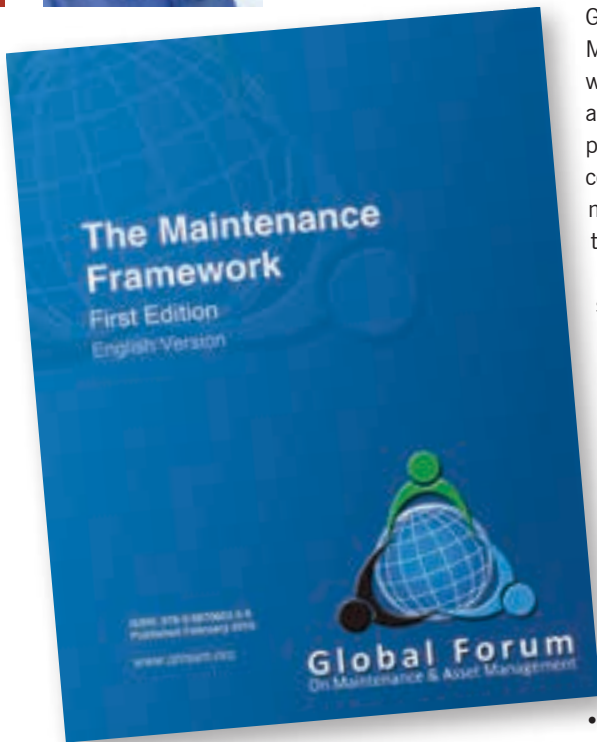
safe food production. This means that components used in production should be either food-safe or detectable. Many food product recalls are initiated due to the possible presence of hard or sharp objects so food safety and detectability are high priorities for any components operating close to the food stream. The same is true of lubricants. For this reason, food-grade lubricants are increasingly used on a plant-wide basis to prevent the chance of applying non-food greases to a critical part.

SKF's stainless steel deep groove ball bearings offer high resistance to corrosion, so that they can withstand the aggressive wash down regimes that are necessary in the food industry. The special seal enhances this, helping to retain lubricant and prevent ingress of wash down fluid. □



The future of maintenance

With the advent of the ISO 55000 series of standards and the release in February 2016 by the Global Forum on Maintenance and Asset Management (GFMAM) of *'The Maintenance Framework'*, Mario Kuisis argues that we are now entering the fourth generation of maintenance, which it describes as 'strategic maintenance'.



In the first of this series it was found necessary to explain the terminology used to describe the maintenance strategies that are the subject of discussion. This was necessary because a common understanding did not yet exist. Asset management had not yet reached the level of maturity where it had become necessary for the sub-discipline of maintenance in particular to develop its own language.

However, confusion was being created by using common language words in the context of maintenance with more than one meaning that could be interpreted either way, or in a way that was at odds with the usual meaning. The definitions that had been given in this series would not necessarily have been shared by all maintenance practitioners. This situation was obviously untenable for such an important facet of industry and indeed, enterprises of all kinds.

It is pleasing to know therefore that the problem may now be considered resolved with the release of *'The Maintenance Framework'* [ISBN: 978-0-9870602-5-9] in February 2016 by the

Global Forum on Maintenance and Asset Management (GFMAM). This document was drafted to align with the asset management landscape and is a document published by the GFMAM to develop a common understanding of maintenance management and how it contributes to the delivery of business outcomes.

Who, you might ask, is GFMAM? And should we be taking any notice of their opinion on this matter?

Well, yes. I would suggest we should. Not only has this forum been applying their minds to all matters relating to asset management for some time, but they have been a driving force behind the creation of the ISO 55000 series of standards for asset management. Their current members include:

- Asset Management Council (AM-Council), Australia.
- Associação Brasileira de Manutenção e Gestão de Ativos (ABRAMAN), Brazil.
- European Federation of National Maintenance Societies (EFNMS), Europe.
- French Institute of Asset Management and Infrastructures (IFRAMI), France.
- Gulf Society of Maintenance Professionals (GSMP), Arabian Gulf Region.
- Iberoamerican Federation on Maintenance (FIM), South America.
- Institute of Asset Management (IAM), UK.
- Japan Institute of Plant Maintenance, Japan.
- Plant Engineering and Maintenance Association of Canada (PEMAC), Canada.
- The Society for Maintenance and Reliability Professionals (SMRP), USA.
- The Southern African Asset Management Association (SAAMA), South Africa.

GFMAM considers that maintenance has evolved over three generations (reactive, planned, proactive) and is now in the fourth generation (strategic). The implications of changes in meanings for readers who may have been following

this series is not very great, but it will be useful to bring complete alignment by adopting exactly the same terminology and associated meanings. Thereafter it will be interesting to consider some of the new concepts introduced by GFMAM.

The words we have employed in the past and their particular meaning in the context of maintenance as described in GFMAM's *'The Maintenance Framework'* is as follows:

Reactive maintenance

Reactive maintenance is identified as the first generation view of maintenance which was 'fix it when it breaks', summarised as 'repair' and 'focus on failure'. Equipment at that time was characterised by over-design and relative simplicity. There is no change from the meaning defined earlier in this series.

Preventive maintenance

Preventive maintenance is considered to be the essence of the second-generation view of maintenance, along with planning, scheduling, coordination and a focus on costs. The approach may be summarised as 'fix it before it breaks'. It is defined as 'maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the function of an item' (ISO 14224 section 3.42). The term 'preventative' used in this series is therefore replaced with 'preventive maintenance (PM)', but with no change in meaning.

Predictive maintenance

Predictive maintenance (PdM) is designed to help determine the condition of critical in-service equipment in order to identify defects and determine when maintenance should be performed to prevent the consequences of failure. The meaning remains the same as used previously.

Condition monitoring

Condition monitoring (CM) is the process of monitoring a parameter of condition in

machinery (vibration, temperature, etc.) in order to identify a significant change, which may indicate a developing fault. It is a major component of PdM. CM was not previously defined.

Proactive maintenance

Proactive maintenance is the term used to describe the view of third generation maintenance, which includes PdM, CM, computerised maintenance management systems for managing complex operations and such techniques as failure modes, criticality and effects analysis and design for reliability. The aim is not to just repair the asset but also improve it. This meaning is broader than previously defined when only PM and PdM were considered.

Having clarified these previously undefined maintenance terms, *'The Maintenance Framework'* goes on to consider the bigger picture. Not only is it good to keep abreast of international developments but it is also always useful to place any activity in context, so it is worth touching on some of these concepts here as they point to the future of maintenance.

During the earlier years of industry when equipment was simple and overdesign was the norm, although maintenance was considered essential, asset and maintenance management was not. However, as equipment has grown in complexity along with increasing demands for safety, reliability, financial and environmental accountability, especially in high-risk or high-performance industries, maintenance management has become crucial to organisational success.

Strategic maintenance

With the advent of the ISO 55000 series of standards it is suggested in *'The Maintenance Framework'* that we are now entering the fourth generation of maintenance, which it describes as 'strategic maintenance'.

ISO 55000 defines asset management as; 'coordinated activity of an organisation (3.1.13) to realise value from assets (3.2.1)'. Realisation of value requires the achievement of an appropriate balance between costs, risks and performance, often over different timescales.

Looking to the future, the implication of this is that in order to contribute to the 'coordinated activities' of their organisation, maintenance managers will need to expand their traditional technical focus to include areas such as equipment selection and design and financial skills. They will also need to acquire an understanding of organisational, systemic and cultural controls. This will in turn require understanding and appreciation of the role of human factors, i.e. the 'soft skills'.

This may be daunting for those who are only now beginning to come to terms with proactive maintenance in totality, but it could also be an opportunity to leap frog ahead and get a head start on the competition.

Asset and maintenance management have come to be seen as worthy professions in their own right and much has been and continues to be done to introduce standards, training and certification so that asset owners can realise the returns from their investment in physical assets. The release of ISO 55000 and the continuing work of GFMAM bring great value in both standardisation, the pooling of expertise and hard earned experience.

The benefits are there for the taking by private and public organisations alike either for improved profitability and sustainability, or enhanced service delivery at lower cost. □

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Structured maintenance management

Structured maintenance management programmes “are critical to maximising production efficiencies,” says Wayne Holton, fluid technology manager, BMG, while outlining his company’s predictive maintenance service offering.

BMG’s efficiency drive, which is designed to help companies reduce energy consumption and optimise production, encompasses predictive maintenance services of condition monitoring and oil analysis.

“The introduction of a structured maintenance management programme, which can be implemented in-house, or partially out-sourced to a professional organisation, is critical to maximising production efficiencies,” says Wayne Holton, fluid technology manager, BMG. “The effects of friction and the resulting wear of moving components are significantly reduced by effective lubrication.

“Through a wide range of energy efficient products – which includes synthetic oils, lubricants and bespoke lubrication systems – and the support of a technically competent team, BMG ensures efficient maintenance, extended life of components and energy savings in any environment.

“To achieve optimum performance and extended life of components such as bearings and industrial chain, correct lubrication is as important as the appropriate selection of each part. Although general multipurpose grease is adequate in many applications, more arduous operating conditions demand the careful choice of the correct lubricant and lubrication system.

“In selecting the right lubricant for a specific application, factors to be considered are speed, ambient temperature, load, vibration and environmental conditions.”

BMG’s specialist technical resources division offers an oil analysis service which consists of laboratory based sampling and analysis, as well as onsite analysis and filtration and flushing. Other services include technical applications consulting, product and system design, product quality control and assurance, as well as condition monitoring services.

Conditioning monitoring identifies lubrication problems, misalignment and vibration troubles and also helps in identifying the causes of the damage so that

units can be fixed before further destruction occurs. This means reduced downtime, efficient production and substantial cost savings.

BMG has extended its range of lubrication products to include a single point lubricator, where the grease is pressurised by a gas generated unit, to provide continuous, reliable, clean and precise lubrication.

These lubricators ensure less friction, which means energy savings and extended service life of components and equipment. Other benefits include reduced risk of contamination and accidents, particularly in dangerous areas; shorter maintenance times; improved reliability of industrial equipment and lower operating costs.

BMG’s automatic lubricators – which ensure exactly the correct lubrication, with the correct grease – are easily integrated into various applications, without the need to modify installations.

Specially designed OMSA lubrication systems eliminate the risk of excessive or inadequate lubrication and ensure the constant and regular lubrication of bearings. These systems are ideal for use in humid and corrosive environments.

Various greases are available for different applications. For example, a general purpose grease is suitable for industrial use; heavy duty grease is recommended for high load applications in humid environments and high temperature grease is designed for long term lubrication at high temperatures, up to peaks of 175 °C.

A synthetic oil is available for high temperature chains and a multi-purpose grease, which complies with food and pharmaceutical standards, is used for bottling machines, dairy equipment and in food manufacturing.

BMG now has 140 mobile technicians with specialist technical skills and



BMG’s efficiency drive, which is designed to help companies reduce energy consumption and optimise production, encompasses predictive maintenance services, including condition monitoring and oil analysis.



BMG has extended its range of lubrication products to include a single point lubricator, where the grease is pressurised by a gas generated unit to provide continuous, reliable, clean and precise lubrication.

equipment to conduct breakdown and routine maintenance on plant. This team carries out trouble-shooting and advises on possible productivity improvements, to ensure the highest level of plant output and reliability.

Specialist services include installation, adjustment, replacement and maintenance of components, shaft and pulley alignment, balancing, condition monitoring, oil sampling and analysis and critical equipment inspections and lubrication schedules. Maintenance training and fault diagnosis also form an important part of BMG’s field services. □

WearCheck launches advanced industrial kit



John Evans, diagnostic manager for WearCheck, displays the company's new Advanced Industrial Kit, in which an expanded range of sample types can be analysed for particle counts and acid numbers (TAN).

Condition monitoring specialist WearCheck has developed an Advanced Industrial Kit, in which an expanded range of sample types is analysed for particle counts and acid numbers (TAN).

The company has also introduced a product that includes an image of a debris pad, both normal and magnified, irrespective of whether any serious debris was detected.

Diagnostic manager for WearCheck, John Evans, talks about the Advanced Industrial Kit that his company has developed to expand the range of sample types that can be analysed for particle counts and acid numbers (TAN).

Diagnostic manager for WearCheck, John Evans, explains, "Traditionally, particle counting has only been carried out on what are termed 'clean oil systems'. Such components include hydraulics, compressors, automatic transmissions and turbines.

"Particle counting has not been carried out on 'drivetrain' components such as gearboxes and drives, as dilution of the sample is required to process high viscosity oils or oils that are badly contaminated. This is time-consuming and difficult to carry out, but WearCheck has created an automated procedure to handle these samples, making it a lot easier to process them."

Evans elaborates further: "the effect that particulate contamination of oil has on wear rates has been well established

for many years. Cleaner oils will reduce the possibility of equipment failure and greatly extend its lifetime. Many customers are now interested in monitoring the cleanliness of gear as well as hydraulic oils, and this new service will allow the assessment of contamination in gear oils, enabling customers to set targets, achieve these targets and improve on them – thus extending the life of gear-type components."

Typically, acid numbers are only analysed for compressor and turbine samples, but with the introduction of particle counting on all machine samples – except engines, the oil is too dark – WearCheck has decided to extend this service to include a TAN acid number on all samples as well.

Particularly on industrial equipment, the acid number is about the only means of assessing the health of the oil and is now included on all hydraulics and gearboxes as well as turbines and compressors.

Says Evans: "The TAN gives our customers an extra indication of oil degradation and alerts them to the fact that the oil needs changing before damage is done to the component."

Finally, various screening tests are carried out on all samples (PQ, particle counting, visual assessment, etc) to see whether debris analysis is required. The MPE or microscopic particle examination is carried out when one or more of these tests fail and the oil is filtered through a fine filter membrane, and any debris present is assessed with a microscope. A zoomed (20 times magnification) and a normal image of the debris is taken and included in the report.

WearCheck's new service includes a full debris analysis irrespective of whether the screening tests have failed or not. This gives customers extra assurance of oil cleanliness or, in the case of severe wear or contamination, two pictures detailing "all the gory details". □

40 years of condition monitoring excellence

2016 is a very auspicious and exciting year for WearCheck, as it proudly celebrates its 40th birthday. From small beginnings as a soil-testing laboratory in the founding director's garage in Durban in 1976, WearCheck has grown into the leading condition monitoring company in Africa, operating eleven laboratories in seven

countries across the continent and beyond, with further expansion in the pipeline.

With the goal to save money and time for customers, WearCheck has evolved into a convenient 'one-stop-shop' for any mechanical or electrical operation that can benefit from reliability solutions services.

Services offered include the scientific analysis of used oil and the analysis of fuels, transformer oils, coolants, greases and filters. Other monitoring techniques employed are the testing and control of the efficiency of combustion, heat transfer, thermography, vibration analysis, balancing, laser alignment and milling.

WearCheck's laboratories process in excess of 600 000 oil samples every year from mining, construction, transport, electrical, shipping, industrial and aircraft operations, amongst others.

WearCheck recently joined the Torre Industries family – an exciting development with potential for business growth. □



Neil Robinson, managing director of Africa's leading condition monitoring specialists WearCheck, celebrates the company's 40th.

Skills training key to optimising reliability solutions investment

If profitability and efficiency are among the goals of any machine-based operation, then a good reliability solutions programme is imperative.

Through reliability solutions services, such as oil analysis, thermal imaging, vibration monitoring, balancing, laser alignment and others, machines are monitored and maintained in such a way as to enable them to yield their optimum output.

Over time industrial/mechanised systems become exponentially more advanced and complicated, and so does their operation and maintenance. Therefore, it is essential that staff at the respective levels of operation is kept educated on how to run and look after the machinery.

WearCheck has been running skills training courses for their customers for more than 20 years. "It has been shown time and again that skilled and well-trained machine operators are able to add to the bottom line of an industrial operation by maintaining the components efficiently, and they are able to do this because they have undergone the correct training," says WearCheck's training manager, Ashley Mayer.

Mayer conducts condition monitoring training courses around South Africa as well as in other regions where there are WearCheck customers. He holds a BSc in mechanical engineering and has tailored the courses to suit a range of levels within an operation, from factory floor to senior management.

WearCheck's training courses cover accurate oil analysis report interpretation, correct sample taking, pre-planned maintenance schedules and good lubricant management.

"WearCheck understands that customers gain the highest return on investment in a condition monitoring programme if their staff understand each step of the process," Mayer says. "We offer several training courses aimed at different levels within the process, from basic understanding of oil analysis through to management of the condition monitoring programme," he adds.

The course material draws heavily on WearCheck's database of sample diagnoses accumulated over the past 40 years; the 600 000 new samples processed each year; experience with a wide variety of makes and models of machinery; and regional and global data on wear trends.

Oil Analysis 1 takes two full days, while Oil Analysis 2 takes only one full day and is, therefore, less expensive. All courses include course material, refreshments, giveaways and certificates and both of these courses can also be customised and



WearCheck training manager Ashley Mayer conducts a training course in Ghana during April this year. Mayer travels to various locations to conduct training on oil analysis at different levels to meet the condition monitoring needs of clients.

presented at a customer's preferred venue.

WearCheck also offers two more on-site courses:

- WearCheck Practical (in English or Zulu), a half-day course.
- WearCheck Customised – oil analysis for workshop technicians, a full day course.

All courses can be presented at the customer's premises for a minimum of seven delegates. There may be an additional charge for the lecturer's travel and accommodation, if needed.

Oil analysis training courses can also be arranged in any of the following areas: Bloemfontein, Cape Town, Kimberley, Makopane, Nelspruit, Port Elizabeth, Rustenburg, Steelpoort, Botswana, Namibia, Tanzania (Mwanza), Zambia (Kitwe) – in fact, anywhere in the world.

Mobius Institute courses

Furthermore, WearCheck is now certified as the Mobius training centre for most of the African continent – with the exception of SA, DRC and Kenya – and Mobius courses can be run on request from customers, on-site at the their premises, anywhere in Africa.

The Mobius Institute is a worldwide provider of education in reliability improve-

ment, condition monitoring and precision maintenance, to industrial plant managers, reliability engineers and condition monitoring technicians.

The full Mobius course includes compulsory six-month practical training sessions. Participants are guided by WearCheck expertise that has been gained through the successful implementation of condition monitoring programmes tailored to meet the specific needs of operating, engineering and maintenance departments across a range of industries. Through these practical sessions, the skills of the technicians are developed in order to progress to the next level.

The training facilitates the successful implementation by plants of reliability improvement programmes through delivery of more easily understandable and comprehensive training. This includes reliability, alignment, balancing and vibration analysis via various education programmes.

The Mobius Institute Board of Certification (MIBoC) is ISO/IEC 17024 and ISO 18436 accredited, providing globally recognised certification to category I-IV vibration analysts in accordance with ISO 18436-1 and 18436-2. Costs include the examination fee for CAT I and II. □

Venue	Oil Analysis 1: Understanding oil and its analysis	Oil Analysis 2: Report interpretation
Rustenburg	21-22 June	23 June
Bloemfontein	19-20 July	21 July
Pinetown	16-17 August	18 August
Namibia	13-14 September	15 September
Gauteng	18-19 October	20 October
Northern Cape	15-16 November	17 November

WearCheck's 2016 training schedule for its Oil Analysis 1 and Oil Analysis 2 training courses.

Centrifuges for achieving zero liquid discharge

In this article, Multotec Process Equipment's Gerrit du Plessis describes the role of Conturbex centrifuge installations in zero liquid discharge (ZLD) applications at the back end of existing process plants.

With the increased focus on environmental legislation and the need for companies to comply with ISO 14001 it has become critical for process plants to deal effectively with effluent streams. This typically involves the introduction of zero liquid discharge (ZLD) processes at the back end of existing process plants.

ZLD is used across a number of industries including mining, pulp and paper, chemical processing and the petrochemical sector. Its application is typically to evaporate and concentrate an effluent or waste stream. It is also sometimes used, however, to produce a saleable product. The process involves a suite of equipment from Multotec including dewatering centrifuges and CleanTeq solvent extraction.

Gerrit du Plessis, product specialist for solid/liquid separation at Multotec Process Equipment, explains that because ZLD is always at the end of a process flow, the equipment used is generally subjected to extremes such as the chemical composition concentra-

tion in the slurry and how its flow rate fluctuates.

"Due to both these issues, it is essential that the equipment selected for the ZLD process is capable of dealing with these varying factors, while still effectively producing the desired end result," he says.

"Often, where engineers have only previously known and used pusher centrifuges they may not be aware that there is an option that is far more suited to the ZLD process. And more importantly, one that will provide significant benefits, including more reliable performance with associated cost savings," Du Plessis adds.

He recommends that those implementing the ZLD process ensure that they have access to an OEM that understands the entire process and is able to take all factors including flow rate, solids concentration, temperature, particle size distribution, chemical composition and corrosive properties into account.

There is an extensive global reference base of successful Siebtechnik Conturbex

centrifuge installations in ZLD applications, with some 7 000 machines in more than 1 000 applications across a spectrum of industries. Multotec markets this range of centrifuges in southern Africa, and du Plessis says it has the requisite depth of minerals processing knowledge and ability to assess any given application and to provide a customised solution capable of meeting process expectations.

He says the Siebtechnik Conturbex centrifuge offers a number of major advantages in the ZLD process. "Chief amongst these is significantly increased reliability as the machine is designed for a short product residence time, which means that its performance is not impacted by the fluctuating flow rate or fluctuating concentration of solids."

The Siebtechnik Conturbex centrifuge has been engineered with a scrolled product transporting mechanism that distributes the solids product evenly across the basket. This allows vibration free operation ensuring better mechanical integrity of the equipment.

"This is an important feature as uneven distribution during this process results in increased stresses on the components, with eventual mechanical failure. Unplanned downtime as a consequence of this sort of stress would have serious knock on effects for the plant, as well as a significant environmental impact," he explains.

A third major benefit is that the machine is self-cleaning. This feature is particularly relevant during a power outage or stoppage on the plant. When this occurs, the rotating components slow down while simultaneously cleaning the basket. This then allows the machine to be restarted without the need to do any form of manual cleaning. Significantly, this feature is unique to the Conturbex machine.

Materials of construction are always important when equipment operates in extreme conditions, as this ensures durability and optimum component life. Where extremely high temperatures and highly corrosive elements are found in the effluent being processed, specialised materials of construction are recommended. And in applications subjected to harsh abrasion, abrasion resistant materials are applied to the flight of the scroll to ensure long life of both the rotating components and the centrifuge itself.

The double drive functionality of the



A Conturbex centrifuge dewatering glauber salt product in a ZLD plant.

Siebtechnik Conturbex centrifuge is an important feature, which enables independent adjustment of the scroll and drum speed. This allows adjustment where extreme process conditions exist and this flexibility enables performance to be optimised.

The centrifuge is engineered in such a manner so as to enable easy maintenance and one of the features relevant to this is the single bearing overhang design, which allows easy access to the internal rotating components. This saves time, leading to greater cost effectiveness during planned maintenance activities. Another important time saving feature is that cleaning nozzles, strategically positioned within the machine, facilitate cleaning-in-place (CIP) during scheduled maintenance shutdowns.

Pointing to applications where Conturbex centrifuges are operating successfully, du Plessis says that in the petrochemical sector these centrifuges replaced pusher centrifuges as part of a de-bottle necking project with the added benefit of less frequent washing requirements. Also in the petrochemical industry, Conturbex centrifuges are used



Two Conturbex centrifuge installations dewatering glaubersalt and mixed salts produced using a ZLD process.

to produce a sodium sulphate by-product from a sulphur effluent stream.

Du Plessis says that there are definitely applications where the features of pusher centrifuges will outweigh those of the Conturbex centrifuge, however the ZLD process is not one of these. "We manufacture all types of centrifuges, including pusher centrifuges, and will recommend the correct type of centri-

fuge for the application at hand. Pusher centrifuges are suitable for applications where the need for crystalline purification is essential."

Conturbex centrifuges are also used for water treatment and de-watering of mixed salts, including sodium sulphate in a colliery plant, and in a crystalliser plant de-watering mixed salts at a platinum operation. □

Pipe launders make their way to chrome

Multotec's pipe launders are well known in the mineral sands and iron-ore mining industries. The polyvinyl chloride pipe launders have proved their worth in these arduous applications for many years, significantly outperforming their steel rubber-lined counterparts. Now, chrome producers are taking note of their benefits.

This includes Northam Chrome Producers, the first chrome miner to put Multotec's pipe launders to the test, and Multotec's Graeme Smith reports that the company will shortly be supplying an additional 400 running metres to another undisclosed chrome producer.

The pipe launders were supplied as part of a spiral retrofit project at Northam Chrome Producers' recovery plant. A total of 72 of Multotec's HX5 and HX3 spirals were designed, manufactured and installed, boosting the plant's recoveries by as much as 6.0%.

The plant was using conventional steel rubber-lined pipe launders that had been designed for the previously installed spirals that were also due for replacement.

Smith says that Multotec's Technology Division discussed the many advantages offered by its pipe launders with the plant's management team. "We detailed the pro-

posed layout of the launder solutions, and the team really liked our idea of ensuring a more durable and tidier installation that would also be safer and easier to maintain over time," says Smith.

One of the biggest benefits offered by the company's pipe launders is their durability. Smith says some of the company's installations in the mineral sands production environment have lasted for up to nine years in highly corrosive coastal environments. What is more, they are easy to maintain. Their design incorporates a replaceable polyurethane boot inside the pipe that endures wear and protects the inside of the pipe.

"In arduous applications, such as those found in mineral sands and iron ore mining, the boots would have to be replaced about every two to three years," he says, adding that the boot can be replaced within five minutes. Manufactured from a much lighter material than steel and having

a smaller outside diameter, Multotec pipe launders are easier to handle and can be installed by two men without the need for any lifting or hanging equipment.

The launder pipes supplied to chrome producers have an outside diameter of 200, 255 and 400 mm. Every pipe launder, installed from the collection point leading down to the sump, had to be specially designed and manufactured to fit into the existing footprint of the plant.

It may just be that more chrome miners will come to experience and appreciate the benefits of a better pipe launder system, thanks to Multotec. □



The cleaner concentrate, rougher concentrate and tail pipe launder arrangement, together with Multotec distributors.

Super Supervision services for ZCMC mill installation

South Africa-based FLSmidth has recently introduced a new Super Supervision service for those customers who prefer to use their own artisans for installation and commissioning. This article describes its use in Armenia for the installation of a second FLSmidth ball mill.

Technical capability, depth of experience and expertise as well as the ability to communicate across international language and cultural divides has seen FLSmidth successfully oversee the installation and commissioning of the second ball mill for Zangezur Copper Molybdenum Combine (ZCMC).

ZCMC, one of the largest companies in Armenia, exploits a Karajan copper and molybdenum deposit in an open pit operation and produces 20 Mt of ore per annum. Significantly, the same FLSmidth team was responsible for the successful commissioning of ZCMC's first SAG mill and first ball mill in 2011. The second ball mill, with a 20-foot diameter and 31 feet long, went into production in 2015. All mills were supplied by FLSmidth.

A team from FLSmidth's South Africa office, under the management of Tony Girodo, was responsible for the supervising of the ZCMC installation and commissioning team. This was done under a new service and support offering known as Super Supervision.

Girodo says there is a move in the mining sector by customers who want to use their own installation crews, but find it necessary to have the appropriate level of supervision at all stages of the installation as well as during both cold and hot commissioning.

"Market needs have changed over the last ten years, and where we previously undertook the complete installation and commissioning with full teams of artisans on-site, mines now prefer to use their own teams. This, however, brings certain challenges with it, of which the most critical has to do with depth of experience and technical capability," Girodo says.

This has been overcome with a new service offering pioneered through the FLSmidth South African office. Super Supervision is a new approach to project supervision and bridges the gap for those customers who want to utilise their own artisan crews during the installation and commissioning phase on a project.

Girodo commented that the initial price may appear high but it is most cost effective in the long term as customers are assured that equipment will be in-

stalled and commissioned in accordance with the OEM's quality standards and procedures.

Under the Super Supervision service FLSmidth provides foremen who have the necessary depth of expertise and product know-how to give hands-on guidance to the customers' teams to ensure that the final equipment will operate in accordance with the requisite parameters and specifications. These individuals are selected for the value that they will add to the project and work closely with the customers' site crews. Developed to meet changing customer needs, Super Supervision ensures that the requisite quality is achieved at all stages of the project by overcoming any potential technical deficiencies from the customers' side: the supplier and end user both win.

In the instance of the ZCMC ball mill installation, the FLSmidth Super Supervision team had the necessary knowledge of the basics of mill installation. Girodo adds that this, amongst other things, applied to bedplate installation and dimensional checks prior to lifting the shell assemblies into place.

Girodo confirms that the Super Supervision service is only one of many options available from FLSmidth. The company also undertakes complete turnkey installations of mills, and offers a technical advisory service where a technically competent FLSmidth individual is assigned or connected to a particular site to assist the customer with all technical queries relating to drawings, manuals and the like.

Site service and support activities fall under customer services (CS) at FLSmidth with the primary goal to provide the requisite level of support for all FLSmidth products in the field. This could include assisting customers in maintaining recommended parts stock-holding levels at the plant.

FLSmidth CS teams can also assist customers during planned shutdowns where equipment is assessed in terms of performance and maintenance requirements with a view to optimising production. By determining equipment condition and any potential issues that could arise, the team assists customers with the scheduling of parts requisitioning as well as planning major repair work and upgrades, which bring older equipment into line with current technology, thereby improving reliability and performance. □



The FLSmidth ball mills at Zangezur Copper Molybdenum Combine (ZCMC) in Armenia. The second mill was recently installed using the company's recently introduced Super Supervision service.

Meeting demands for top-class lifting and rigging equipment

Rodney Young, factory manager at Kelmeg Lifting Services (KLS) talks about the company's local offering and growth.

Since 1991, Wadeville-based Kelmeg Lifting Services (KLS) has provided South African industry with quality lifting and rigging equipment, with a special focus on webbing slings, endless round slings and cargo securing systems. Thanks to their eye for continuous improvement and innovation, however, the company strives to keep up with changing needs in the market, and now boasts a diverse range of products, components and systems, all carefully designed with quality and safety in mind.

Ongoing research and development (R&D) has ensured consistent growth and diversification for the company, particularly during the last five years in which Kelmeg has trebled in size, according to Rodney Young, factory manager at Kelmeg.

"We have worked hard to achieve a sustainable footprint in all markets, with a focus on diversity not only in terms of our product portfolio, but also within the industries we serve," says Young. "We are known as manufacturers of polyester flat webbing slings, endless round slings and cargo securing systems, but now offer a range of other systems, including webbing protectors, vehicle toe-straps, 4x4 recovery kits, motorbike straps, tool bags and a host of other lashing components."

With safety a priority in industries across the board, there is a growing demand for high quality rigging and lifting components. "When lifting a substantial weight, such as 50 t, there is much at stake," Young points out.

"Safety is becoming an increasingly critical factor for businesses to consider, and we are mindful too of changing legislation in this regard. It boils down to a quality product, and at Kelmeg we are proud of our high standards, as borne out by our ISO accreditation," he says, noting that Kelmeg also manufactures accord-

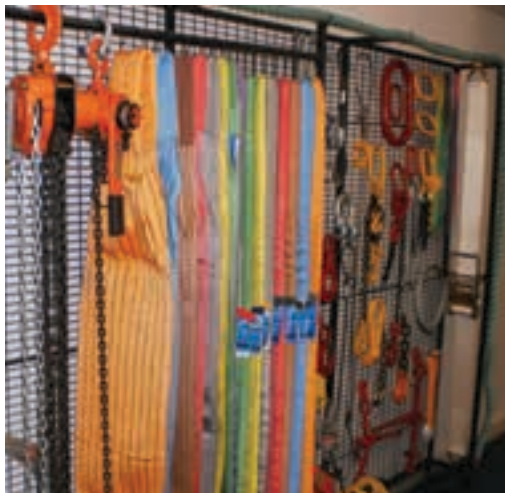
ing to the SANS 94-1 and SANS 94-2 specifications, as required by the latest DMR (Driven Machinery Regulations).

Young also pays tribute to his staff of 40, many of them with extensive experience and intellectual capital. Of vital importance to the business is the ongoing training that Kelmeg provides across the board. This includes the recognised outsourced training courses for the LMI (lifting machinery inspector) and LTI (lifting tackle inspector) qualifications.

A division of Renttech South Africa since 2011, Kelmeg has built up strong relationships with its extensive network of distributors, both nationally and internationally. Through its distributors, the company has a presence in most industries, including petrochemical, offshore oil and gas, construction, agriculture, shipping, engineering and manufacturing, among others.

"What we offer is versatility, quality and exceptional lead times – as well as competitive prices. We run a 'tight ship', working smartly and efficiently, with no waste of labour – and we are able to pass on these efficiencies to our distributor network," Young points out.

"We have an innovative and versatile approach to what we do, growing and developing according to the market – and there is always something new in the pipeline," Young concludes. □



KLS has been providing South African industry with lifting and rigging equipment – webbing slings, endless round slings and cargo securing systems – since 1991.

High quality chain hoists offer lower lifetime costs

High quality chain hoists face the same challenge in South Africa as other reputable equipment brought into this country – a competitive price bettered by even cheaper imports from China. Despite their generally lower quality, the very low price of these Chinese imports makes for an attractive purchase. When they break down, they are simply discarded and replaced.

Notwithstanding this challenge, Hitachi, a leading high quality chain-hoist brand manufactured in Japan and distributed in South Africa by Condra Cranes, reports steady local sales, the result of good service, back-up and well-established distribution channels.

Since Condra secured the exclusive Hitachi agency in 2009, sales outlets supported by well equipped agents have been set up in Durban, Cape Town, Bloemfontein, Mbombela, Polokwane, Rustenburg and the Sishen mine in Northern Cape.

Hitachi chain-hoists are well known for careful design and an ability to perform well and reliably for many years under robust conditions. The hoists feature helical gearing for quiet operation, electro-magnetic disc brakes for long life, and plug-in cables to reduce maintenance and installation time.

They are also rich in safety features, which include: a 24-volt impact protected and rain-proofed control pendant with wire rope moulded into the cable for strain relief; an electro-magnetic contactor with mechanical interlock to protect against shorting; optional emergency stop buttons and overload protection; chain containers fitted as standard; upper and lower limit switches to prevent hook over-travel; and a reverse-phase relay on most models to facilitate inspection.

Among the more ordinary features in the range are chains with hardened surfaces for optimum strength and wear resistance, and hooks that are heat-treated and fitted with a safety latch and 360-degree swivelling.

Distributor, Condra, which manufactures overhead cranes in the two-ton to 500-ton range, uses the Hitachi range to extend its lift offering all the way down to 250 kg. □





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Resonance screen supply underlines successful global penetration

Extending its success in Australia, which began with the supply of vibrating screens back in 1997, MBE Minerals South Africa has recently manufactured and supplied a complete resonance screen with and additional screen box to an Australian iron ore mine.

The recent supply of a complete resonance screen with an additional screen box to an Australian iron ore mine underpins MBE Minerals SA's drive to participate in global markets. The supply of these screens is the continuation of the screen replacement programme of 20 such machines for this major Australian iron ore producer.

"Significantly, the original screens were manufactured in South Africa by MBE Minerals in 1997 and have been operating successfully in a fashion that is typical of their reputation for extended life cycles in arduous hard rock applications. We can reference a number of enduring heavy duty vibrating screen installations in the iron ore sector, including ones in the South African Northern Cape that have been in operation for more than 40 years," says Johannes Kottmann, managing director of MBE Minerals SA.

The 2.4 by 4.5 m screen employs the principle of resonance and dynamic vibration adsorption for its screening action. "A number of design elements have been incorporated to enhance performance, including the operation of the screen box at near resonance frequency. This allows the actuating device to replace only energy lost to the oscillating system by mechanical resistance and material transport," Kottmann explains.

A counter-oscillating frame of pre-determined mass ratio to the screen provides vibration absorption, thus minimising the transfer of dynamic loads into the supporting plant structure. The addition of support, working and coupling springs allows energy exchange and guides the counter-oscillating masses.

MBE Minerals SA manufactures a wide variety of vibrating screens, all designed with sound mechanical features including vibration damping, side plates, cross members and the appropriate feed and discharge chutes. This includes screens of linear and circular motion design, both in single and double deck

configuration from 0.6 to 3.6 m in width and up to 8.5 m in length.

"Our screens are manufactured to provide increased throughput, while at the same time reducing both downtime and maintenance costs. Leveraging an

extensive footprint of products for sizing, scalping, dewatering and media recovery, we are able to customise each screen to the specific requirements of the customer's application," Kottmann concludes. □



The recent supply of a complete resonance screen to an Australian iron ore mine underpins MBE Minerals SA's drive to participate in global markets.



The resonance screen manufactured by MBE Minerals SA is one of 20 such machines being supplied as replacement screens to an Australian iron ore mine.

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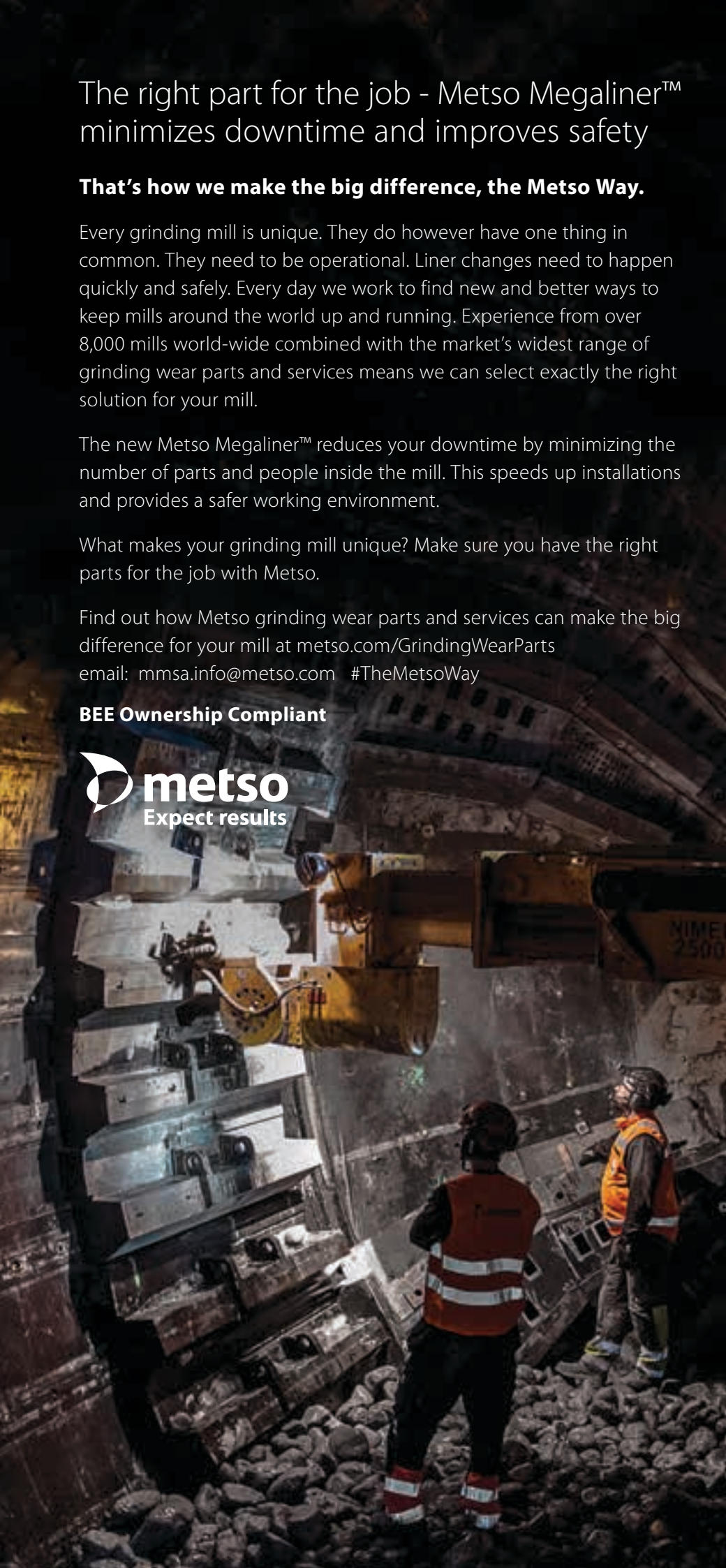
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Retrofit screens project excites SA iron ore giant

Joest Kwatani has successfully completed another large screen equipment project for a South African iron ore operation in Kathu in the Northern Cape.

Joest Kwatani has enjoyed a 25-year relationship with this mine, mostly because of the performance of its robust screens in these very arduous working environments.

Kim Schoepflin, managing director of Joest Kwatani, says this was the largest retrofit undertaken at the mine in such a short period, and that the project was completed within budget and well before the contractual completion date. “We have always enjoyed fast track projects; we find that they are always extremely efficient and, more importantly, accurate,” she says.

Joest Kwatani undertook the project over two phases, which involved designing, manufacturing, installing and commissioning 57 screens in just over a year. Schoepflin says the second phase was the largest of the two involving the installation of 22 screens in the mine’s cyclone plant and 15 in its washing and screening facility.

In the washing and screening plant, seven were primary double-deck and eight secondary double-deck screening machines. These size iron ore material, which is fed to the cyclone plant, where the balance of Joest Kwatani’s screens are single-deck vibrating units used to separate coarse and medium sized material.

Schoepflin says that one of the biggest challenges was working in an existing plant structure and screening machine footprint, while ensuring the productivity at the mine was uninterrupted.

Significant design challenges had to be overcome so that the existing plant could accommodate the new screens. This included designing screens with low side plates and developing a fit-for-purpose spreader beam to lift the units over one another in order to place them into their final positions in the washing and screening plant.

In order to keep the programme on track, the company gradually phased itself into the second stage of the work,

and then followed up with a detailed project plan over the entire contractual period. Schoepflin notes, however, that flexibility is key to working successfully on mining projects.

“Although our plan was aligned to the mine’s production programme, we have always had the ability to adjust and think on our feet to accommodate the operation’s strict production requirements,” she says.

All the screens feature Joest Kwatani’s exciter gearboxes that increase G-forces and therefore improve the mine’s recovery of ferrosilicon material and the screening efficiency, while reducing total cost of ownership. “Our screens have been known for being workhorses since their inception and will place the operation in a very good position for the future,” she says.

The screens were manufactured at the company’s premises in Kempton Park, Gauteng. Depending on the installation schedule at the mine, four to eight units



A Joest Kwatani double deck screen ready for installation at a washing and screening plant of the Kathu-based iron ore mine.

were transported to the mine site every month, after undergoing stringent testing at the company’s in-house test facilities.

The screens were received by Joest Kwatani’s 15 dedicated personnel stationed at the site, who oversaw the installation and commissioning of the screens. The contract also includes a one-year maintenance agreement that will be honoured by the company’s dedicated office in Kathu.

This is just one of many examples of Joest Kwatani’s ability to deliver a robust bespoke solution to the mining industry. And it is no surprise that it continues to dominate the screening market in the iron ore rich Northern Cape. □



Joest Kwatani drain and rinse screens ready for installation into the mine’s cyclone plant.



SA flighting manufacturer

MechTech visits the Germiston facilities of Bruton Spiralflyte, and talks MD, Barry Bruton, who has recently bought a modern 'doughnut' press for manufacturing accurate thicker-section flights for mining and other arduous conveying applications.

Bruton Spiralflyte is a business that goes back over 50 years, to 1967 when Barry Bruton's father, Fred (FD) Bruton founded a fabrication business called Brudan Engineering on 1 Refinery Road opposite Germiston Lake. Brudan was a large general engineering and fabrication business. "In those days, my father did structural steel, boilers and pressure-vessel work for the likes of Vecor and Highveld Steel. Most notably, Brudan fabricated Ammonia plant Number 4 in Kempton Park," remembers Bruton.

"Then someone asked if he could make flighting, so he started making them the traditional way: cutting doughnuts, pressing them and welding them onto a shaft to make a screw or auger. This is called the fabricated or sectional flighting method.

In the days before computers there were a number of ways of doing this. A piece of string wrapped around the spiral path on a pipe, for example, was used to measure the inside diameter and pitch. Then the doughnut would be cut but it was never very accurate and there was a lot of hammering involved to get all of the flights to align," Bruton explains.

In the late 1960s, Bruton senior heard of a machine for manufacturing continuous flighting from strip material. "At R90 000, though, he was told he couldn't afford it, but when anyone suggested to my dad that he couldn't afford something, he went out and bought it.

"This was the first Spiralflyte machine brought into South Africa and it is still working today, nearly 50 years later. It is no wonder that my dad thought it would be good business," Bruton tells *MechTech*.

The 14-ton flighting machine is still generating over R100 000 a month of continuous-roll flighting. Strip material is fed in at one end and a spiral screw at the correct pitch and diameter comes out at the other end. "But it is still an art to set the machine up to produce the specific

flight required," he adds.

Following recession and a slump in the fabrication sector, spiral flighting became an increasing 'niche' for the company and in the 1990s, the family downsized with the purchase of its current property in Knights, Germiston and renamed the business Bruton Spiralflyte in recognition the new direction. "I took over few years later when my father passed away," Barry Bruton recalls.

Flighting is widely used for screw conveyors or augers, for moving cement, maize, coal, sugar cane and sand. "Continuous rolled flighting is used in agriculture, for combined harvesters, for example and we did supply flighting to a South African equipment manufacturer in the days when local manufacturing was stronger," Bruton says, adding: "today, most of our business is for the aftermarket, though."

"Flights are made-to-order wear parts. If a farmer phones in and tells us the screw length, pitch and diameter, we can make the exact screw that his machine needs. The patent for this technology goes back to Archimedes, so our business is all about offering a rapid turnaround manufacturing service at the right price and quality," he says.

Bruton Spiralflyte bought a second continuous flighting machine in 2006 to accommodate increasing demand for smaller flight thicknesses and diameters. The newer machine also has a super-edge feature – it can produce a thickened outer edge, simply by reducing the rolling compression in that area, which can extend the wear life of the flight in certain applications. These are used for mineral and silica-sands applications, where cold working of the flight material improves wear resistance. "The material can be deformed by as much as 50% during forming, so one ends up with a much thinner section than one started with.

Continuous flighting is ideal for steels and simple stainless steels such as 316 and, in particular, 3CR12. "I wish indus-



The company's new state-of-the-art fabricated/sectional flight manufacturing system starts with a CAD program, which generates the exact doughnut profile required for CNC laser cutting. Bruton Spiralflyte's continuous rolled flighting is widely used for screw conveyors or augers for moving cement, maize, coal, sugar cane and sand. These are loaded onto the pressing machine, which presses flights with identical pitch (inset).

try would choose 3CR12 more often. It is easy to form and weld, not excessively expensive and it offers good corrosion and wear resistance," Bruton continues.

Increasingly, however, Hardox and Benox materials, along with thicker section (20 mm) and complicated stainless steels (310) have become popular – and these cannot be easily manufactured using the continuous flighting machines.

Hence, turning full circle to its pre-1968 flight manufacturing roots, Barry Bruton has bought a flight-pressing machine, "which builds on the original doughnut pressing methodology original used by my father".

Describing the process involved, he says that 'dark art' of the past involved cutting each disc to the same size. Then these would be pressed to the correct pitch, with over-pressing being required to compensate for the spring back. "Each doughnut ended up a little different, making the boilermakers assembly task difficult and time consuming.

While the new machine reverts to the same basic principles, Bruton has bought

adopts state-of-the-art technology



patented computer-controlled accuracy and measurement systems that ensure the precision of each doughnut. "First, we enter in the flight parameters into a CAD program, which will generate the exact doughnut profile required. This is transferred to CNC laser cutting machines, which produce the required number of identical shapes.

"These are then loaded onto the pressing machine, which presses the doughnut to the perfect spiral profile. The pressing loads, over-pressing distances and maximum speeds are automatically set based on the flight size, material specification and section thickness so that each flight section manufactured comes out within the tolerances required," Bruton explains. "Operators no longer have to work by feel and then hit the poorest ones with a hammer to make them fit," he adds.

The advantage? "This system enables us to make augers in 20 mm stainless steel, for example, and to use harder,

tougher materials such as Hardox and Benox, which are commonly used on the mines. It also makes onsite replacement of individual spares easier, because they are all accurate.

"Having been manufacturing flights for over 50 years, we know about almost every application. We supply fabricators and distributors across South Africa and we sell into Zimbabwe, Botswana and Namibia, among other countries, to companies servicing mines in Africa.

"In the future, we hope to add another novel technology called on-edge rolling. This is used for centreless/shaftless screws made in thicker material. They have hollow cores, which are ideal for sticky or stringy materials.

"Locally manufacturing screws and flights enables us to offer the best lead times for custom-made replacement parts. And we are willing to solve any flight related problem. If we can't make it, we know someone who can," Bruton concludes. □

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Efficient forming and tube-end machining

Transfluid Maschinenbau, a manufacturing partner for tube bending and tube processing machines, presented its new forming machines range at the Tube Trade Fair in Düsseldorf in April. *MechTech* presents a summary of the key features.

Selecting the suitable procedure for attaching connection elements to tube ends is essential for economical machining processes. This is because geometries are becoming more and more complex and the pressure of remaining cost effective is increasing significantly. There are various options, such as being able to solder or weld rotary parts manufactured in advance onto a tube. The tube normally has to be calibrated for this and soldering in a furnace can change the bend geometry, the join or the surface.

Induction soldering on the other hand, is very costly and leak-tightness, if necessary, must also be checked. Overall, this process is time-consuming and always associated with a large, complicated equipment and a process chain in which additional soldering paste, a soldering ring or gas is required, as well as forming gas for welding.

Forming provides a more efficient solution. Transfluid Maschinenbau has developed various cold forming solutions for axial, roll and combined forming. Here, machines do the basic forming, while the tools safeguard the process – and the company has particular expertise

in the tool technology area. The system can reduce follow-up costs and guarantee quality, due to the incorporation of intelligent tool solutions.

The company's 'T-form' REB systems are designed for axial upsetting. Depending on the requirements, the machine configuration is determined by three significant factors: the tube size, the material and the forming geometry. For example, sharp-angled contours require significantly more upsetting than smooth ones. The REB forming machines can provide fast tool changing, extreme degrees of forming and complex geometries. The tool sequence is positioned vertically or horizontally via a servo motor. Up to six forming stages and one intermediate clamping unit enable virtually all forming requirements to be met.

Integrated rolling stations are used for specific tube forming processes. The system is operated via a touch screen with an integrated database. Specific machining sequences, processes and machine parameters can be managed here. With regard to drives, Transfluid optionally equips the REB systems with hydraulic, numeric or electrical drives. Furthermore, for very short cycle times, there is also the option to carry out forming procedures step-by-step, with transfer systems between steps.

The tube size and forming geometry play an important role in the precise design of the Transfluid SRM roll forming machines. The tube diameter determines the machine's basic construction with regard to the opening stroke and the output torque. The procedure is particularly suitable for creating sharp-angled contours for sealing elements and optimised surfaces. All drives are electrical servo drives and can be CNC controlled if required. This allows tool-independent forming and stores all setting parameters. Time-consuming adjustments are, therefore, not necessary. Tubes can either be formed from inside to outside or from outside to inside.

Combination machines are used according to the geometry. Transfluid combines the benefits of both forming



Smooth contours such as these require significantly less upsetting than sharp-angled contours.



Axial tube forming with a spring follow-on tool can be used to attach an external component.

and machining procedures. Often, axial pre-upsetting is carried out and the final geometry is achieved using the roll process. For example, to ensure that trimming before the axial tube forming process is also possible or to ensure that a pre-upset geometry can be rolled subsequently, the combined procedures are available in one machine or as a transfer system, in which the machining processes are carried out one after the other. With fast tool changes included, the advanced, high-tech combination can be used for extreme forming – for sharp-angled contours/radii, high demands on the surface and forming closely behind arcs, for example.

The Transfluid UMR forming machines are used for flaring connections. The machine size depends on the tube size – up to 325 mm in diameter – and the tool is adjusted to the appropriate forming geometry. Fast tool changes ensure that time is saved and the system also enables tube ends to be closed. The UMR systems run virtually independently of the tool with a freely-programmable, controlled forming taper. Flares of between 20° and 90°, as well as clamping lengths in the order of the tube diameter can be produced, which have excellent sealing surfaces – and flares of up to 90° can be manufactured in a single step.

Flange connections can also be produced using this solution. □



Transfluid's roll tube forming machines enable minimum clamping lengths combined with an optimum, controlled forming result.

Increasing local transformer manufacturing: a strategic move for greater local involvement

WEG Transformers Africa, a division of Zest WEG Manufacturing, is determined to continue growing its share in both the South African and African transformer markets.

Louis Meiring, chief executive officer at Zest WEG Group Africa, says the acquisition last year of Heidelberg-based TSS Transformers facilitated immediate access to additional facilities as well as best-in-class technical skills. “Upskilling ourselves in this critical market sector and increasing our local manufacturing base was a strategic move that will see greater involvement from Zest WEG in this industry,” Meiring says.

Zest WEG Group is owned by Brazil-based WEG and this significant investment in local manufacturing highlights WEG’s financial commitment to its local operations. Meiring says the acquisition was in line with the international player’s intention to expand its global network of businesses and manufacturing plants. The WEG Group aims to increase its sales year-on-year by a minimum of 17% until it reaches an annual turnover of US\$10-billion in 2020.

WEG Transformer Africa (WTA) operates two major facilities and is poised to reinforce its position as a leading African manufacturer of electrical equipment. The last two years has seen the recapitalisation of the WTA Wadeville operation. Andre Mans, COO of WTA, says that this extensive investment programme has seen the facility undergo a complete makeover with the upgrading of equipment and streamlining of processes. “Today, WTA Wadeville is a modern operation that boasts best-in-class production and manufacturing capabilities,” he says.

WTA Wadeville produces standard distribution, power and special application transformers ranging from 50 kVA to 10 MVA in voltages up to 66 kV with off-load tap switches or on-load tap-changers. Known for its responsiveness to customer-specific needs, the facility also has the engineering expertise and capability to manufacture special transformers for mining, industrial, rectifier/



WTA's modern facility houses what is considered to be the best privately operated oil sampling laboratory in South Africa.



An important value-added service offering from WTA is its suite of structured transformer maintenance programmes that allow customers to protect these assets from degradation.

traction, converter and thyristor drive applications. WTA also manufactures a range of mini substations. Mans says that, where applicable, the transformers carry SABS certification.

The Heidelberg facility, which was previously TSS Transformers, was acquired in the third quarter of 2015 and boasts an impressive 45 000 m² footprint. The modern facility is capable of locally manufacturing power transformers up to 40 MVA in voltages up to 132 kV, as well as mini substations and moulded circuit breakers.

This facility houses what is considered to be the best privately operated transformer oil sampling laboratory in South Africa. Mans says this is a crucial differentiator in the market as it gives customers access to skilled technicians who analyse samples on state-of-the-art equipment to world-class standards.

Concluding, Mans says that an important value-added service offering from WTA is its suite of structured transformer maintenance programmes that allow customers to protect these assets from degradation. □

Heat exchanger desalination



Roger Rusch (left), CEO of Industrial Water Cooling (IWC), talks about the suitability of his company's SONDEX heat exchanger desalination solution for Africa, a technology that can utilise waste heat from engines or other heat rejecters to produce drinkable water by evaporating seawater under vacuum.



SONDEX's fresh water distillers utilise the waste heat from diesel engine jacket cooling water or other heat sources to produce pure drinkable water by evaporating seawater under high vacuum. This system produces up to 150 t of drinkable water per day.

There are a number of valid reasons for South Africa's growing water crisis such as climate change, lower rainfall, crumbling water-pipe infrastructure, multiple minor and major leaks across urban and rural communities, theft of water and more.

One solution to the seriously diminishing fresh water supplies in South Africa is to tap into the largest water resources available: the ocean, and the desalination of such water.

Desalination is a well-established method of removing salt from water in order to produce process water, ultra-

pure or potable water. This is accomplished through using membranes (reverse osmosis and nano-filtration) or thermal processes (multi-effect distillation, evaporation and crystallisation).

The reason desalination hasn't yet become more popular is cost limitations. Desalination is an expensive process. Salt dissolves very easily in water, forming strong chemical bonds, and those bonds are difficult to break, requiring large amounts of energy.

A global company at the forefront of developing next-generation, fresh water distillation technology is Danish-based SONDEX. To bypass the considerable expense, SONDEX has developed a process that uses heat exchangers to recycle excess or waste energy generated in an industrial process.

This energy is then redirected to power a separate thermal distillation plant.

In thermal distillation, boiling water is turned into vapour, which leaves the salt behind. The vapour is then condensed back into drinkable water as it cools. This process requires more energy when compared to the other common method of desalination, reverse osmosis, where seawater is forced through a semi-permeable membrane that separates the salt from water.

Roger Rusch, CEO of IWC, an official supplier of SONDEX heat exchangers in Africa, says: "SONDEX's fresh water distiller utilises the waste

heat from diesel engine jacket cooling water or other heat sources to produce pure drinkable water by evaporating sea water under a high vacuum, thereby enabling the feed water to evaporate at temperatures below 48 °C. Steam can also be used as the heat source instead of the hot jacket water. This technology eliminates the need for an additional, costly energy source."

How to use heat exchanger packs to desalinate ocean water

The Fresh Water Distiller is based on a two-stage design in a vertical configuration. It is made up of two custom-designed titanium plate heat exchanger packs acting as evaporators and one titanium plate heat exchanger pack acting as a condenser. These plate packs are located in two separate chambers under different vacuums.

In stage one, the first evaporator plate pack, located in chamber one at 70% vacuum, turns the seawater into vapour, thereby separating the salt. This vapour is then directed through a large diameter pipe down into stage two, which is located in the second chamber working at 90% vacuum. The hot brine obtained from stage one is redirected to the second plate pack, which is also located in Chamber two.

When the vapour reaches chamber two, it is condensed and its heat released into the second plate pack with the hot brine inside. Acting as an evaporator, the second plate pack turns the hot brine into vapour, leading to more salt separation.

The third plate heat exchanger pack,



SONDEX has developed a process that uses heat exchangers to recycle excess or waste energy generated in an industrial process.

Prepare now for the Carbon Tax Bill

In November 2015, the National Treasury published the Draft Carbon Tax Bill for public comment. Once implemented, the Bill will penalise companies with excessive green house gas (GHG) emissions, motivating them to shift towards cleaner, more energy-efficient technology.

This is a revolutionary step for South Africa and forms part of the country's commitment to reduce GHG emissions by 34% by 2020 and by 42% by 2025, in line with international guidelines set by the United Nations.

As outlined in the draft bill, the initial marginal carbon tax rate will be R120/t of CO₂e (carbon dioxide equivalent), but the actual thresholds are much lower – ranging between R6.00 and R48/t – as outlined below.

To allow transition time to implement low carbon alternatives in the first phase, a basic percentage-based threshold of 60% will apply, below which tax is not payable. The following additional tax-free allowances also apply:

- An additional 10% for process emissions.
- An additional allowance for trade exposed sectors, to a maximum of 10%.
- An additional allowance of up to 5% based on performance against emissions intensity benchmarks. These benchmarks will be developed in due course.
- A carbon offset allowance of 5.0 to 10%, depending on the sector.
- An additional 5% tax-free allowance will also be applied for companies participating in Phase 1 of the carbon budgeting system.
- The combined effect of all of the above tax-free thresholds will be capped at 95%.
- Due to the complexity of emissions measurement in the waste and land use sectors, 100% thresholds have been set i.e. these sectors are excluded from the tax base for Phase 1.
- Taxable emissions include: emissions from fossil fuel combustion; emissions from industrial process and product use; and fugitive emissions. The greenhouse gases covered include carbon dioxide, methane, nitrous oxide, perfluorocar-

bons, hydrofluorocarbons and sulphur hexafluoride.

- Carbon tax on liquid fuels (petrol and diesel) will be imposed at source, as an addition to current fuel taxes.
- For taxation on stationary emissions, reporting thresholds will be determined by source category as stipulated in the National Environmental Air Quality Act. Only entities with a thermal capacity of around 10 MW will be subject to the tax in the first phase. This threshold is in line with the proposed DEA (Department of Environmental Affairs) GHG emissions reporting regulation requirements and the Department of Energy (DoE) energy management plan.

The carbon tax will be administered by the South African Revenue Service (SARS). "Although the Carbon Tax Bill is still in draft phase, there's no doubt that it will be passed. All that remains now is for the Minister of Finance to determine the final tax rate, exemptions and the actual date of implementation. This means that companies with high GHG emissions, such as smelter plants, chemical production plants, boiler rooms, sulphur and coal burning power plants, to name but a few, need to start cleaning up their acts by finding cost-effective solutions to reduce their environmental footprints," Rusch says.

One effective approach to reducing GHG emissions is installing a scrubber plant inside the facility. "Scrubber plants are designed to capture pollutants such as carbon dioxide at source. GHGs are then either redirected to an underground storage facility or reused in the manufacturing process," explains Rusch.

"Scrubbers are the international industry standard for treating greenhouse gases at source. They will not only prevent companies from paying carbon tax penalties, but

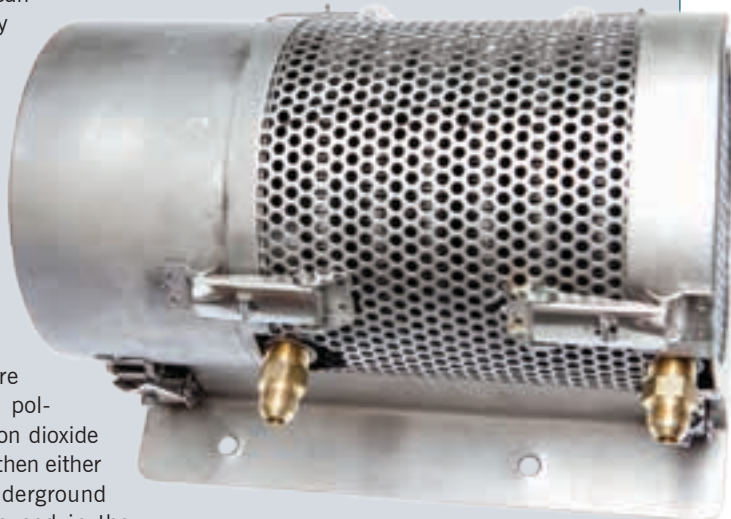
will also prevent costly treatment and rehabilitation of water and ground resources, fauna and flora," says Rusch.

One of the most important factors companies will need to consider when installing a scrubber is choosing the correct material to use for the components inside the plant. In this aggressive chemical environment, companies should consider using GRP (glass-fibre reinforced plastic) components.

GRP is exceptionally durable, resistant to galvanic and electrolytic corrosion and can withstand continuous contact with aggressive compounds. All necessary scrubber equipment such as piping, ducting, fans, scrubbers, process vessels, chimney stacks, custom fabrications, bund walls and related fittings can be constructed out of GRP. IWC is geared up to provide customised reinforced fibreglass components across all industries."

IWC's products and services include the design, manufacture and installation of GRP piping, fittings, tanks and other process equipment. Additionally, IWC also undertakes repairs and refurbishment projects and other associated services.

"To avoid massive financial penalties, South Africa-based industries need to immediately identify technologies such as these to prepare for the implementation of the Carbon Tax Bill," suggests Rusch. □



An effective approach to controlling and eliminating GHG emissions is to install a scrubber plant to capture pollutants such as carbon dioxide at source. GHGs are then either redirected to an underground storage facility or reused in the manufacturing process.

acting as a condenser and located in chamber two, is cooled with cold sea water and powers the custom-designed SONDEX twin-ejector, which removes non-condensable gases and brine from the flooded evaporation process in both stages.

The pure drinking water obtained from

the process is then directed through a flash tank, which removes any steam bubbles, before being pumped into storage tanks using a freshwater pump.

Adds Rusch: "Each chamber is equipped with a demister that removes water drops and salt from the steam produced in stage one as well as stage two.

This results in high quality freshwater from both condensers.

"This system produces up to 150 t of drinkable water per day. Typical applications are off-shore rigs, passenger ships, land-based industries located near the ocean and other places where heat is expensive to create," he says. □



Mining sector cooling systems

Heating and air-conditioning solutions specialist, AHI Carrier, aims to position itself as a leading supplier in the mining sector. The company, which invests heavily in key technologies and innovative solutions, points to efficiency and quality as the main reasons for the success of its products.

Mines require sufficient cooling and ventilation to ensure worker comfort and safety, and to keep processes running smoothly. AHI Carrier specialises in mining water chillers with capacities of between 5.0 MW and 10 MW.

AHI Carrier commercial sales director Jaco Smal (above) indicates that

Carrier mining chillers are designed with robustness and reliability in mind, also achieving premium energy efficiency with variable speed control on the compressors. "The maintenance costs on the Carrier chillers are dramatically reduced in comparison with open-drive compressor chillers used by others."

AHI Carrier's 19XR AquaEdge chillers feature a semi-hermetic motor design, which is highly reliable and reduces the need for additional mechanical room

cooling. The chillers also feature two-stage compression technology, which is an advantage for large tonnage and high lift applications.

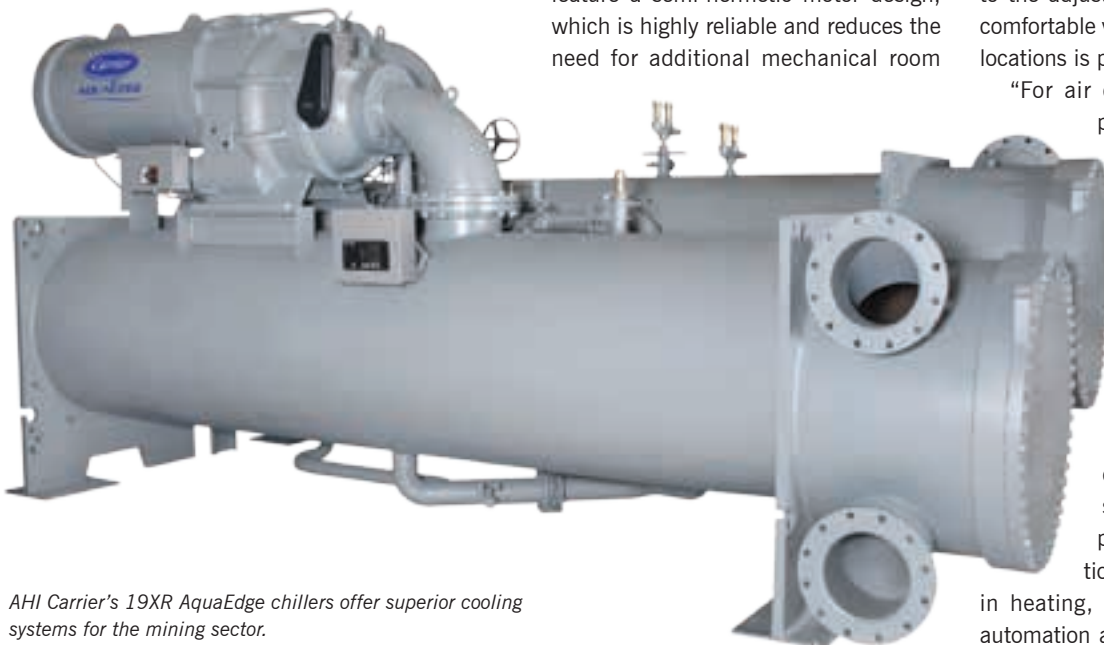
"The two-stage design provides improved cycle efficiency by leveraging an inter-stage flash economiser. This reduces compressor power while simultaneously increasing refrigeration effect and capacity, resulting in high energy efficiency under full load and part load conditions," adds Smal.

The 19XR AquaEdge variable speed centrifugal chillers are easy-to-install, have copper nickel tubes, clad tube sheets and marine water boxes on both the evaporator and condenser. Thanks to the adjustable touch screen display, comfortable viewing from four mounting locations is possible.

"For air conditioning and heating products in South Africa, there's no name more trusted than Carrier. AHI Carrier is a company that believes in problem solving on a global level through innovation that drives new industries. We supply a variety of air conditioning and heating solutions for the mining, commercial and industrial sector and have been a provider of sustainable solutions for more than 100 years in heating, air conditioning, building automation and energy services for the lifecycles of buildings," adds Smal.

As well as its extensive chiller range, the company offers: air handling units, which can include electric heating coils, valve packages or hot water coils; controls ranging from thermostats to zoning systems; and Carrier operates its own servicing entity with access to the latest engineering and the most advanced technical servicing tools.

"Even though the mining sector is still at a low, AHI Carrier is determined to penetrate the sector and acquire significant market share. I have full confidence in the quality and reliability of our products. Our water chillers improve productivity and save on energy costs. We are proud to provide superior quality water chillers that meet a variety of cooling applications," he concludes. □



AHI Carrier's 19XR AquaEdge chillers offer superior cooling systems for the mining sector.

Features summary for 19XR AquaEdge chillers

Ratings

- 19XR and 19XRV (VFD): 703 to 5 627 kW.
- 19XR two-stage: 2 814 to 10 551 kW.

Performance features

- IPLV (integrated part load value): 0.31 (19XRV).
- Chlorine-free HFC-134a refrigerant.
- Semi-hermetic compressor motor.
- Low energy consumption during part load and full load operation.
- Aerodynamically contoured impeller.
- Multilingual display.
- Compatible with Carrier Comfort Network® (CCN) communication link.

- Two stage economised compressor (19XR two-stage units).

Reliability features

- ASME constructed heat exchangers.
- Single-stage or two-stage positive pressure compressor.
- Low voltage control circuits.
- Lowest industry refrigerant leakage rate at less than 0.1%.
- Semi-hermetically sealed compressor, motor, and transmission.
- Automated controls may be tested before start-up.
- Refrigerant-cooled, unit-mounted variable frequency drive (19XRV).

Setting a new standard in chiller technology

Johnson Controls is enhancing its portfolio of commercial and residential HVAC/R products with the expansion to 1 000 tons of cooling (3 500 kW) for its successful magnetic-bearing centrifugal chiller line, the YORK YMC². The larger cooling capacity units address the need for reduced sound, high efficiency and low maintenance while advancing the future of chillers through magnetic bearing and oil free technology.

The chiller uses magnetic levitation technology in its driveline to spin without friction, offering quieter, more efficient operation. The YMC² also has a standard variable speed drive to further increase the efficiency of the chiller.

Sound levels as low as 70 dBA for a quieter operation, the same sound level as a vacuum cleaner.

YORK chillers are known for utilising industry-leading low entering condenser water temperature to reduce energy usage. The YMC² chiller is capable of achieving values below 0.1 kW/t at part load, resulting in a significantly lower utility bill.

The oil-free design delivers reliable operation and low maintenance, providing a lower total cost of ownership over the life of the chiller.

"The YMC² chiller is an example of Johnson Controls' ability to develop innovative solutions to solve our customers' challenges," says Neil Cameron, Johnson Controls area general manager: building efficiency – Africa.

"In addition to the YMC² chiller, our new offerings include a lower-cost air-cooled chiller and smart, connected chiller technology that supports optimised uptime. We have the industry's best and most extensive product portfolio, and we intend to build on it to enhance our offerings to a diverse customer base around the world," says Cameron.

Johnson Controls' 150 000 employees serve customers in more than 150 countries by developing quality products, services and solutions to optimise energy and operational efficiencies. The company recently announced another global HVAC success story: it is partnering on a three year initiative to replace rooftop equipment at 225 Target stores in the USA, a project that entails installing 3 600 York Predator series packaged rooftop units to maximise energy savings through more efficient HVAC equipment at all Target stores that are eight years or older. □



The YORK magnetic centrifugal chiller (YMC²) delivers quiet, safe, and reliable operation, making it the first choice for use by navies for the world's nuclear submarines. For commercial and residential use, the company is expanding this range up to 3 500 kW of cooling.

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Optimised designs of take-up trolleys and ore skips

By Francois du Plooy & Clive Sheppard, WorleyParsons RSA

With the worldwide resources market under pressure, companies in this sector are looking for ways to reduce construction and operational costs. Solutions that were accepted as standard practice a few years ago, because they are known to work, are now being looked at from every angle to reduce costs. Presented here are two short pieces from WorleyParsons RSA's Advanced Analysis consulting practice that show how savings can be achieved in components and areas that are often overlooked.

Bulk material handling conveyors require a conveyor take-up in order to maintain the required belt tension, compensate for permanent belt elongation, and to provide extra belt length during splicing operations. An alternative to a well-known conveyor take-up arrangement is first discussed here, followed by an example of the use of discrete element modelling (DEM) for designing ore skips.

Take-up trolley design

The article provides an overview of important aspects that govern the mechanical and structural design of horizontal take-up trolleys, and explores the simplification of a current take-up trolley design, to arrive at an alternative, optimised solution. Figure 1 show a typical horizontal take-up trolley layout.

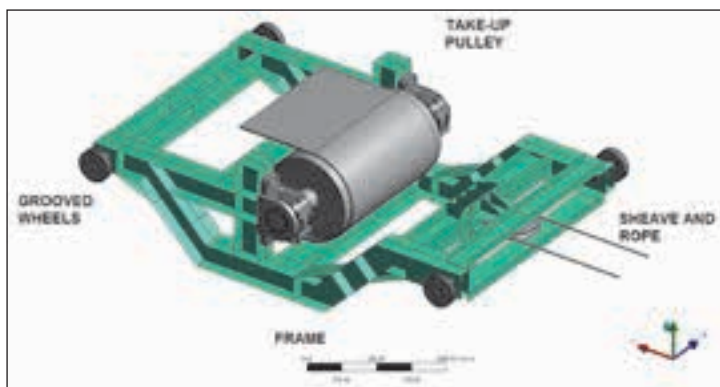


Figure 1: The well-known horizontal take-up trolley design.

The typical horizontal take-up trolley consists of a pulley that transfers the belt tension loads to the take-up trolley. Belt tension acting on the take-up trolley structure is transferred via the sheave wheel to the ropes. Grooved wheels are used to support the trolley, vertically and laterally, and allow the trolley to travel in the take-up frame.

The current design

The layout of the structure is such that the tensile force is transferred through the structure below the take-up pulley.

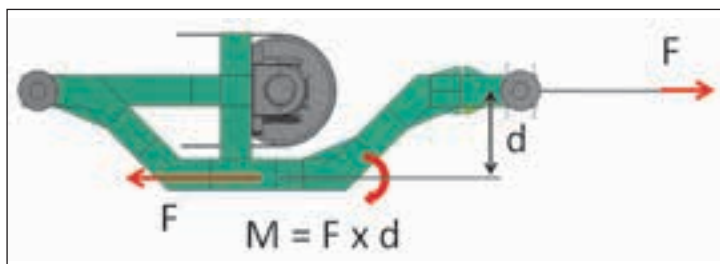


Figure 2: The transfer of forces causes moments, which govern the section selection for the entire structure.

The offset in the force path creates a bending moment (M) in the bottom member and the welded moment connection as shown in Figure 2, requiring these members to be oversized compared to the section required for a pure tensile load. This moment, therefore, tends to govern the section selection for the entire structure.

The layout of the sheave arrangement is such that the sheave connection bolts are subjected to tensile loads. A more ideal configuration would be to have the connection in compression or shear. The design requires a large amount of welding. Additionally, high quality welding and quality control is needed, as full penetration welds are required to resist the combination of tensile forces and bending moments at the welded moment connection. With the take-up trolley supported by grooved wheels on both sides, a rule of thumb for the wheelbase of 1.5 times the width of the trolley should be applied to prevent the trolley lodging.

Optimised take-up trolley design

The re-design of the trolley focused on improving the current shortcomings. Various concepts were evaluated to arrive at the most simplified solution. Improvements were made to optimise the structural layout, sheave arrangement and the use of welding in order to reduce mass and manufacturing costs. The structure was analysed using Prokon and Ansys structural design software.

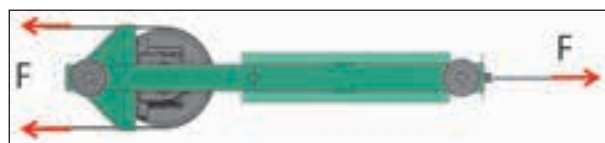


Figure 3: Side view of optimised trolley.



Figure 4: Isometric view of the optimised trolley.

The proposed layout is such that most structural members are subjected to tension or compression only, eliminating bending moments created by offset members transferring operational loads. This enables the use of much lighter material sections.

A circular hollow section is used to support the combination of torsional loads due to the take-up pulley mass and moments as a result of belt tension.

The sheave arrangement is improved by removing the bolted connection. The connection layout also allows for a much lighter design.

The cost of manufacturing is reduced by making as much use as possible of fillet welds loaded in shear, eliminating the need for full penetration welds and the associated quality control expenses. The alternative arrangement also results in a much lighter frame, again reducing manufacturing costs. The overall trolley length is reduced, by using a grooved flat-wheel arrangement, eliminating the need for a length-to-width ratio of 1.5.

The optimised design reduces the amount of welding and structural mass of the take-up trolley significantly. A limit analysis of both designs shows the optimised design to have a load capacity to mass ratio 3.2 times that of the original design.

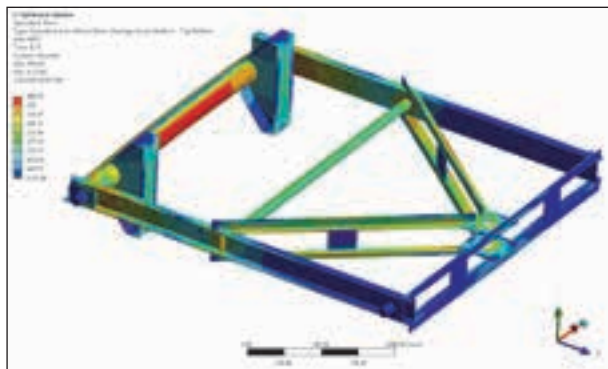


Figure 5: Non-linear stress limit analysis of the optimised design.

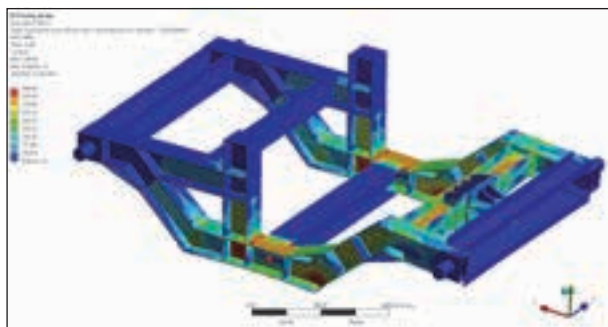


Figure 6: Non-linear stress limit analysis of existing design.

	Existing design	Optimised design	Ratio
Structural mass (kg)	968	395	0.4 of existing
Total weld length (m)	23.2	15.6	0.67 of existing
Capacity to mass ratio	413 kN/kg	1 329 kN/kg	3.2

Table1: Summary of measurable improvements

Dynamic response of ore skips during loading

Since the use of discrete element modelling (DEM) has become standard in the bulk materials handling industry, it has become possible to calculate realistic loading conditions.

WorleyParsons RSA was recently required to recommend skips of ever-increasing size to support the tonnage required by new mines. Skips of 50 t payload are envisioned for future projects with correspondingly larger displacements during filling. This article describes the DEM of skip filling from a flask and the response of the skip to the loading.

The DEM model is shown in Figure 7. The flask is first

loaded by a conveyor belt resulting in a realistic distribution of material in the flask. Once the radial door opens, the material flows down the chute into the skip. The Centre of Gravity (CG) of the material moves from height 1 to 2.

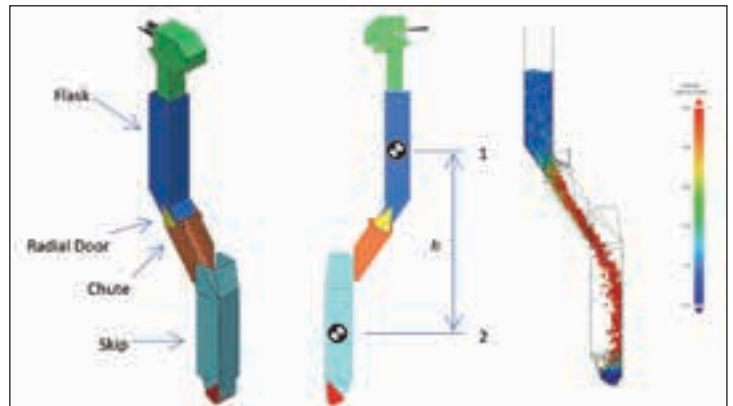


Figure 7: DEM model showing the arrangement of the flask, chute and skip and a typical result.

The mass flow rate during loading is shown Figure 8. The graph can be split into three regions: sloping up (Δt_u), steady state (Δt) and sloping down (Δt_d). The total loading time is labelled τ .

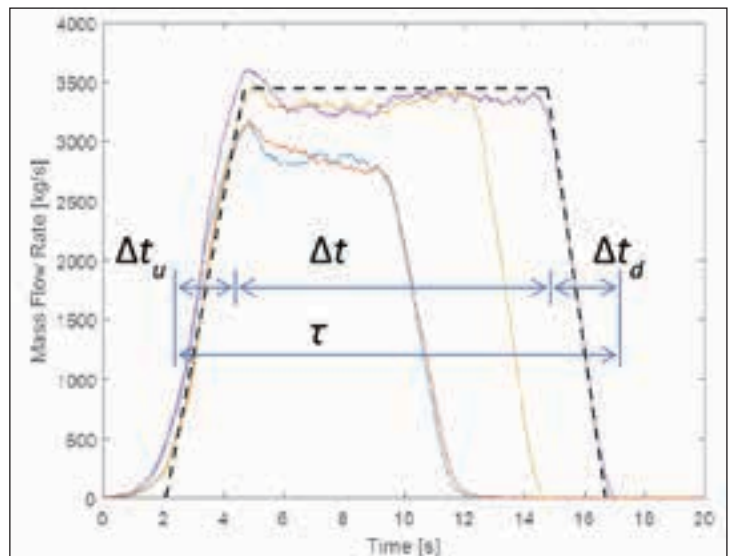


Figure 8: Mass flow rate for various cases.

Skip response

The response of the skip can be calculated using energy conservation. Assuming no losses, the potential energy of the payload before the skip door is opened must be equal to the potential energy after it has come to rest. It was found that this approach grossly overestimated the maximum displacement. Another approach is to approximate the response using a lumped parameter system as shown in Figure 9.

The variables shown are:

m_o is the initial mass of the skip including the effective rope mass.

$m(t)$ is the payload mass, which varies as a function of time.

v is the absolute velocity at which the payload mass enters the system.

k is the stiffness of the rope at the loading station.

x is the vertical displacement of the skip.

The equation of motion must consider the change in mass of



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the skip rope system during loading. The change in momentum of the payload must also be considered as an external force.

$$m_t(t)\ddot{x} + (\dot{m}(t) + c)\dot{x} + kx = f(t) + \dot{m}(t)v - \int_0^t \dot{m}(t)g \quad m_t(t) = m_o + \int_0^t \dot{m}(t)dt$$

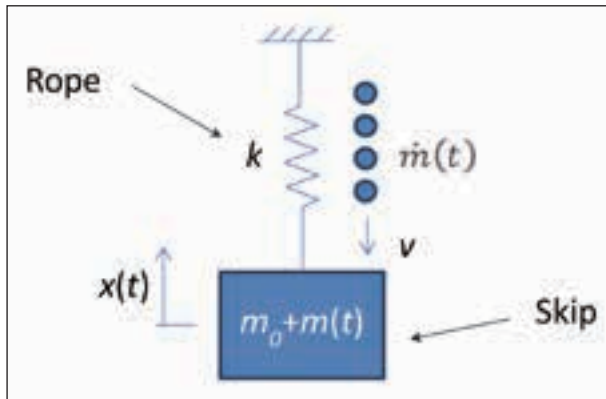


Figure 9: Lumped parameter approximation of the skip rope system.

The equation of motion is solved using the Runge-Kutta implementation in Matlab for 4 cases. The natural frequencies of the various cases were different and depended on the payload mass and the rope arrangement i.e. Koepe vs Blair Multi Rope. In order to compare the dynamic amplitude the normalised time response is shown in Figure 10.

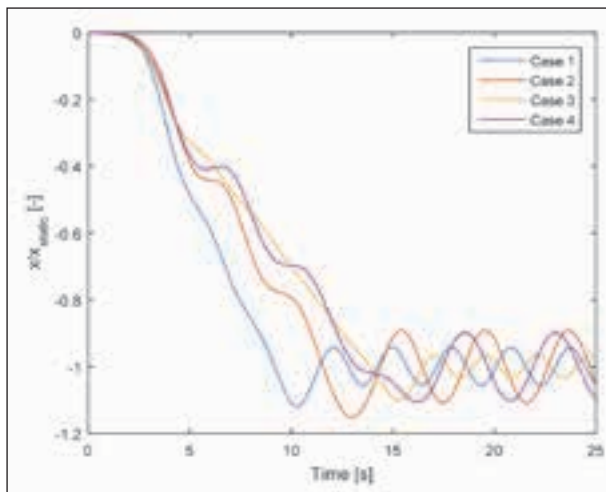


Figure 10: Comparison of time response for the various cases.

The Dynamic Load Factor (DLF) can be calculated in order to compare the response at various natural frequencies. Previously the DLF was often calculated by normalising the x-axis to the ramp up time (Δt_r) and assuming the steady state loading to continue indefinitely (Biggs, Hamilton). In order to do this,

various assumptions had to be made including that the mass of the system is constant, while in reality, it typically doubles during filling. These assumptions were effectively addressed by using the DEM calculated mass flow as an input. It was also found that normalising to the total loading time (τ) yields a more sensible graph (Figure 11).

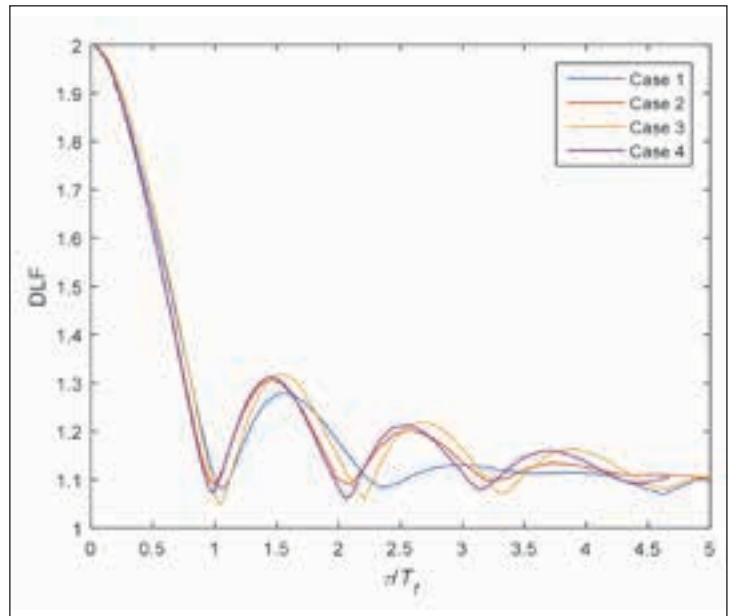


Figure 11: DLF comparison.

With the advent of DEM it is now possible to address the concerns that Hamilton expressed in his report by improving the accuracy of the loading imposed on the skip during loading. Importantly it is shown that the assumption of a system with a constant force and a finite rise time is unconservative. The recommended DLF of 1.5 in SANS 10208 part 3 is however affirmed by these results.

Conclusions

The optimisation studies completed by WorleyParsons RSA's Advanced Analysis consulting practice have shown that savings can be achieved in components and areas that are often overlooked, and accepted as standard practice.

References

- 1 Biggs, JM: Introduction to Structural Dynamics, McGraw-Hill, 1964.
- 2 Hamilton, RS: Dynamic response of freely suspended skips during ore loading. Anglo American Corporation, November 1989.

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Repair solutions for South African agriculture

In trying times Afrox acknowledges that farmers are more cost conscious. To this end the theme of Afrox's display at the 2016 NAMPO Harvest Day exhibition was 'Total Solutions Partner'. Afrox demonstrated complete solutions focusing on in-house fabrication, repair and maintenance, as well as hardfacing for

all farming welding applications, aimed at assisting farmers reduce their costs in light of the current economic conditions and the severe drought crisis gripping South Africa.

Afrox's do-it-yourself approach to this year's exhibition was not only an acknowledgement of the support Afrox has received from the agricultural industry over the last 89 years, but also a gesture of assistance, with an emphasis on fabrication and products that can be used for repairing implements rather than adopting the more costly replacement option.

"We wanted to show farmers how to repair equipment themselves so that there is no need to outsource or unnecessarily replace existing machinery," says Johann Pieterse, Afrox Manufacturing Industries business manager. "Experts from our manufacturing division were at

the stand to physically demonstrate some of these applications," he adds.

A live manufacturing display was an exciting and interactive highlight at the Afrox stand this year where, among other things, there was a step-by-step demonstration on how to build your own trailer. "It's all about hands-on practical advice this year," comments Pieterse. "For example, with our trailer build demonstration, we will be giving a detailed explanation and practical display of how to build your own trailer as well as providing particulars on the basic products required for this project," he says.

The Afrox range of gases, welding and cutting equipment, together with associated consumables, is available through co-ops, certain local distributors and Afrox retail outlets in the region. Agrigas is exclusively available via approved co-ops.

www.afrox.co.za



At the 2016 NAMPO Harvest Day exhibition, Afrox focused on repair and maintenance during trying drought and economic conditions facing the South African agricultural sector.

Android apps for TKSA 51 introduced

SKF Maintenance Products division can now offer full Android support for its shaft alignment tools. After the successful launch of the SKF shaft alignment tool TKSA 51 with Apple iOS apps, SKF have now launched the Android apps for

the TKSA 51.

The TKSA 51 apps 'Shaft Alignment for TKSA 51' and 'Soft Foot for TKSA 51' are now available for Android devices from the Google Play Store. The apps are virtually identical to the iOS versions and both platforms will be supported with the same software updates.

The support of Android and iOS devices allows customers a wider choice of devices to better meet their operational needs. Android devices are typically less expensive than similar iOS devices, making this alignment system more affordable.

Also, in many regions around the world, such as Latin America or Asia, Android devices have a significantly higher market presence than iOS devices. Since users are mostly experienced with Android devices, the new app facilitates the market entrance and penetration. Apple devices are also more difficult to source in some regions and the new Android app will give customers the choice of the most suitable, locally available device.

By fulfilling customer needs for Android support, SKF is striving for greater customer satisfaction and higher attractiveness for new customers.



Versatile winches for vehicle and hydraulic applications

WARN, through its sole Southern African distributor Torre Parts and Components, has a range of 12 V, 24 V and hydraulic winches, with load capacities ranging from 4 082 kgf (9 000 lb), to 13 600 kgf (30 000 lb).

"We have had significant successes with the 8 165 kg (18 000 lb) 24 V winch due to its price point, versatility and compact size. It is used in various applications including military vehicles in SA and around the world," says Leonard Chester, product manager, vehicle accessories, Torre Parts and Components.

"WARN's success is based on its product range, service levels and ability to customise winches with features such as the Over Load

Interrupter, which is an available accessory to prevent the motor from burning out," he adds.

WARN's Series 18 is an 18 000 lb, 24 V tow truck and industrial dc electric winch. It offers heavy single line pulling power of up to 18 000 lbf and has a dependable high-torque, series-wound 24 V dc electric motor. It comes with a weatherproof industrial contactor control pack and a rugged 10 m industrial remote control.

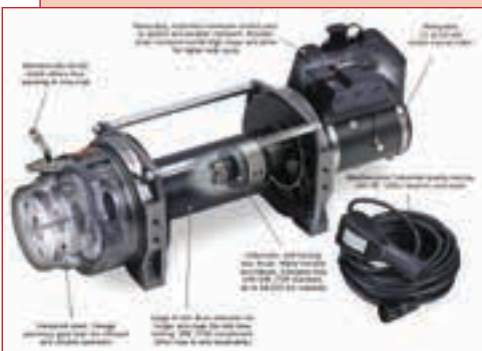
The disc brake is designed for extended power-out use and includes a thermal overload switch that protects the motor from overheating. It uses a wire rope with a roller fairlead.

The lower-end WARN Series 9 hydraulic winch is suitable for tow trucks and industrial hydraulic applications with 9 000 lbf of pulling power. This is suited to tow, utility and trailer applications.

A hardened steel, two-stage planetary geartrain provides faster line speeds and a heavy-duty automatic disc brake provides reliable operation. It also includes a wire rope with roller fairlead.

The Series 9 is available in two motor sizes: 4.9 and 3.0 in³ and meets SAE J706 and CE standards.

www.torreautomotive.co.za



www.skf.com

Failsafe brake puts a stop to 'run-aways'

Bobcat Equipment South Africa, in partnership with Ferrobrake in Witbank, has pioneered a failsafe braking system on the Bobcat T40180 Telescopic Handler that optimises worker safety during materials handling operations in surface and underground mining by stopping the machine in the event of engine failure.



Bobcat Equipment's failsafe brake system passed rigorous independent tests.

"The brake system is a critical component on any piece of moving machinery and in South Africa it is a mine safety requirement," says Bobcat engineer, Ian Caulfield. "Reducing the risk of run-away machines, especially in underground mining where machines are taken down steep incline shafts of up to 25°, cannot be over-emphasised.

"We took the decision to design the brake system for Bobcat's largest telescopic handler, the T40180 18 m high-reach machine, as it already delivers the best possible efficiency and productivity through class-leading performance, while always focusing on safe operation thanks to the machine's state-of-the-art safety systems.

"The failsafe brake system is in line with mine safety regulations and is primarily designed around engine failure," explains Caulfield. "Brakes are applied hydraulically and if the engine cuts out, the lack of hydraulic oil flow allows the

brakes to be automatically spring applied. In the event of engine failure while the machine is still moving, the failsafe brake system will automatically apply the brakes, bringing the machine to a stop.

"Once the system has stopped the machine, brakes can be released mechanically or porta-power can be used." The tamper proof system also incorporates an emergency brake, which can be activated by simply pushing an emergency stop button. Caulfield adds that the system is also available as an after-market fitment.

"We have signed an exclusivity agreement with Ferrobrake with whom we worked very closely throughout the design and engineering stages," continues Caulfield.

In conclusion, he reveals that there are plans in the pipeline to develop a similar failsafe brake system for the Bobcat TL470 telescopic loader.

www.bobcatsa.co.za

Magnet technology: changing steel handling

Magswitch, an industry leader in advanced permanent magnet technology, has patented technology that is taken



The Magswitch 600 A switchable magnetic welding clamp can simply be placed on a clean work surface, flat or round, and turned on, making welding set-up quicker and easier than ever.

the magnetic steel handling industries by storm. The technology uses two diametrically polarised magnets, one rotating on top of the other. When the top magnet is rotated by 180° relative to the bottom, the magnetic poles of both magnets align to generate a powerful magnetic field. When rotated back 180° to be counter-aligned, the magnetic field within the magnet material collapses. This creates a permanent magnet that can be turned on and off at will.

While magnets have been used for welding, fabrication and general industry for a long time, their role has been limited as they are often considered a hassle. Magswitch changes that! The days of wrestling with magnets – to place them accurately, release them and clean them, for example – are forever over. Magswitch

Compact vortex flowmeter for low viscosity liquids

KOBOLD Instrumentation, represented in South Africa by Instrotech – a Comtest Group company, has introduced the compact, cost-effective vortex flowmeter Model DVZ, used for measuring and monitoring smaller and medium-sized flow of low viscosity, water-like liquids in pipes.

This device has impressed in numerous series applications due to its reliability and response time. It functions without any mechanical moving parts, using the vortex principle, where a sharp-edged object, the Karman vortex-generator, is installed within the flow duct, making it virtually maintenance-free. This is a considerable advantage over devices based on the variable area or impeller principle.

Vortices are created behind the object whose frequency is proportional to the velocity of flow of the liquid. The flow volume can be determined with a high degree of accuracy by measuring the vortex frequency. The result is a very high linearity over the whole measuring range (0.5-4.5 or 10-100 l/min) with an accuracy of +2.5% of full scale.

Unlike calorimetric flow measurement, its measuring principle works irrespective of the temperature and without time delay and can thus the instrument can also be used in time-critical applications. The measurement process is suitable for practically all liquids with a viscosity similar to water – irrespective of the pressure, temperature, density and electrical conductivity of the medium. Due to its specific operating principle, Kobold's DVZ flowmeter is especially suitable for measuring aggressive, corrosive or saline solutions. It can also be used for ultrapure media.

www.instrotech.co.za



challenges traditional and time consuming clamping practices on small and big jobs, leading to time savings, faster set ups, convenience and safety advantages.

From the point steel is received to how it is moved through the plant and fabricated, Magswitch tools can be applied to improve safety and productivity.

www.vermontsales.co.za

Asset management increasingly important for rail

A global survey of senior rail managers conducted by ABB shows that increased integration of IT and OT is key for long-term planning in the industry.

A global survey of approximately 200 senior executives from major rail operators has revealed that most identify asset management facilitated by the integration of information technologies (IT) and operational technologies (OT), as a key contributor to meeting the financial and operational goals of their organisations. Some 88% indicated asset management is a priority, and two-thirds believe it has become more important over the last 12 months.

Furthermore, the majority of respondents believe that integration of IT and OT applications would be valuable in improving the connection of disciplines across the enterprise – a concern identified by 75% of respondents. They listed improved safety, increased reliability, better use of capital, more efficient operations and maintenance, increased staff productivity, better visibility across the organisation and improved long-term planning as other benefits of IT/OT integration in relation to asset management.

Almost 60% say long-term capital planning is a high priority in their asset management efforts, with another quarter saying it is of medium priority. Railway operators could significantly improve such planning if they factored in the health of their existing assets, but in the past that has been a challenge.

“This is an ideal use case for the Internet of Things, Services and People (IoTSP). For example, more sensors and more wireless communications are generating up-to-date information, which can be leveraged for asset maintenance and replacement planning,” says Massimo Danieli, managing director of ABB’s grid automation business unit within the Power Grids division. “By connecting different systems and stakeholder groups, organisations are able to become more efficient and effective at maintaining their assets, which results in greater reliability for the end-customer as well.”

Paul Barnes, special project manager, Route Asset Management Team at Network Rail in the UK, sees asset management as a key strategic initiative. “If I’ve got thousands of kilometres of track out there, and hundreds of thousands of assets, what do I need to know this morning in order to make it work effectively tomorrow? We’ve got lots of components, but only limited ability to draw information together into a picture that allows us to manage it. And, that’s where we see the IT/OT integration bringing us a huge step forward.”

All too often data is being assessed by individual departments within a railway operator so that the data ends up in silos – denying the organisation the opportunity to produce a broader view

of the overall health of assets in support of an asset management strategy. With the shift toward predictive and prescriptive capabilities across asset-intensive industries, and the availability of data that is critical to business performance, railway operators should seek to include this information as key performance indicators (KPIs) on strategy or operational dashboards.

For more details on the findings, the survey report, *‘IT/OT Convergence – The future of digital railways might hinge on the rise of asset management’*, which was conducted in collaboration with Microsoft, is available for download. □



Located on centennial campus of North Carolina State University, this state-of-the-art Smart Grid Centre of Excellence (COE) has functional systems where information technologies (IT) and operational technologies (OT) converge to close the loop of automation, control, data acquisition and asset management.

Industry diary

June 2016

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Welding Coordination: ISO 3834 and ISO 14731

22 June, Secunda
SAIW: Laetitia Dormehl
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Africa Rail 2016

28-29 June, Sandton Convention Centre
Tarryn Theunissen, Terrapinn
+27 11 516 4044
tarryn.theunissen@terrapinn.com

Manufacturing Indaba:

Manufacturing the future

28-29 June, Emperors Palace, Ekurhuleni
Julie Cunningham
julie@manufacturingindaba.co.za

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Rapid.Tech and Additive Contract Manufacturing

14-16 June 2016, Erfurt, Germany

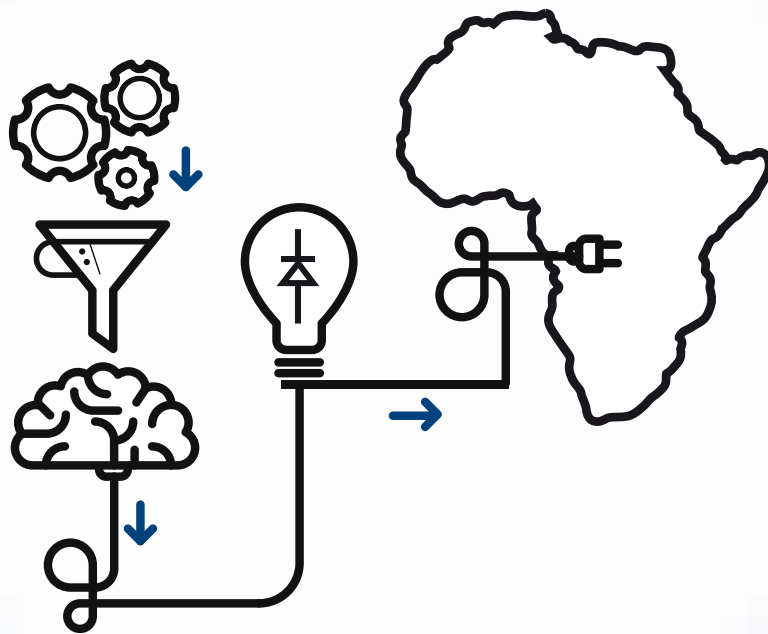
The rapidly increasing use of additive manufacturing (AM) and 3D printing processes in industry is generating high demand for qualified service providers. With the new trade forum ‘Additive Contract Manufacturing’, the 13th Erfurt Rapid.Tech international Trade Show and Conference for Additive Manufacturing is striving to keep abreast of these developments.

“Whether we’re talking about prototyping,

tooling or series manufacturing, more and more sectors and businesses are harnessing the huge potential of AM to manufacture products more quickly, with greater individualisation, at lower cost and with improved resource efficiency,” reports Eric Klemp, MD of voestalpine Additive Manufacturing Centre, the programme coordinator of the new Trade Forum.

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