

THIS MONTH:

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- Interactive glass to fuse IT and architecture
- Engineering excellence from shaft sinking specialist
- African solutions: C&I, microgrids and smarter plant services

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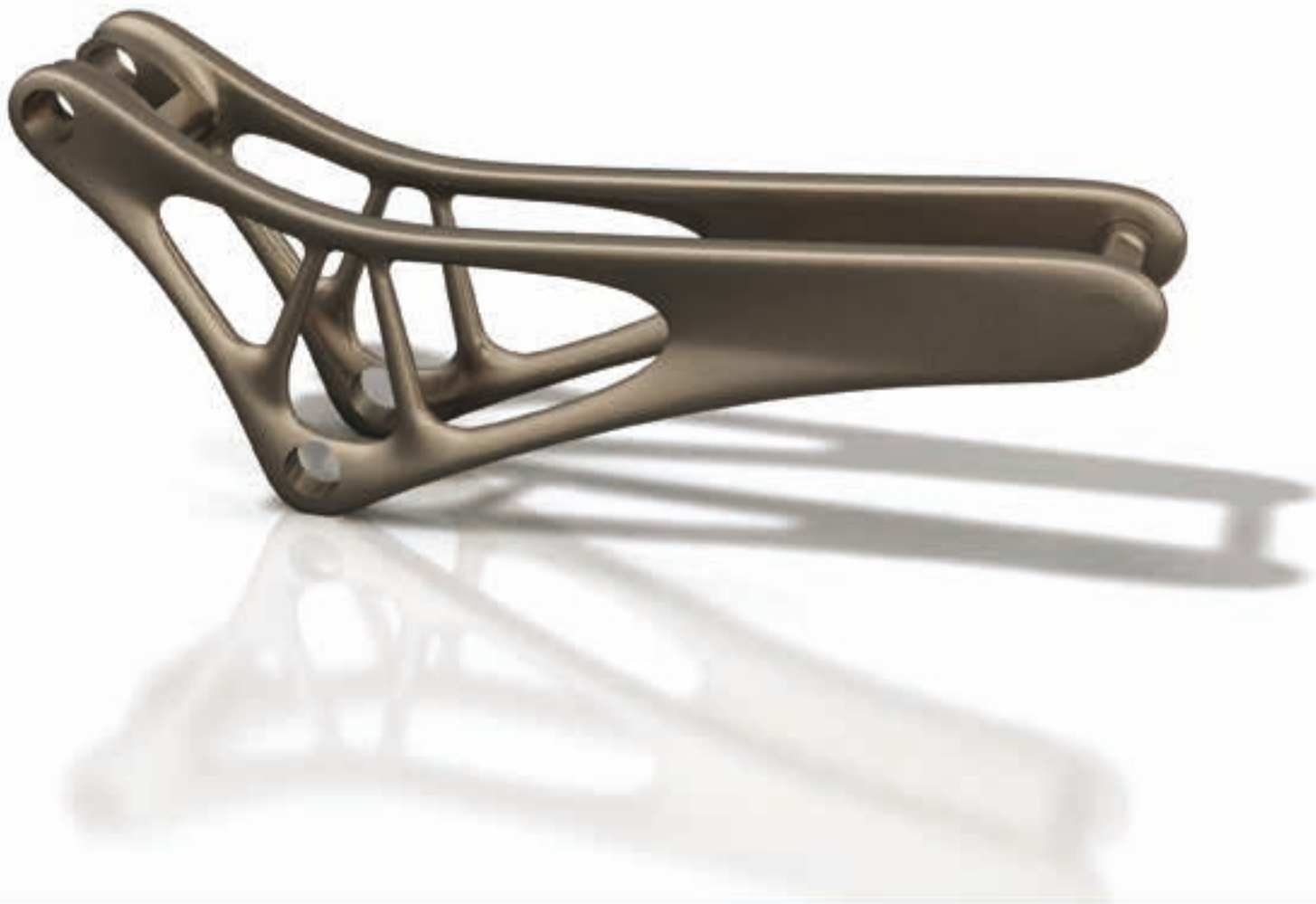
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Evolutionary change and enduring the downturn



Conventional wisdom suggests that change is required, and perhaps inevitable, for industry to survive lean economic times. The phrase 'adapt or die' immediately springs to mind. The title 'enduring the downturn', therefore, is a paradox. When times are tough, one cannot 'continue without marked change', as the meaning of 'enduring' implies.

But don't we all want South African industry to endure?

The theory of evolution, as first argued by Charles Darwin in his *'On the Origin of Species'* can be summarised as follows: Individuals less suited to the environment are less likely to survive and less likely to reproduce, while better suited individuals are more likely to survive and more likely to reproduce. Small and relatively random genetic variations in individuals are the differentiators, and over many generations, these small variations accumulate to become resilient survival characteristics in new species – species that can endure in their environments.

A Google search on surviving the downturn returns numerous lists of tips. I opened one published by the US Small Business Administration that listed 14 items of guidance – but links to five, eight and 10-item advice lists were also returned. Such lists all seem to begin with cost rationalisation advice: watch your inventories; cash flows; debt levels; and capital expenditure. Most refrain from directly suggesting retrenching people, but who doesn't associate rationalisation with retrenchment?

As an analogy, such factors seem more like the everyday survival lessons that an animal might try to pass on to its young: 'be wary of crocodiles when drinking', sort of advice. Everyday financial survival tips can be encapsulated in one bullet: adopt good business practices.

Buried in bullet 12 of the Small Business Administration's list – a bullet that advises companies on the dangers of cutting back on advertising – there is a sub-bullet that reads: *'Stress quality and durability. Consumers are looking for as much value as possible in a weak economy'*. But it advises businesses not to use these words, which have *'degenerated into advertising clichés'*.

Further down, tip 13 reads *'Another mistake during recessionary times is to reduce training budgets. Training can best be conducted during slack periods – especially low-cost, on-the-job instruction and broadened skill acquisition'*.

The article's conclusion? *'Resourceful entrepreneurs capture the available opportunities and take steps during today's hard times to lay the groundwork for tomorrow's prosperity'*. On the trite edge?

The featured articles in this month's *MechTech* from ABB, BMG, Murray and Roberts Cementation and Yaskawa suggest to me that industry in South Africa has good survival instincts. All of these companies are forward looking and positioning for an upturn. ABB has enthusiastically and effectively stepped into the troubled waters of our new-build power stations and is ahead of schedule with the Kusile C&I contract. BMG has acquired Hansen Industrial Transmissions SA to complete its electromechanical drives offering with respect to the Sumitomo brands. In very lean times for the mining industry, Murray and Roberts Cementation is pioneering safer and more efficient shaft sinking technologies, while robotic automation specialist, Yaskawa Southern Africa, is embracing the whole suite of its parent's automation solutions – at a time when local manufacturing is, at best, ailing.

Some common features can be easily identified: These companies are all expanding on existing technologies and proven expertise; all can cite reliability, efficiency and service excellence as cornerstones of their offering; and all are committed to training and development to raise the skills' sets of their employees.

Emphasised by both ABB's Leon Viljoen and BMG's Mark Barbour are their company's service offerings, which have emerged as increasingly important while industry favours refurbishments and life extension over new capital investment. In the uncertainty of the economic climate, it is interesting to note the strong focus on reliability monitoring and advanced analytics to better track the real condition of operating assets. These companies can at least improve industry's confidence levels in the reliability of machines.

Service, however, has another more human aspect. It is the people in companies that most influence their longevity. It is the strength of the inter-relationships between the people in industry that will, ultimately, govern which role-players are successful and which will fail.

Survival qualities, in the evolutionary sense, are not the things we should be looking to change. We should be striving to reinforce, and in some cases repair, the strong relationships that have made industry successful in the past. We should be renewing training endeavours to restore the skills sets associated with success. We should be restoring durability and quality to their rightful place as values rather than clichés. And we should be working ever harder to rebuild the integrity and trust that has to exist between people, companies and governments for economies to thrive.

These enduring qualities are necessary to restore South African industry to sustainable health.

Peter Middleton

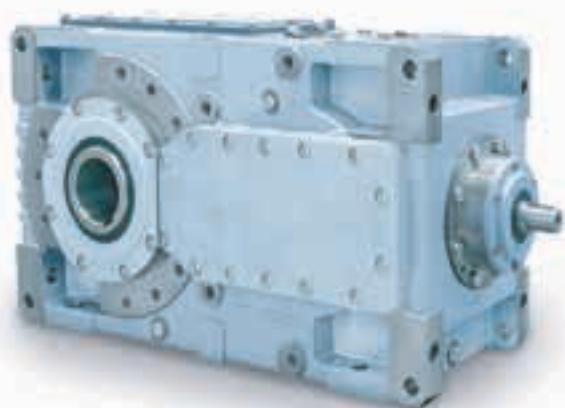
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ON THE COVER



Electromechanical drive solutions using leading global brands

MechTech talks to BMG's David Dyce, electronics manager; Mark Barbour, business unit manager of Electro Mechanical Drives; and Graeme Neilson the unit's general manager, about the complete set of brands, drive packs, engineering and service solutions available from this single-source, multi-brand local distributor.

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 Yaskawa Southern Africa, through the opening of a new Drives Motion Control (DMC) division at its Longmeadow facility in Gauteng, South Africa, is taking on local responsibility for the full Yaskawa product range. *MechTech* talks to managing director, Terry Rosenberg.
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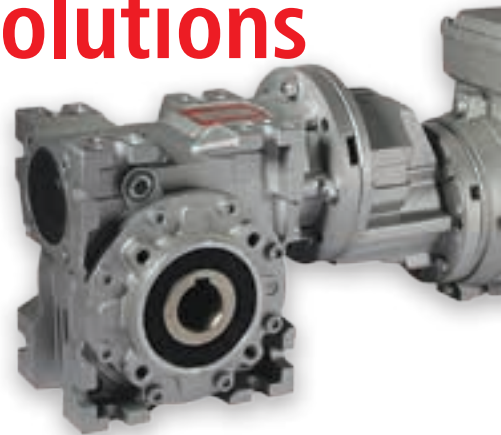
- 34 **Engineering excellence from SA's shaft sinking specialist**
 In response to the traditionally onerous, high-risk and labour intensive methods used, Murray & Roberts Cementation has introduced a series of innovations that are likely to change the way shaft sinking is done in South Africa forever. *MechTech* talks to Japie du Plessis, project executive designate and Jan Vermaak, mine engineering manager.

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Electromechanical drive solutions using leading global brands

MechTech talks to BMG's David Dyce, electronics manager; Mark Barbour, business unit manager of Electro Mechanical Drives; and Graeme Neilson the unit's general manager, motors (photographed below), about the complete set of brands, drive packs, engineering and service solutions available from this single-source, multi-brand local distributor.



“Today, BMG can provide gearbox solutions that go from 15 Nm up to 6-million Nm,” begins Barbour.

“From a gearbox that can fit into the palm of your hand to a systems that weighs 40 t.

“Our strength is that we have global leading brands in our stable so BMG can offer a wider and more customised range of solutions. Key competitors in this space represent single brands, so their product portfolios are smaller. Ours has allowed us to grow into many different directions and to provide a wide range of niche, customised and optimised solutions,” he suggests.

But BMG is not a ‘jack of all trades’. “We have a carefully selected basket of brands that have been tailored over the years to best suit the needs of South African industry – and we feel that our brand basket is now full. We have developed technical expertise in each individual product and a comprehensive range of drive solutions using brand combinations,” he assures.

Preparing for the upturn

“While the local economy, off the back of weak global commodity prices, is not doing well right now, for the past few years we have been looking forward and positioning ourselves for when the cycle turns,” Barbour continues.

“We have moved to have all of our

expertise and products on the same site, here at BMG World in Johannesburg. This not only reduces costs and improves efficiency, but it promotes interaction between our different technology and brand specialists.

“A typical drive solution, for example, consists of a gearbox, a motor and a variable speed/frequency drive (VSD/VFD), along with the associated couplings, brakes and shaft bearings. We have exclusive brands for every component on the shaft, but each component is part of a holistic drive solution that needs to be engineered to suit the application and optimised for reliability and energy efficiency,” Barbour argues.

“Hence our three core drives businesses – gearboxes, electronics/VSDs and motors – are now interlinked and managed out of this world class engineering facility at BMG World. All of us can now work together as one team to develop single solutions made up of multiple brands,” he tells *MechTech*.

A new 24 000 m² state-of-that-art warehouse has also just been completed at BMG World. Mooted to be biggest and most advanced industrial distribution centre in sub-Saharan Africa, BMG's re-developed, fully computerised warehouse will carry stock worth approximately R700-million and it will allow the under-roof workshop area on the site to be increased from 1 500 to 10 400 m².

The complete gearbox range

BMG's gearbox business started in 1988, when, while still trading as Bearing Man, the company began to sell small Varvel worm and inline helical gearboxes for general-purpose applications such as small conveyors and mixers. “At that time we were moving from being a bearing supplier into getting involved in power transmission. We soon established a foothold in the food, agricultural and

packaging industries, which led to a growing demand for bigger and more sophisticated solutions,” Barbour recalls.

“In 1996, we formed a relationship with Nord for geared motors and we set up local assembly and service facilities. These are now widely used for mixers and conveyors in the medium to heavy industrial sectors. Today, we supply 250 000 Nm Nord gearboxes for over-land bulk materials conveyors and large mixers – and our engineered solutions have reached as far as Canada, with the supply of a large mixing solution with a 1.8 m bell housing,” he relates.

BMG has long been the supplier to the region of Sumitomo geared products, which include: the Fenner SMSR (shaft mounted speed reducers); the Sumitomo Cyclo, a unique inline technology that uses rolling elements instead of gears to achieve high speed reduction with low shear forces; Paramax inline and bevel helical industrial reducers; and from 1st October 2015, the full range of Hansen-branded Industrial drives.

“With the recent acquisition of Hansen Industrial Transmissions South Africa (HIT SA), we are now the only regional route to market for Sumitomo geared products. Hansen has built up an installed base of some 12 000 industrial gear units, mostly in the Power and Petrochemical industries of this country.

“The Hansen P4 brand is strong in vertical application, with its derivative, the M4 ACC drive being chosen for the air-cooled condensers of the new-build power stations. The locally developed Hansen I4 industrial gearbox has also emerged as a preferred solution in the underground coal sector,” Barbour reveals.

“We have an exclusive evergreen relationship with Sumitomo for its entire range and, along with the Hansen team that will soon be moving across to BMG World, we will be taking over full support



Varvel worm and inline helical gearboxes coupled to MS asynchronous motors are ideal for general-purpose applications such as small conveyors and mixers.



The Hansen P4 brand is strong in high-load vertical applications such as mixing in the chemical, minerals processing, pharmaceutical, cosmetic and food processing industries.



Danfoss offers full-featured VSDs/VFDs from 0.37 to 1.2 MW and solutions are available for 220, 380, 525 and 690 V systems.

responsibilities for the installed base and for the advancement of the Hansen brand,” Barbour assures, adding that, “our bigger service footprint, we believe, will enable us to offer an even better service to Hansen customers.”

Completing its gear drive offering in the large power range is BMG’s Zollern Dorstener brand of custom-built gear systems. “These are large gearboxes, mostly for sugar processing applications. They incorporate bevel helical and planetary stages, can weigh up to 62 t and produce torques of up to six million Nm. We have installed units for Illovo Sugar and Royal Swazi, as well as at the sugar factories in Nakambala, Malelane, and Komati.

Motors and the VSD/VFD range

Motors general manager, Graeme Neilson, says that, globally, there is a move towards using higher efficiency motors. Following that trend, the company has now moved towards Synergy IE3 premium efficiency motors in the BMG Motoline range. “We are currently phasing out IE2 Synergy product and replacing them with the IE3 product.

“But 80% of our local customers are still inclined towards lower efficiency IE1s,” he points out. “While customers are generally convinced of the need to improve energy efficiency and some insist on IE3 and better, simply swapping a motor for a higher efficiency equivalent does not always result in massive savings,” Neilson says.

BMG, therefore, is continuing to stock IE1 motors for the local market. “With another nine percent hike in the electricity coming into effect this month, every-

body needs to save energy. Often more effective than changing to a premium efficiency motor, though, is to look at the whole drive train and system.

“The tensioning and alignment of V-belts, shaft alignments and finding ways of avoiding throttling and bypassing for pump and fan operations, for example, can have a more significant effect than simply changing the motor,” he suggests, adding that these issues have been highlighted by BMG’s World Class Production Efficiency Initiative to help customers towards better global competitiveness.

The company takes a similar approach to its VSD/VFD range. David Dyce explains: “Our premium VSD drive offering is through the Danfoss brand, which recently acquired Vacon, another high-end electronic drive manufacturer,” he tells *MechTech*.

“These two brands have a multitude of variations that cover almost any sophisticated drive requirement. In terms of kilowatts, Danfoss offers systems from 0.37 to 1.2 MW and solutions are available for 220, 380, 525 and 690 V systems. Vacon offers higher power units – up to 5.0 MW – and includes water-cooled options, which allow for more compact installation, on ships, for example, where space is limited,” says Dyce.

To complement the fully featured Danfoss and Vacon ranges, BMG also offers its Motoline VSD range. “These are tailored to the entry level VSD side of the market, for those not requiring complex features and who are simply looking for some basic starting and speed control

on a pump or conveyor, for example,” he explains.

“Traditionally, VSDs were used to achieve advanced control functions, but today we find that they are being routinely coupled to motors for energy efficiency. Take a glass processing line, for example, VSDs are needed to control and optimise manufacturing processes. Such plants will go through every piece of equipment and evaluate the benefits of using a VSD to drive their motors more efficiently – and they will usually buy a VSD if it is justifiable.

“Typically, energy savings on pumps in the water industry are giving a pay-back period on a VSD investment of less than nine months – and this is true of centrifugal fans, too,” Dyce advises, adding, “while the fully featured Danfoss products can offer the best possible combination of control features, reliability and efficiency; the Motoline VSD range also plays a role in reducing energy consumption for less complicated applications.”

Barbour continues: “Our service offering is also an important component of our electromechanical business unit. As well as workshops for our gearboxes, VSDs and motors here at BMG World, we currently have six strategically placed assembly and service centres in South Africa that can offer 24/7 support – and we have a mobile onsite maintenance team to help with emergency breakdowns.

“We strive to do justice to all of the global brands we represent. This gives us a very stable position in the market and we are well positioned for the next five years and ready for the upturn,” he believes. □

All systems go for the PROTEC Matriculants



Top students from the PROTEC Tongaat branch hold up the number of distinctions they achieved in 2015, from left are: Minenhle Mbatha, Nosihle Khumalo, Mpumelelo Mkhosana, Precise Mbense, Akshay Rajkumar, Lungani Ngcobo and Asemahle Nmonelwa.

“With a 96,9% pass rate, versus the national average of 70,7%, PROTEC learners from nine branches around the country, their teachers and corporate funders are still celebrating excellent results,” says Balan Moodley, CEO of PROTEC, a specialist mathematics, science and technology programme for South African students. “The privilege of a nurturing academic environment has proved to more than 400 PROTEC Matriculants last year, that with hard work, determination and the support of the PROTEC programme, their dreams

for a bright future can be realised.

PROTEC was established over 33 years ago, in recognition of the need to improve the critical shortage of engineers in South Africa. Through this programme, which runs in conjunction with provincial education departments and with the invaluable support of private sector funders, more than 30 000 learners from disadvantaged communities are now qualified doctors, engineers, accountants, lawyers, educators and entrepreneurs.

“PROTEC is a national non-profit technological career development programme for senior school students. Learners are selected, not only for their aptitude in mathematics and physical Science, but

their sheer determination to succeed is an attribute we value highly.”

PROTEC offers an excellence programme in STEM education (Science, Technology, Engineering and Mathematics) that begins in Grade 10, continues through tertiary education and provides support in the early years of the work place. In the school phase, qualified PROTEC tutors provide extra tuition on Saturdays and academic studies are supplemented with a World of Work (WoW) and a life orientation programme, computer skills, study assistance and career guidance – a holistic approach to help students achieve their full potential.

Learners also convene during school holidays for practical and theoretical tuition. Vacation schools include educational excursions or field trips to expose PROTEC students to the world of work in different industries, including civil, mechanical and electrical engineering.

www.protec.org.za

New air-insulated switchgear for Cape Town

ABB South Africa has been awarded a three-year framework agreement for its UniGear air-insulated switchgear (AIS) and ZX0.2 gas-insulated switchgear (GIS), from the City of Cape Town.

“This is the first time that the City of Cape Town has bought ABB ZX 0.2 gas insulated switchgear for its distribution substations,” says Bryan Johnson, product group manager, MV Switchgear, ABB South Africa.

The framework agreement, which is estimated to include 300 panels over the three-year period, includes three portions: extension of existing UniGear switchgear, new UniGear air-insulated switchgear and new ZX0.2 gas-insulated switchgear manufactured by ABB Germany, with the associated cable supply and installation to be executed by ABB in South Africa.

The agreement is to supply, install and commission 12 kV indoor switchgear for distribution infrastructure feeding from main step-down substations throughout the City of Cape Town and surrounding areas.

“By continuously investing in infrastructure, we will be encouraging and, indeed, leading growth by always ensuring the physical supporting capacity for people

to build opportunities,” says councillor Ernest Sonnenberg, mayoral committee member: Utility Services, City of Cape Town. “Such an approach places the City of Cape Town at the forefront of South African metros and will bring us in line with international best practice in terms of development strategies.”

“We are providing the City of Cape Town with fully certified IEC compliant switchgear, which includes IEC compliance of all components,” says Johnson. “The switchgear will help to increase the safety, reliability and efficiency of the distribution network.”

While some components will be brought in from ABB’s global factories, the majority will be manufactured locally at ABB’s modern facility in Longmeadow, Johannesburg. www.abb.com/africa



A typical medium voltage ABB gas insulated switchgear installation.

Wacker Neuson Group expands executive board

At the start of 2013, Cem Peksaglam took on the responsibilities of the outgoing CSO in addition to his own mandate as chairman of the executive board. Under his leadership, the Wacker Neuson Group has gone from strength to strength, reporting record revenues in recent years – and 2015 was no exception. The company has now completed its group strategy realignment and is in the process of strengthening the executive board.

Jan Willem Jongert (51) will join the executive board in his new role as chief sales officer (CSO). Jongert will be responsible for global sales, service, logistics and marketing activities of the Wacker Neuson Group.

Alongside his tasks as CEO, Peksaglam will remain responsible for strategy, mergers and acquisitions, human resources, legal issues, compliance, real estate, investor relations, corporate communication and sustainability. “We have made good progress with our international growth strategy in recent years and we are now looking to build on our performance. Jongert is an experienced international sales expert and we are delighted to welcome him to the Executive Board,” says Peksaglam.

www.wackerneuson.com

Mrs Ples skull at Nuclear Africa 2016

At the Nuclear Africa 2016 cocktail networking function, the world authority on 'Mrs Ples', Francis Thackeray, head of the Evolutionary Studies Institute at the University of the Witwatersrand, presented the CEO of Necsa, Phumzile Tshelane, with a bronzed replica of the famous skull.

'Mrs Ples' is the nickname for a fossil skull that was discovered at Sterkfontein in the Cradle of Humankind World Heritage Site. It was found by Robert Broom and John Robinson in 1947. The skull represents *Australopithecus Africanus*, which is more than two million years old, a species that is a distant relative of humankind.

The skull has been studied at Necsa, using the SAFARI-1 nuclear reactor and is the subject of ongoing research. The immense investigative power of beams of penetrating radiation, such as X-rays is well known to researchers in the paleosciences. What is less widely known is the availability of beams of neutrons from a nuclear reactor, such as the SAFARI-1

research reactor at Necsa, situated practically inside the area known as the Cradle of Humankind. These neutrons can penetrate much deeper into materials such as fossils.

In 1997 the very first research on fossilised materials using neutron radiography and diffraction from a nuclear reactor, were conducted at Necsa.

Although known as "Mrs" Ples, Prof Thackeray was able to interpret the neutron results to deduce that 'Mrs Ples' was probably male. Today, Necsa boasts two world-class new neutron diffraction instruments at SAFARI-1 with much higher resolving power than used back then.

In 2013, sixteen years after the first measurement, 'Mrs Ples' was again examined using SAFARI-1, and further studies have confirmed that 'Mrs Ples' is, in fact 'Mr Ples'. Furthermore, the analysis shows that he was an adolescent.

The bronzed replica is to be placed on permanent on display in the Visitor's Centre at Necsa.

www.nuclearafrica.co.za

SEW-Eurodrive to streamline operational efficiencies



The operations division is at the heart of SEW-Eurodrive and the division's newly appointed general manager, Greg Perry, is eager to consolidate current successes to improve service delivery.

The scope of the company's operation's division encompasses numerous functions, including production, logistics, services and engineering. Despite the fact that the company is recognised as a market leader in innovation and quality, Perry admits that more needs to be done to maintain current clients and win over new ones in tough economic conditions.

"Our products are good and we have every confidence in them, in terms of design and functionality. Due to a gradual slowdown in new investments, a general industry trend is that operations are reducing overhead costs by diverting budgets towards maintenance to extend the total life cycle of equipment. As a result, customer service is more important than ever, and we are adopting a continuous improvement approach in that regard," he says.

Bearing this in mind, Perry believes that SEW-Eurodrive will maintain its competitive edge in industries such as mining, automotive, food and beverage, and water treatment. "Our business model is sound and we have a strong team of people behind our products. However, it is important to work 'smarter' in challenging times,

and we are doing this by taking a proactive approach towards streamlining efficiencies across the board," he concludes.

www.sew.co.za

In brief

Micromine's general manager, Claire Tuder has won an award for exceptional business talent at the BusinessNews-hosted 2016 40Under40 Awards. Established in 2002, this awards programme is designed to recognise and celebrate Western Australia's 40 leading business entrepreneurs under the age of 40.

According to the latest **PPS** survey conducted among engineering professionals, 80% of the respondents do not think that the Government will allocate sufficient funds to address the country's electricity and water crises. A confidence level of only 35% was expressed among engineers when asked whether the Government would deliver on its infrastructure spending promises.

City & Guilds in Africa has joined forces with **The British Council** to create a new International English Language certificate. The qualification has been designed to offer a flexible and accessible course to those who want to improve their English communication skills alongside technical skills training. The certificate can be attained through online modules and will be available to approved centres from March 2016.

Atlas Copco's annual report reflects that the company achieved record revenues, operating profit and operating cash flow in tough market conditions for the 2015 year. "We are focusing on boosting customers' productivity through our continuous drive for innovation. Staying efficient is also key, partly by being on top of the digital transformation. For the first time, the Group generated more than SEK 100-billion in revenues," says global president and CEO, Ronnie Leten.

Leading South African PTFE manufacturer, **Trident Plastics**, trading as Hardomid Plastic, has announced the sale of the company to **AZ-Armaturen Valve Group**, a longstanding customer of Trident Plastics. Trident Plastics will continue to operate as an independent company and all the employees will remain in the business.

Rittal South Africa has announced that MD Stephen Venter has stepped down and his responsibilities have been taken over by Ute Schoeman, who has stepped in as acting MD for the local operation. She will take full responsibilities until a successor has been found. "Customers can be assured of our commitment and that we endeavour to ensure a smooth transition in leadership," says Schoeman.

Afrisam, the leading supplier of concrete materials in southern Africa and a supplier of superior quality cement to the Lesotho nation for over half a century, has again demonstrated its commitment to the economic development of Lesotho and its people by establishing the first ever cement manufacturing facility in the country.

African solutions: C&I, microgrids

MechTech talks to ABB South Africa's CEO, Leon Viljoen (right), about his Africa-wide outlook and emerging technologies to carry the continent towards smarter, more connected and more reliable infrastructure.

Kusile is ABB's flagship project at the moment and that is "going extremely well". Having been awarded the control and instrumentation (C&I) project for all six units of the Kusile Power Station in eMalahleni, Mpumalanga in March 2015, ABB has already successfully conducted the factory acceptance tests (FATs) that were proving impossible for the original contractor just 18 months ago.

Eskom re-issued tenders for the Medupi and Kusile C&I at the end of 2014 and ABB won the Kusile C&I contract. "Given the lost time, the C&I is now on the critical path for Unit 1 and the electrical balance of plant (eBoP) of the power station, so considerable effort was put in to meet the deadlines. So we are very pleased that the FATs were successfully completed during November and December last year," Viljoen tells *MechTech*.

"Internationally, ABB is Number 1 in C&I. We are unique in this field in that we don't manufacture the mechanical equipment such as boilers and turbines, so we have the ability and experience to customise control solutions that are robust and flexible, regardless of which OEM's equipment it involved," he suggests.

In addition, ABB has already successfully integrated its control system into a small unit at Maasvlakte Power Station in the Netherlands that uses the same Hitachi boiler and Toshiba turbine as those used for Kusile and Medupi. "This reassured Eskom that we could do this," Viljoen says.

Another global C&I reference for ABB is the Sadara Integrated Chemicals Project in Saudi Arabia. "While we are locally known for our power solutions, our global revenue is higher in automation than in power. People often miss this."

On the power side in South Africa, ABB has reached the final testing stage of the turnkey electrical eBoP solution for the Ingula pump storage power station, where it was responsible for the design, engineering, supply, installation and commissioning, including the service and auxiliary transformers, dry-type dis-

tribution transformers and medium- and low-voltage switchgear.

The first unit of Ingula (Unit 3) was successfully synchronised to the grid on March 6, 2016, making an additional 333 MW of peaking capacity available. With all the civils now complete, full commercial operation of the four-unit, R25-billion pump storage project is now expected by January 2017, adding 1 322 MW of peaking capacity and significantly reducing the need to run the expensive diesel-driven open-cycle gas turbines.

"We also expect to see Kusile Unit 1 begin to generate power later this year. From there on, Eskom's capacity constraints should begin to ease," Viljoen notes.

Microgrids and renewable solutions

According to Viljoen, the price of renewable power generation technologies has come down tremendously. "We see from the last round of wind and solar in the REIPPPP, that these technologies are now much more cost effective than they were when the programme began."

The problem with renewables is the effect they have on the grid. In a traditional grid the amount of harmonics is small and do not impact on the quality of supply. With wind that is intermittent and brings a lot of harmonics into the system, one can destabilise a system that is not very robust.

Describing a success story in Kenya, Viljoen says that a wind farm was connected onto a weak grid. To overcome variability problems, ABB is installing a flywheel to absorb and supply energy to counter the surges and harmonics caused by the wind farm on the grid. "These sophisticated stabilisation technologies now exist, enabling us to overcome most grid connection problems for renewables," he notes.

The REIPPPP has proved to be an excellent model in terms of regulation, rules and technical specifications. Now that we have this programme, big wind and solar farms can be established very



quickly, which has led several countries north of our border to investigate this route.

Zambia, for example, is importing additional power through Mozambique, which is generated from diesel turbines on a ship and this is costly. Solar farms – that can be quickly constructed – are much cheaper at today's prices and a much better option compared to diesel generation solutions.

ABB is harnessing its power inverter technology, along with its control, automation and instrumentation expertise to develop smarter microgrid solutions to better harvest renewable energy. "In our Longmeadow facility, for example, we have had to install diesel generators for backup power to keep us going during outages and/or load shedding. But to reduce the running costs and the carbon footprint of burning diesel, we are adding PV panels onto our roof, along with battery storage to give us a full microgrid solution for this key facility," Viljoen reveals.

Describing the concept, he says that microgrids involve multiple connected technologies that, together, meet electrical demand in the most convenient, environmentally friendly, and energy and cost efficient ways possible.

They make sense wherever a diesel generator is being used. The idea is to minimise the amount of fuel used by the generator. Not only is the diesel fuel expensive but also, in some places in

and smarter plant services



A view of the nearly completed Unit 1 boiler at Kusile, the site of ABB's flagship control and instrumentation (C&I) project.

rural Africa, it is hugely expensive to get fuel to the site. It is not a simple matter of filling up cans or ordering a delivery, fuel often has to be sent to remote mines and industrial sites via tankers that have to travel for many hours on poor roads.

"So by installing PV for use during the day, along with battery storage to extend its use into the morning and evening, the diesel generator is only required at night as a last resort – and this now makes economic sense," he says.

In terms of battery storage technology, ABB has recently partnered with Samsung for the development and supply of battery technology in the renewable space. Samsung is putting large amounts of money into more cost-effective and longer lasting renewable battery storage and I believe this will soon be making

microgrid solutions even more cost effective.

Plant services and smart monitoring

For us, software is integrated into everything we do. Almost all of our equipment is associated with software in some way and, through a recent agreement with Microsoft, we are aligning our solutions to take full advantage of the Internet of Things.

"Even for Kusile, the C&I information from our system is readily available and, while analysing it is not yet part of the project scope, information collected can easily be passed to our analytics systems for close and ongoing condition monitoring," Viljoen informs *MechTech*.

Sensors are now much less expensive.

It even makes sense to include them in low voltage motors across a plant to enable us to monitor individual sub-systems. There is significant interest in this approach for critical processes such as those the petrochemical companies employ.

But while it is now easy for all OEMs to collect data from machines and send it to a central place, what is also needed is the analytics to determine what the data actually means. "It is here that ABB can play an important role. We are the world leaders in transformer technology, for example, so if we get data from transformer oil – which can now be collected using built-in sensors – we can determine exactly what is going on."

Availability and reliability are the key deliverables when using the Internet of Things to keep track of equipment. As



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soon as a machine shows signs of deterioration, it is often best to scale down the process and sacrifice some production until the necessary maintenance can restore the system to its full potential. The system condition is under better control, maintenance is better planned and visibility is high – any manager anywhere can get an indication of the state of plant assets at any time. Going forward, all of our assets such as substations, switchgear, drives, motors and transformers, will have condition-monitoring sensors installed.

Off the back of an acquisition of a specialist asset management software development company, ABB has established Enterprise Software, an asset management business unit to drive this new aspect of its business. The unit is supporting the total asset lifecycle through three key connecting components: the Asset Health Centre (AHC) as an asset performance management solution; Ellipse as an enterprise asset management system; and Service Suite as the mobile workforce management solution.

The AHC takes in data from equipment and analyses it through performance models or algorithms developed to codify years of industry experience to determine the asset's true condition. This information is then passed onto the Ellipse system, which determines what action needs to be taken, what replacement parts are required and when the repair needs to be done. If technical personnel are needed, the scheduled information is passed onto Service Suite, which allocates personnel and interacts with the maintenance team through the repair, capturing progress and status reports until the process has been finalised and the plant returned to full health.

Through the Health Centre, the condition of all assets can be analysed and accessed at any time, promoting reliability. "This is how modern plants will be managed in the future and, along with the associated service responsibilities, it is likely to become central to our offering going forward," Viljoen predicts.

Since ABB are the machine specialists, it has a central service role to play over the lifetime of plant equipment. "Customers are losing skills and the new technology enables us to work together with plant operators to proactively manage plant reliability and maintenance."

Concluding, Viljoen says that ABB's OEM engineering expertise provides a strong knowledge set in analytics. The company has the software systems and the expertise to roll out very strong OEM equipment packages, supported by monitoring, analytics and service support to maximise reliability, availability and equipment life. □



"Internationally, ABB is Number 1 in C&I, says Viljoen. "We are unique in this field in that we don't manufacture the mechanical equipment such as boilers and turbines, so we have the ability and experience to customise control solutions that are robust and flexible, regardless of which OEM's equipment it involved."

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SA's robot specialist moves towards

Yaskawa Southern Africa, through the opening of a new Drives Motion Control (DMC) division at its Longmeadow facility in Gauteng, South Africa, is taking on local responsibility for the full Yaskawa product range. *MechTech* talks to managing director, Terry Rosenberg (right).



Globally, Yaskawa is a world leading supplier of industrial robots (Motoman); machine controllers; servo drives and servomotors; and inverter solutions, enabling the company to offer comprehensive automation solutions for a diverse set of markets. Yaskawa's robotics division has been active in South Africa through Johannesburg-based Robotic Systems SA since 1991, which is the market leader in robotic automation in South Africa with an installed base over 1 000 industrial robots.

During the first quarter of 2012, a majority stake in Robotic Systems was acquired by Yaskawa Europe and the local entity was renamed Yaskawa Southern Africa. Terry Rosenberg, who was retained as MD of Yaskawa Southern Africa along with his successful local team noted at that time: "After many years of working with the Yaskawa organisation, we are excited to be a fully-fledged partner in this foremost international group of companies."

In December of that same year, Yaskawa Europe announced the signing of an agreement to acquire a majority share in VIPA, (visualisation and process automation) a specialist Germany-based manufacturer and supplier for I/O modules, PLCs and HMIs.

With the global integration of VIPA,

Yaskawa began to expand its product portfolio with a view to becoming a total solutions provider with a portfolio combination comprising VIPA's product portfolio with Yaskawa's inverter drives, ac servo solutions and robot product lines.

"Beside the synergies resulting from the combined and integrated product portfolio, there are much more benefits for existing and new Yaskawa customers", states Manfred Stern, president of Yaskawa Europe. "Together with the engineering resources of the Drives & Motion Division and the Robotics Division, Yaskawa Europe now has a strong development team here in Europe, close to our customers and the EMEA markets."

In March this year, Yaskawa Southern Africa announced the establishment of a new local business unit, DMC (drives, motion, control) bringing, at the behest of its European parent, the full global Yaskawa offering into the Southern African region. "As the local subsidiary of Yaskawa in the Europe, Middle East and Africa region, we are now able to support and supply the full suite of Yaskawa automation solutions to the region.

"Every manufacturing machine, conveyor belt, lifting system, bottle filler or packaging system has controllers, drives and motors that have to be co-ordinated to optimise the performance of the process," says Rosenberg. "This is an enormous market for us and a significant growth opportunity."

The VIPA controller range

VIPA was founded in 1985 as an automation systems house, initially developing PC-based machine operating panels and control and communication modules. The development of the SPEED7 high-speed PLC, which is among the most powerful PLC systems on the global market, was a technological milestone for the company, significantly extending its reach into the automation industry. As well as this PLC technology, VIPA adds a complete range of PLCs, from small to high performance, along with

remote I/O technology, touch panels and SCADA systems to the local Yaskawa offering.

Key global references include carmakers Daimler and Volkswagen. For Daimler, Yaskawa VIPA Speed7 CPUs, SLIO I/O systems and bus technology was used to reliably control and synchronise the complex system of fans, filters and air conditioning equipment required in the paint plant at the new Mercedes Benz compact vehicles plant in Hungary.

And in VW's Kassel factory in Germany, VIPA, together with ThyssenKrupp, installed the assembly line for double clutch transmissions. A powerful network of 37 Speed7 CPUs was created to synchronise 14 robot stations, check the quality in real-time and transmit all the data to the digital control system. This system enables one transmission to leave the assembly line every two minutes.

Inverter drives and motors

Since it was founded about 100 years ago Yaskawa has been developing dedicated mechatronic solutions for industries such as packaging and food processing; lifting and materials handling; cranes, hoists lifts and escalators; textile machines and plants; HVAC systems, fans and pumps; and machines, tools and systems.

In 2007 the company announced the production of its 10 millionth inverter from its Yukuhashi plant in Japan, a statistic that makes Yaskawa one of the largest inverter manufacturer in the world.

For general purpose use, Yaskawa offers its J1000 series for compact automation requirements; the V1000-range where open-loop vector functionality and the use of synchronous/permanent magnet (PM) motors without feedback is preferred; and the A1000 series, which is



The VIPA CPU SLIO iMC7 offers – in combination with VIPA SPEED7 Studio – modern Motion Control functions according to PLCopen.

total automation solutions

Yaskawa's premium inverter, offering superior reliability, environmental benefits and energy savings. Additional features such as auto-tuning to automatically adjust motor settings to achieve highest machine performance, advanced energy-saving control technology and special features for high spindle speed, accurate positioning, and crane and hoist control are available – and via the L1000 and T1000 spinoff series, the A1000 inverter drive has been customised for lift and textile applications.

The company's special purpose Yaskawa AC variable speed/frequency drive is the world's first series produced matrix converter and features direct conversion of the ac input voltage to ac output, without the need for a dc-bus and capacitor banks. This ensures a long service life and offers fully regenerative, energy efficient four-quadrant operation without the need for braking options or similar devices.

For servo applications, the company can now offer its Sigma-7 series of next-generation servo systems, which are available in the 50 W to 15 kW power range and operate at speed loop bandwidth of 3.1 kHz. These deliver the highest performance levels due their unmatched frequency response, reduced setting times and more precise control. In addition, they feature faster setup, simpler tuning and vibration suppression.

For quick and efficient setup, these modern 'plug and play' servo amplifiers require no parameter settings and gain adjustments to achieve high-precision positioning. When an existing solution needs to be upgraded, the whole Sigma-7 system can easily be re-configured for a new task. Out of the box servo drive solutions for common tasks – including gantry, pick & place and beam applications – have been developed for Yaskawa's

servo amplifier and servomotor combinations.

On the motor side, the company has a complete range of induction, permanent magnet synchronous and servomotors optimised to match the application and the chosen drive strategy. Motors are available in the power range from 0.1 to 373 kW in various enclosure styles, from open drip-proof to explosion proof. Brushless ac servo motors with maximum speeds of up to 4 500 rpm and torques to 7.0 Nm are on offer, while two different types of machine tool specific motors – single winding and dual winding – complement the company's spindle range.

Of particular note are the company's MYSP 160 and MYSP 225 gearless lift motors for lifting loads of between 400 and 2 500 kg for traction elevator applications. These are permanent magnet motors available with traction sheaves designed for elevator ropes of 6.0 mm or 8.0 mm. With pulse-generator encoders and electromagnetic brakes, these motors are designed to be driven by the L1000A inverter drive, the special lifting solution based on the A1000 drive. Designed for three million full load starts, the cooling fans and capacitors in these units have been carefully selected for a maintenance-free lift life of at least 10 years.

With an initial focus on marketing, Yaskawa DMC is investing in permanent technical and sales personnel as well as offices, training and demonstration facilities. Yaskawa Europe Drives & Motion Division's South Africa-based partners – including Hudaco Group company, Varispeed, and Anytech, a subsidiary of the Directech Group, a longstanding VIPA representative in South Africa – will



For servo applications, Yaskawa now offers its Sigma-7 series of next-generation servo systems, which are available in the 50 W to 15 kW power range and operate at a speed loop bandwidth of 3.1 kHz.

be retained as channel partners, fully serviced and supported from the new Yaskawa DMC division in Johannesburg.

Yaskawa Southern Africa will also be equipping its local branch network in Port Elizabeth, Cape Town and Durban with the infrastructure necessary to stock and support the extended range.

"And if someone wants us to build a whole machine, we are willing to do that too. We have always done this on the robot side, but now we can offer much more than robots. We can offer turnkey automation solutions that are 100% customised to a manufacturer's exact needs," Rosenberg concludes. □

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Aluminium motors for industrial applications

The Bauer range of aluminium three-phase 380 V and 525 V motors are ideal for industrial applications such as fans, compressors, pumps, sanding and drilling machines. Lewis Hiepner, product manager for electric motors at BI talks about their advantages.

“The main benefit of Bauer aluminium electric motors is that they are far more lightweight than cast-iron equivalents due to the aluminium casing and end shield,” says Hiepner.

“This MS range of aluminium three-phase 380 V and 525 V motors has been supplied successfully to the South African market for the past decade,” he points out. A main feature is the multi-mount design, with the added benefit of being able to change the feet on-site.

This gives the customer the option of having the terminal box on the top or on the left or right hand side, depending on the specific requirements. In addition, Bauer motors can be fitted with an ac or dc external brake.

The ac brake is specifically for instant stopping when the power is switched off. Applications include bottling plants

where stopping accuracy is critical. The dc-type brake, on the other hand, is slower to react. This is due to the brake’s electrical power having to pass through a rectifier in order to convert ac back emf into dc, with a resultant delay. Typical applications include overhead cranes, where stopping accuracy is not as critical.

All Bauer motors conform to the relevant IEC standards, as well as being designed for S1 duty. This means that the motors can run continuously for 24 hours under normal load conditions. Another feature is the Class F insulation, with a ‘B’ temperature rise of 80 °C from a maximum ambient temperature of 40 °C, which gives a maximum operating temperature of 120 °C.

A vacuum pressure impregnation system is used in manufacturing the insulation. The motors are also IP55 weatherproof, meaning that they can

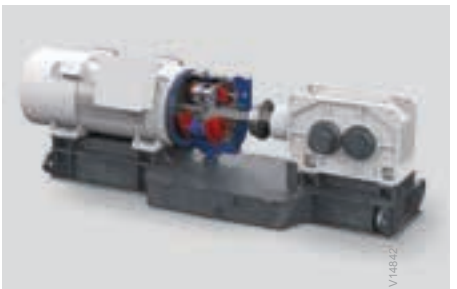


Bauer aluminium motors are far more lightweight than cast iron equivalents.

withstand normal weather conditions if the cable termination to the terminal box is carried out correctly. The Bauer range is also water, dust and vermin proof.

“It is part of our strategy of being a total solutions partner for our customers to stock some of the best products and brands from around the world, and the Bauer range definitely falls into this category,” adds Ross Trevelyan, business unit head: product and engineering at BI.

BI recently launched a new brand identity with the aim, according BI CEO, Burtie Roberts: “To become a proactive company and to ensure we are the preferred supplier.” □



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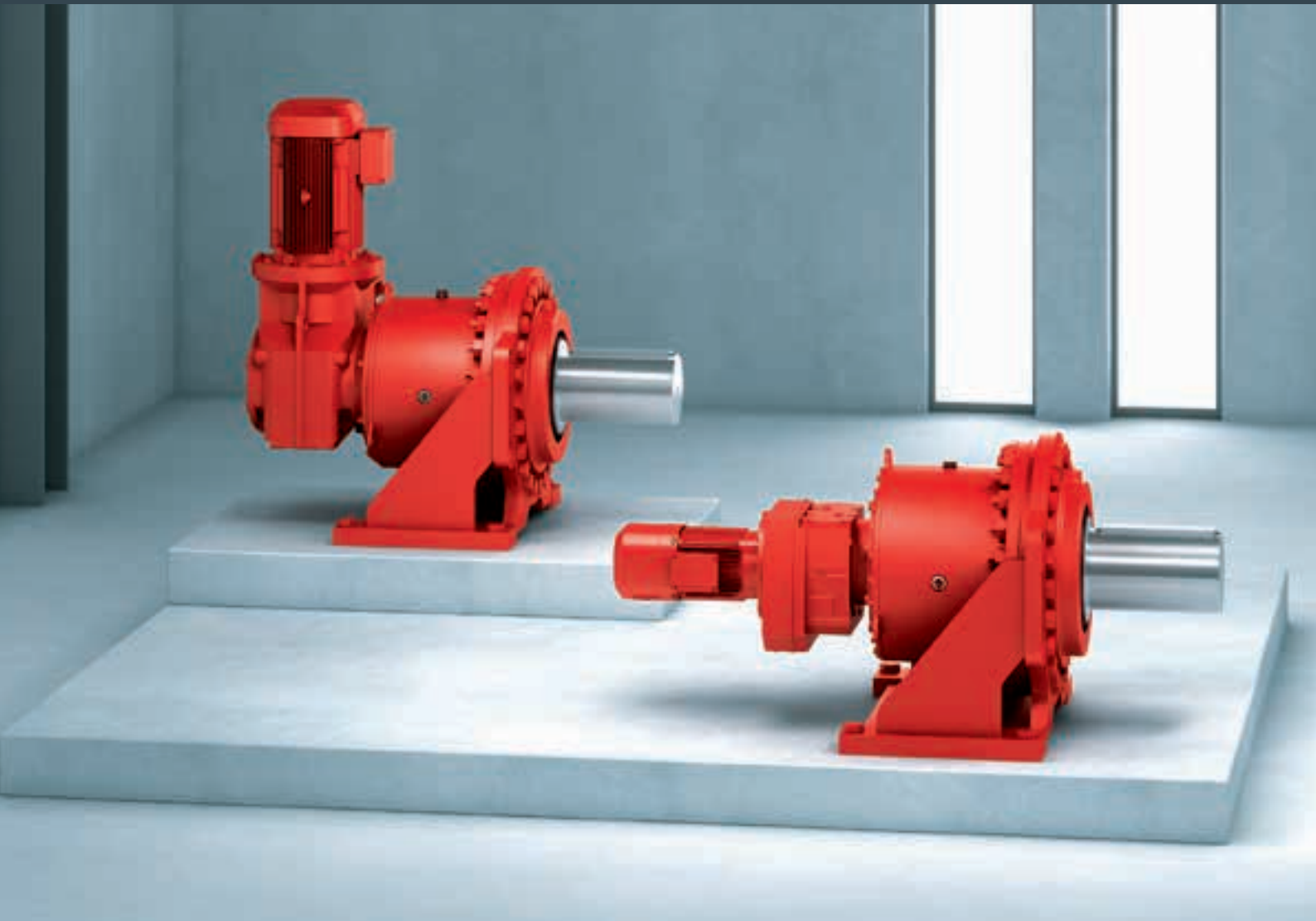
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Induction heater for couplings

SKF South Africa, the bearing and rotating technology and engineering solutions specialist, once again provided an optimum solution for a key customer by joining forces with one of its authorised distributors, Citi Bearings Vereeniging.

The customer, a market leader in the South African steel industry, needed a bearing heater capable of heating couplings and approached Citi Bearings Vereeniging for a solution. "Our authorised distributor recommended the SKF TIH 220m large induction heater and demonstrated a new unit at the customer's site," explains Eddie Martens, SKF product manager, MaPro.

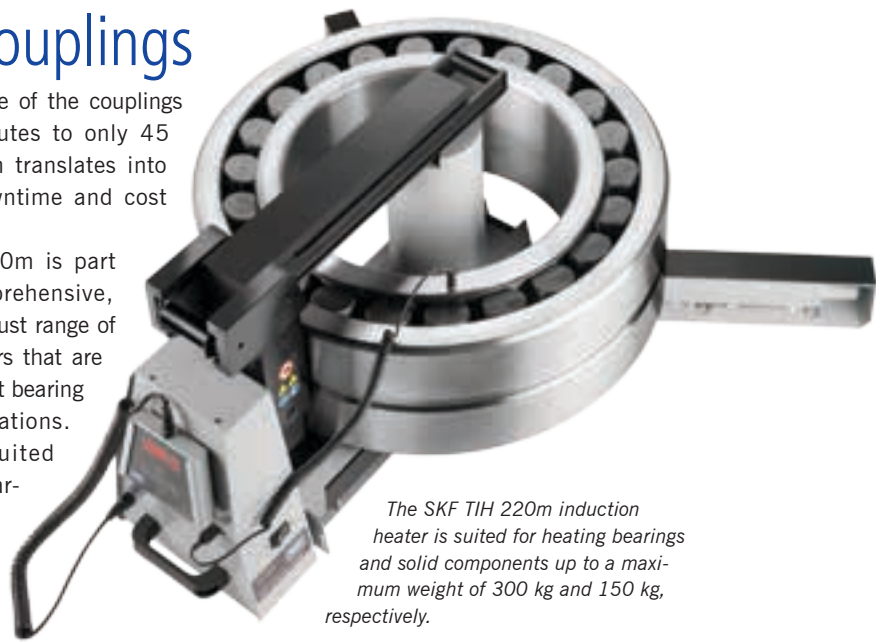
Recognising the induction heater's impressive capabilities that will meet all the necessary requirements, the customer ordered the unit from Citi Bearings Vereeniging.

In addition to meeting the customer's specific application needs, the TIH 220m was also found to be suitable for two of the company's other sections' requirements. The customer also reported that the induction heater has almost halved

the heating time of the couplings from 150 minutes to only 45 minutes, which translates into significant downtime and cost savings.

The TIH 220m is part of SKF's comprehensive, reliable and robust range of induction heaters that are suitable for most bearing heating applications. The unit is suited for heating bearings and solid components up to a maximum weight of 300 kg and 150 kg, respectively. "The heater is capable of heating a 220 kg bearing in just 20 minutes," adds Martens.

The induction heater's power electronics systems feature an advanced design that includes current and over-heating control. The standard unit is supplied with two yokes allowing bearings with bore diameters from 60 mm to 600 mm to be accommodated.



The SKF TIH 220m induction heater is suited for heating bearings and solid components up to a maximum weight of 300 kg and 150 kg, respectively.

The heater also boasts a number of features that make the unit user-friendly, easy and safe to operate. The sliding or swivel arm allows for easy and quick replacement of bearings with a large yoke. In addition to maximising uptime, operator fatigue is also reduced. An SKF remote control complete with operating display and control panel further adds to the units easy and safe operation. □

SKF solutions extend fan and blower MTBF

Air handling equipment operates under challenging conditions with factors such as heat, dust, corrosive vapours and wash-down exposure all shortening fan and blower life. Premature bearing failure can result from lubrication loss or contamination; shaft misalignment; or excess vibration – and any failure will cause unscheduled downtime, production losses, and/or costly emergency repairs. Making matters worse, accessing installed onsite equipment is usually difficult and can also be dangerous.

SKF's comprehensive, cost-effective fan and blower solutions, which include bearings and seals, lubrication, alignment and reliability solutions, all reduce the chance of premature failure. SKF specialised bearings and seals tolerate harsh operating conditions while SKF lubrication systems, and shaft/belt alignment tools contribute to improve the service life of fans. Condition monitoring services and equipment to identify failures before they become catastrophic are also available.

Bearing and seal solutions include: Ball and roller bearing mounted units, SKF concentra bearing units, CARB® bearings, SKF Explorer bearings, fan wheel hub bushings, split housing units, contact seals

and flinger seals, and labyrinth seals.

On the lubrication side, solutions include: specialised SKF lubricants, SKF multipoint lubricators, and SYSTEM 24 with 24/7 automatic lubricators.

Laser shaft alignment tools as well as laser belt alignment tools are also available, while reliability solutions such portable data

collectors, on-line data collection systems, failure analysis software as well as machine balancing are also on offer.

As drop-in replacements or part of an integrated maintenance system, SKF fan and blower solutions extend Mean Time Between Failures (MTBF), reduce unplanned downtime, reduce maintenance and repair costs, enhance plant safety, and increase productivity. □



Comprehensive and cost-effective fan and blower solutions from SKF can extend equipment MTBF, reducing downtime and associated costs.



Cornerstones of success – 85 years and counting

“Innovation, tradition and customer focus are the cornerstones of SEW-Eurodrive. That was the case when our company was founded 85 years ago and it is still true today. What began as a small workshop with 16 employees has become a global family-run drive engineering business,” says the company’s South Africa MD Raymond Obermeyer (left). In this article, he retraces company’s history and recommitments to its values.

SEW-Eurodrive now has over 16 000 employees, who demonstrate their commitment by working day in, day out to ensure the machines and systems of customers throughout the world keep on moving.

“Thanks to a broad-based product portfolio and a wide range of customer-oriented service modules, our company offers customers clear added value and measurable benefits. These are made possible by powerful drives, high quality standards and customised solutions,” Obermeyer says.

“On the occasion of our 85th anniversary, I’d like you to join me in looking back at our history and looking toward to the future,” he adds. “After all, the world will keep on turning, everyone will keep on moving and so too will SEW-Eurodrive.”

It all began with an ingenious idea

SEW-Eurodrive started with an ingenious inventor, Albert Obermoser, whose 1928 design of the first-ever geared motor revolutionised drive engineering. It was Christian Pähr who recognised the enormous potential of this state-of-the-art drive and in 1931, amid political and social instability, had the courage to start a company that would set benchmarks and make a lasting change to the world of mobility – Süddeutsche Elektromotoren-Werke in Bruchsal, or SEW for short.

Time moved on, but the family-owned business remained. In 1945, with Central Europe in ruins, Christian Pähr’s son-in-law Ernst Blickle took on overall responsibility at SEW. He helped shape Germany’s economic miracle. Under his expert leadership, a further milestone in drive engineering was achieved in 1965 with the launch of the modular system for gear motors. Technology changed, but

the basic principle remained the same.

“Today, the wide variety of offerings – ranging from high-quality individual components to intelligent all-in-one solutions – continues to give our company a crucial competitive edge,” says Obermeyer. Following Blickle’s death in 1986, his wife Edeltraut initially took the helm as managing director and president. During this period, a new course was set for the company’s future.

From local player to global leader

The first production plant outside Germany was established by Ernst Blickle in Haguenau, France, in 1960. His two sons Rainer and Jürgen Blickle have continued to spearhead the company’s international mission since 1987, with great success. Its status as a global player has gone from strength to strength.

The foundation of SEW-Eurodrive Inc in Lyman in the United States is particularly notable. Along with the headquarters in Germany and the site in China, it is one of the company’s most important locations.

“Today, we’re the proud owner of 15 production plants and 79 Drive Technology Centres in 48 countries. The company has more than 16 000 employees worldwide, including 550 in research and development alone. In the fiscal year 2014/2015, sales were €2.6-billion,” Obermeyer reveals.

SEW-Eurodrive is thus one of the international market leaders in drive engineering and drive automation. Bruchsal has always been at the heart of the company’s operations. Here, standards are set that impress industries around the world, from the automotive and beverage sectors to transportation, logistics and mining.

Quality and workmanship

“SEW-Eurodrive is synonymous all over

the world with high-performance and dynamic drive engineering. Our products – whether it be geared motors, electronically controlled drives, components for local installation, mechanical variable-speed drives or the comprehensive service programme – represent top engineering, made in Germany with a high level of reliability.

“Our success is the result of hard work – the product of a mind-set that affirms and creates values. As a family-owned business, we are committed to promoting social responsibility and a sense of togetherness as well as discipline, loyalty and dedication. The human dimension is key – this principle has always been pivotal to our corporate philosophy, and will continue to be so in the future,” relates Obermeyer.

The future starts now

Willingness to change and the ability to identify new trends, while remaining true to its own values have always been hallmarks of this drives company. This ability to adapt to the needs of a constantly changing market has played a key role in continuously strengthening and developing the company’s market leadership. The numerous awards that SEW-Eurodrive has received over the years – from ‘Customer Champion’ to the ‘Baden-Württemberg’s prize for environmental technology’ – are a visible result of this process.

“Our concrete vision for the future is ‘Industry 4.0 – from Smart Factory to Smart Company’ – naturally by using drive engineering and drive automation from SEW-Eurodrive. This aims to combine the new concepts of Industry 4.0 with the established principles of lean management, thereby intelligently networking all the elements involved in a value creation process – people, machines and products,” he concludes. □

Understanding ac motor control strategies

Since the late 1970s, many control models with different names have been developed for ac motors. Examples at SEW-Eurodrive include V/f control, VFC, CFC and servo control.

To achieve clarity among the many designations and abbreviations, SEW-Eurodrive mechatronics engineer, Norman Maleka, explains the basic characteristics of control models based on the example of the company's frequency inverters, which cover the entire power and application range – from standard to the toughest technical requirements.

“Up until the 1970s, dc motors were just about the only option for step-less adjustment of speed and torque in industrial applications. Traditional dc motors are prone to wear, which generates mechanical loads and servicing costs. Ac motors, on the other hand, are far more robust and virtually maintenance-free,” states Maleka.

They were, however, more difficult to control, especially when ac control engineering and power electronics were in their infancy – at a time when there were no digital signal processors and both power MOSFETs and IGBTs were still theoretical concepts.

Maleka notes that open and closed

loop control of ac drives has now become indispensable and is still enjoying highly impressive growth rates in electrical drive engineering. “Inverters with voltage/frequency control are ideal for simple applications such as speed control of pumps, fans or basic materials handling equipment.”

These inverters are used to drive moderately dynamic ac motors and are essentially based on the proportional adjustment of voltage and frequency. This keeps the flux in the machine constant and maintains the maximum torque. Since the rated flux generates the highest torque per kg of machine, the raw materials used – steel, copper and insulating materials – are at their most effective.

“From the motor's perspective, the controlling inverter acts as an adjustable mains voltage and mains frequency supply. This means it is also possible, in principle, to operate several smaller motors simultaneously with one inverter. Thanks to their straightforward principle and easy handling, frequency inverters with V/f control are ready to use in a short time. This has therefore become the standard control mode, without speed feedback,” says Maleka.

SEW-Eurodrive uses a version of V/f control in its MOVITRAC LTE-B, MOVITRAC



SEW-Eurodrive V/f control frequency inverters.

B and MOVIDRIVE B frequency inverters for installation in control cabinets, and also in MOVIMOT, MOVIFIT FC and MOVIPRO SDC decentralised drive controls.

During project planning for an electric drive system, Maleka emphasises that it is vital to identify the application's control accuracy requirements. If these requirements are transparent and specified, the tailored drive system can be assembled from the necessary components – the gear unit, motor, encoder, inverter and controller.

“The key objective is to include the right components for the specific control quality requirements while also optimising costs. If the requirements are set too high or too low from the outset, this results in unnecessary additional outlay. SEW-Eurodrive regards itself as a specialist in helping customers select the ideal drive components,” Maleka concludes. □

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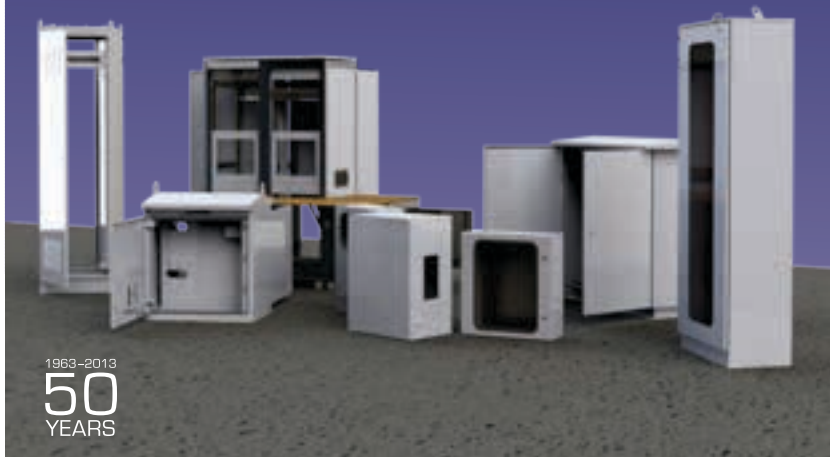
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Best-ever simulation-driven design suite released

On March 8, 2016 in Troy, Michigan, Altair released HyperWorks® 14.0, its latest open architecture CAE simulation platform, which is to be showcased at Hannover Messe 2016 on April 27. *MechTech* summarises some of the new features.

HyperWorks is a comprehensive, open-architecture, multi-physics CAE platform that uses pre- and post-CAD simulation to develop products with enhanced performance – weight and materials optimised components, for example, that make use of advanced technologies such as 3D printing for rapid development and significantly reduced times to market.

Founded by James R Scapa, George Christ and Mark Kistner in 1985 as an engineering design consultancy, Altair's early successes included contracts for GM and Ford for the design of their vehicle platforms and truck chassis systems. The company created its first design software product in 1990, the flagship CAE modelling tool HyperMesh®, a market-leading, multi-disciplinary finite element pre-processor for large complex models.

In 1993, Altair released the first commercial version of OptiStruct®, a structural analysis solver for linear and nonlinear problems under static and dynamic loadings. This software tool is still the market-leading solution for structural design and optimisation.

The first version of the HyperWorks CAE suite was released in 1999, with its innovative pay-per-usage licensing model. The suite concept brought together multiple software tools with specific functionality, with users being given the opportunity to only pay for the tools they use. Both the common platform idea and the licensing model were novel at that time and have enabled the company to thrive in the 21st century.

Today, Altair specialises in the development and broad application of simulation technology to synthesise and optimise designs, processes and decisions. Privately held with more than 2 000 employees, The company is

headquartered in Troy, Michigan, USA and operates from more than 45 offices in 22 different countries. Customers currently include more than 5 000 corporate clients across broad industry segments.

HyperWorks 14.0

The latest release of Altair's HyperWorks open architecture CAE simulation platform includes several new products, feature enhancements, updated functionalities, and licensing methods to help users towards better designs, including: expanded optimisation and nonlinear solver capabilities; accelerated meshing, assembly, and graphics; and several new software tools that have been added via the Altair Partner Alliance.

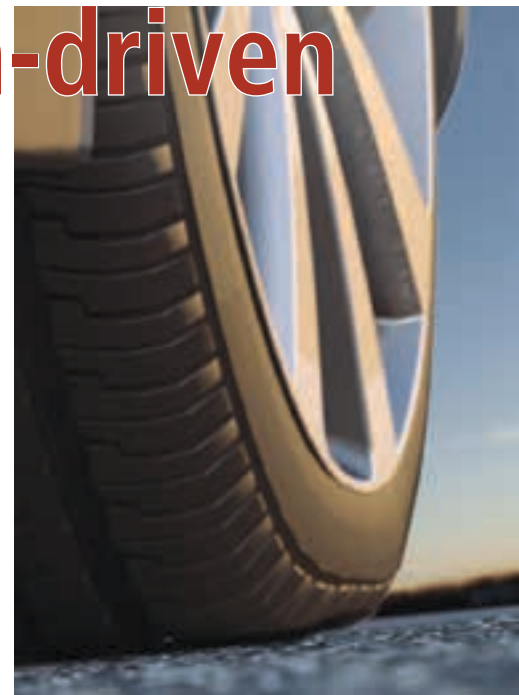
Key highlights

OptiStruct's capabilities have been elevated to include more nonlinear analyses, new contact and optimisation algorithms, and numerous improvements in solution speed. Also, a breakthrough solution for the design and optimisation of lattice structures has been developed to support additive manufacturing.

"With OptiStruct 14.0, it is now possible to run larger, full vehicle NVH (noise-vibration-hardness) models for more accuracy without the errors generated by our existing NVH solver on the same computer," says Tae-Won Park of SsangYong Motors.

HyperMesh has a new part and assembly workflow that promotes flow of data directly from product data management (PDM) data structures. Combined with the new high-velocity graphics engine tuned to handle even the largest models, HyperMesh 14.0's performance is up to 15× faster for large FE models with solid elements and up to 60× faster for geometric models, while using less hardware memory.

"The new HW 14.0 graphics engine



is nothing short of amazing. We can achieve much better performance, even with low-end graphics cards," says Patrick Bandeira of Prodrive, Aston Martin Racing.

"With this release of HyperWorks, we've introduced parts and assemblies in HyperMesh that directly correspond to those in the CAD and PDM world," adds James Dagg, chief technical officer of User Experience at Altair. "The new assemblies are extremely flexible, allowing for modular modelling where entire subsystems can be replaced or updated automatically, keeping the CAE model synchronised with the design."

Multiscale Designer, a practical tool for the seamless integration of modelling, simulation, testing and optimisation of engineered products using complex materials is now part of the HyperWorks suite.

FEKO, the best-in-class software for electromagnetic simulation related to antenna design and placement, electromagnetic compatibility, radar cross-section, and other applications is now fully merged into HyperWorks with added features to reduce modelling and computation time. And integration with HyperStudy has been added for advanced optimisation.

MotionSolve now provides improved 3D rigid-to-rigid contact and advanced co-simulation capabilities, and the automotive multi-body simulation library has been expanded for full vehicle simulations.

An alternate solver-licensing scheme **HyperWorks Unlimited Solver Node** is



now available, offering unprecedented enterprise-scale value.

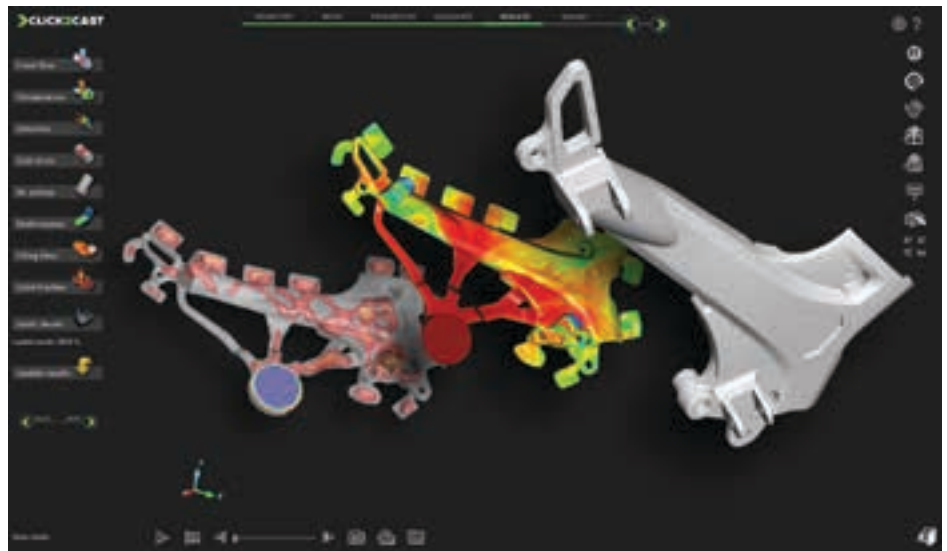
Click2Cast offers the easiest casting process simulation on the market, requiring neither special training nor an extensive technical user background. It is a very effective and powerful design tool, and provides high value at the critical intersection of manufacturing and product design.

In addition, the **Altair Partner Alliance (APA)** continues its portfolio expansion of third-party technology with applications from over 45 strategic partners. These are directly accessible using HyperWorks Units in domains including: durability and fatigue, NVH, 1D systems simulation, injection moulding simulation, composite modelling, stress analysis, materials libraries, thermal analysis, and rapid prototyping.

The Hannover showcase

The latest versions of HyperWorks 14.0; its concept design and optimisation tools solidThinking Evolve® and Inspire® 2016; and new design processes for the development and manufacturing of innovative products are to be showcased at Hannover Messe in Munich on April 27. In addition, Altair will host: 'ATCx AM – Design for Additive Manufacturing' a conference included in the overall CAE Forum programme.

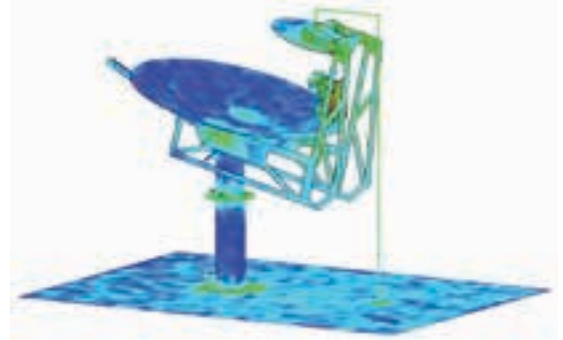
The Altair programme features an afternoon filled with presentations from partners such as Laser Zentrum Nord, Materialise, and voxeljet – as well as customers such as EDAG and RUAG



Above: Click2Cast offers the easiest casting process simulation on the market, requiring neither special training nor an extensive technical user background.

Left: Altair has released HyperWorks® 14.0, its latest open architecture CAE simulation platform.

Right: A FEKO model of a single antenna for the SKA project.



Space. These companies will present technologies and solutions for additive manufacturing – from design to actual 3D printing.

The entire development and manufacturing processes of a cast aluminium component will be showcased, jointly with Altair partners, HBM nCode and voxeljet. The component was designed and optimised with Inspire, then nCode DesignLife was applied to conduct a fatigue analysis and, finally, solidThinking's Click2Cast software was used to simulate and optimise the casting process.

The created design resulted in a casting form, 3D-printed by voxeljet. Thanks to the nature-inspired optimised design created with Inspire and the application of a 3D-printed cast form with voxeljet solutions, manufacturers can now benefit from the design freedom 3D printing offers, while benefitting from series-production readiness and higher cost efficiencies.

In addition, the resulting component outperforms traditionally manufactured parts. Depending on the load case, the new component was three to five times stiffer, without additional weight.

Altair will also highlight its solutions for laser additive manufacturing methods together with Laser Zentrum Nord. Throughout 2016, the companies

are offering training for engineers and designers to learn how to develop and design state-of-the-art 3D-printed metal products. The companies also collaborate on projects for various customers from different industries, such as automotive and aerospace, and will present case studies resulting from this cooperation.

"We are happy to welcome HBM nCode and Laser Zentrum Nord at our booth," says Mirko Bromberger, director of marketing and additive manufacturing strategies at Altair Engineering. "Both companies are important partners for development and production, especially with regards to new development and manufacturing processes. Visitors of Hannover Messe can expect a very broad and informative programme, highlighting solutions for the different production and engineering disciplines."

In the course of the CAE Forum at Hannover Messe 2016, Altair will organise and moderate the symposium: 'Design for Additive Manufacturing' featuring presentations about: structures inspired by nature for 3D printing; key aspects of design for additive manufacturing; development processes for the innovative manufacturing of mould components; part optimisation by 3D printing; and design case studies involving space structures and pressure valves. □

Flexible solutions thanks to SY manifold valves

SMC, a leading provider of pneumatics continues to dazzle with the new SY series of valve manifolds, which will be manufactured on-site in SMC South Africa's new production facilities. Product manager Ernst Smith at SMC Pneumatics South Africa reveals more.

According to Smith, the “unique, all-purpose SY pneumatic manifold valve” is available in three sizes, namely the SY3000, SY5000 and SY7000. Thanks to its innovative redesign and smaller size, a reduction of 29% is achieved in installation space offering greater flexibility, increased flow rates and more economical operation. Also, the two smaller valve sizes or the two larger sizes can be mixed on the same manifold to more closely match application requirements.

The valve manifold offers piping options to the top, side or bottom with various port size options, achieving a flow rate of up to 1 500 l/m via the biggest valve mounted on the manifold.

“The valves in the new SY series offer further air savings as a result of driving bigger cylinders with reduced cycle times

without the need to use larger, more expensive solenoid valves. These valves are available in either rubber or unique metal seal versions with the metal seal version being particularly suitable for higher operating frequencies and extended lifetime performance – boasting switching cycles of up to 200-million cycles,” Smith explains.

The SY series incorporates SMC's energy-efficient V100 pilot valve and a power saving option that reduces power consumption per valve coil down to just 0,1 W.

The option to have a single valve mounted on a base is available, if needed, and flow rates exceeding 1 500 l/m are also available. The connection to this plug-in sub-base type valve is via the well-known M12 waterproof connector. The valve can be supplied fitted with a re-



sidual pressure release valve that enables manual dumping of residual compressed air in the cylinder. This function ensures safety in the production environment by avoiding the need to use any external components or dangerous actions to get rid of trapped air when the supply pressure is cut-off.

“Safety is always considered when we look at products and customer applications,” continues Smith. Overall safety in applications has been improved in several ways via optional configurations, such as:

- The addition of a backpressure check valve built into the valve or one that can be retrofitted later.

Lowering dew point to protect automation equipment

Failure to remove water vapour from factory air can quickly become a costly maintenance headache. This according to Brian Abbott (right), product manager at SMC Pneumatics South Africa. “Water vapour and the resulting water condensate are the foremost causes of costly downtime and increased maintenance. The blame is often laid on the more visible culprit - oil or contaminants, both of which are easily removed with proper filtration,” he says.

“Moisture in facility airlines can cause corrosion and rust which can break loose to the air passageways causing blockages in narrow restrictions and filter elements. This can lead to increased pressure drops and loss in machine performance, not to mention energy loss and costs of the compressed air,” adds Abbott.

Aftercoolers, drip legs and water separators are used to remove water condensate from factory compressed air. However, this air is still at 100% relative humidity and is, therefore, still at risk of condensing into water should the surrounding temperature drop to its dew point.

In order to increase protection of ex-

pensive automation equipment, factory compressed air must remove as much water vapour as possible to avoid any condensation further downstream. Lowering its dew point does this.

Abbott explains the process: “Drying compressed air at the highest pressure consistent with the facility's demands will result in the most economical dryer operation. For most industrial applications, the rule is to first set the pressure dew point to meet general requirements, then adjust it to between -6.0 °C and -10 °C lower than the facility's lowest ambient temperature. Hence, factory air dryness or dew point is relative to the application specific requirements.

Refrigerated dryers are the most commonly used to lower the dew point. A refrigerated dryer will further cool the compressed air by removing heat at its inlet side and lowering its dew-point temperature to 3.0 °C, then expelling the condensate through an automatic condensate drain. The dryer will then reheat the dried compressed air back to ambient temperature by recycling the previously removed heat using a heat exchange process. This reheating of the compressed

air to ambient temperature will eliminate ‘sweating’ cold pipes when working in humid factory conditions,” Abbott explains.

Also recommended is a coalescing filter upstream from the refrigerated dryer to remove any compressor oil and other contaminants that may still be trapped in the compressed air to ensure the dryer functions properly. Oil coating the cooling surfaces decreases efficiency while coalescing filters saturated with liquid water will aid its drying capacity. In circumstances where factory piping is exposed to ambient temperatures lower than the dew point achievable by refrigerated drying, alternate methods of drying must be considered.

Membrane dryers use hollow fibres composed of a macro-molecular membrane through which water vapour passes easily, but it is difficult for air (oxygen and nitrogen)



- The addition of a manual pressure release valve for every cylinder, where required.
- A supply shut-off spacer per valve to allow the maintenance team access to the system or part thereof while the manifold is still pressurised.
- Spacers with double check valves in working lines to enable intermediate stops or for drop prevention of loads in vertical applications.
- A slide locking manual override function with double action and a long distance visual indication.

Power and control options include; D-sub connectors, flat ribbon cables, terminal block box, pre-assembled leads, circular connectors and all the options for serial transmission. Applicable protocols include PROFINET, PROFIBUS, DeviceNet, CC-Link, EtherNet/IP, EtherCAT, CANopen, AS-Interface, OMRON CompoBus/S and CompoNet. In addition, digital as well as analogue inputs and outputs can be added to suit application requirements.

“SMC prides itself on working closely with customers and, through our technical support structure, we are able to provide solutions that improve productivity and reduce overall production costs. Once specified, each manifold will be assembled from local stock and tested

according to stringent specifications to ensure that it is ready-to-use when it arrives on-site. Thanks to the intelligent fieldbus specification for communication and diagnostic messages, downtime is significantly reduced to offer greater efficiencies in a very competitive market,” Smith suggests.

SMC to launch in-house production facilities

To enable shorter delivery times and availability of non-standard stock items, SMC’s local production facility in Midrand will be fully operation by July 2016. The state-of-the-art production facilities will initially focus on cylinder production, manifold assemblies and air preparation combination sets. Here cylinders with bore sizes ranging from 6.0 mm up to 300 mm in diameter, with complete flexibility of rod end types, will be produced.

Delivery of these items will take place on a three-tiered service basis: regular orders within three days; larger orders within two weeks; and breakdowns will be turned around within the same day.

“SMC’s local production facilities will also be used to produce standard stock items to bridge stock gaps often caused by bigger, unexpected customer orders. Customers will enjoy the benefit of availability of such items without the



SMC SY series manifold valves incorporate the energy-efficient V100 pilot valve and a power saving option that reduces power consumption per valve coil down to just 0,1 W.

long lead times. Further to this, when presented with an old, odd cylinder that has failed after years of use, SMC has the resources in place to assist in getting these customer machines up and running again” adds Smith.

Also, when a pattern of repeat orders of non-standard cylinders is identified, SMC will proactively adopt this as a ‘local standard’ and produce these in larger quantities for interested customers in order to reduce delivery times.

“Intelligent solutions and a customer-centric approach are at the core of what SMC stands for. We strive to proactively partner with our customers to ensure mutual success,” concludes Smith. □

to pass through. When humid, compressed air is supplied to the inside of the hollow fibres, only the water vapour permeates the membrane and this is drawn to the outside due to the pressure differential between the moisture inside and outside the hollow fibres. The compressed air becomes dry and continues to flow unimpeded out of the membrane dryer.

A portion of the dry air from the outlet side is passed through a very small opening to reduce the pressure and purge the outside of the hollow fibres. The moisture that permeates is discharged to atmosphere by this purge air, which in turn creates a low partial pressure allowing the dehumidification process to proceed continuously.

By altering the airflow rate and membrane configurations, pressure dew points from 15 °C to -60 °C can be achieved. Membrane air dryers are a cost effective solution for point-of-use applications in pharmaceutical manufacturing, packaging, laboratory environments and other applications.

Desiccant dryers, on the other hand, pass air through a bed of desiccant – an absorbent material such as silica gel or activated alumina – which adsorbs water

vapour to its surface to effectively lower dew points to temperatures well below that which a refrigerated dryer can achieve. Heatless regenerative models use a pair of desiccant beds that alternate in service – while the one bed is operational, the off-line bed is regenerated (dehumidified) via a pressure swing adsorption process. Pressure dew points from a standard -30 °C to an optional -50 °C and beyond can be achieved using desiccant technology.

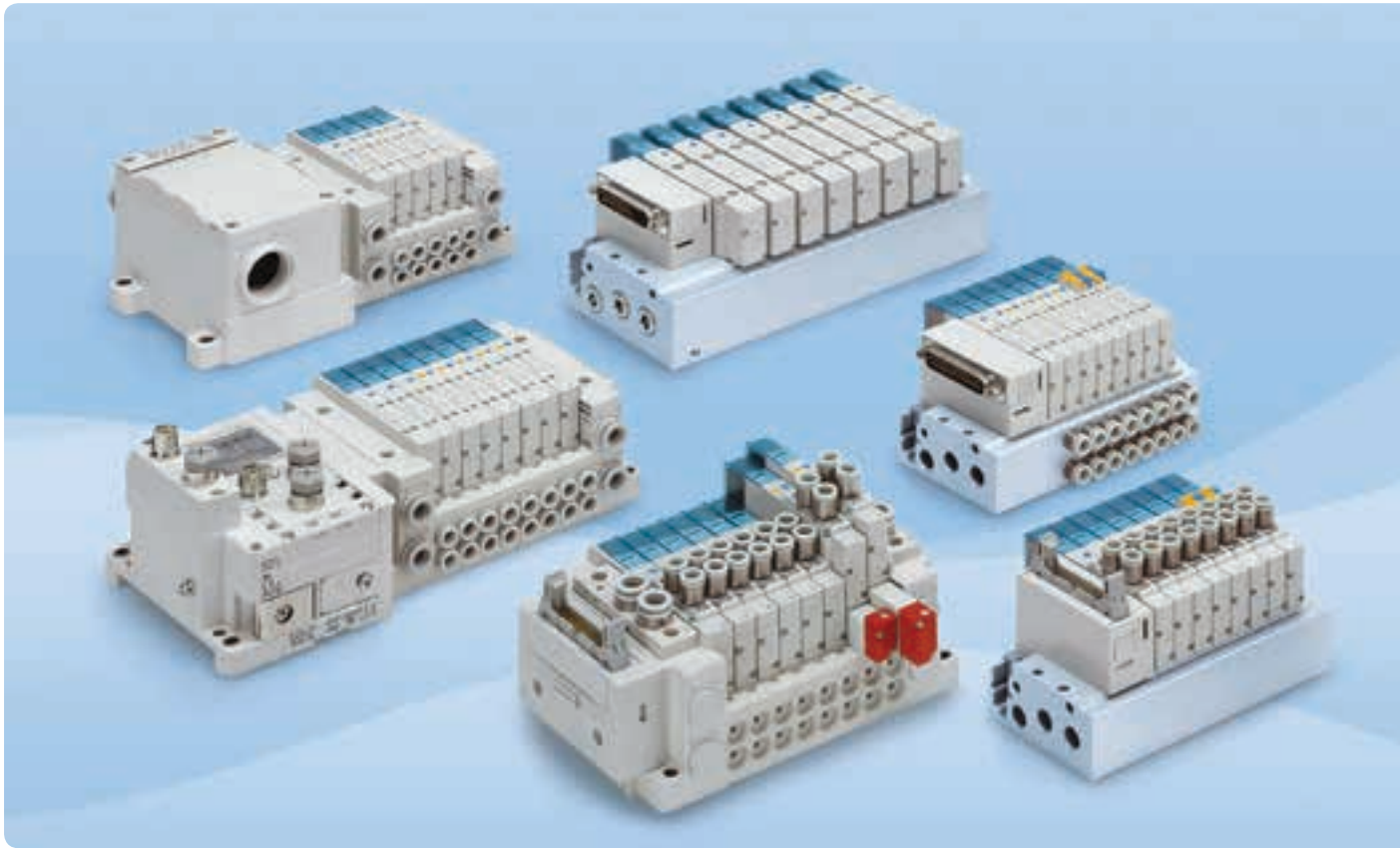
Both membrane and desiccant dryers are adversely affected by the presence of oils or liquid water and must be protected with a quality coalescing filter.

Over specifying an application’s or a facility’s dew point can be very costly due to excessive energy bills, while the maintenance costs for water vapour damage to product lines can be as costly if the dew point is under specified.

According to Abbott, it is sensible practice to dry the compressed air to a dew point which is -10 °C lower than the factory’s lowest ambient temperature. Then each compressed air supply can be sub-divided by application using zone or point-of-use membrane or desiccant dryers to provide the appropriate level of dryness. □



SMC’s series IDH compact refrigerated air dryers offer stable, compressed air temperature control with its integrated heater, regulator, dryer, and filter.



Meet the sleek SY series from SMC

The SY series of Valve Manifolds (Valve Terminals) is manufactured on-site at SMC South Africa's brand new production facilities.

The unique, all-purpose valve is available in three sizes, namely the SY3000, SY5000 and SY7000. Thanks to its innovative redesign and smaller size, a reduction of 29% is achieved in installation space offering greater flexibility, increased flow rates and a more economical operation. With flowrates of up to 1500 litres per minute, most industry applications can benefit from this manifold. Units can be hard wired or are compatible with most industrial field bus types.

Customers can achieve air savings as a result of driving bigger cylinders with reduced cycle times without the need to use larger, more expensive solenoid valves.

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Latest air compressors deliver efficiency improvement

Ingersoll Rand has introduced the new RS30 and RS37 models, the first compressors in a series of new oil-flooded rotary screw air compressors known as the Next Generation R-Series.

The Next Generation R-Series rotary screw air compressors from Ingersoll Rand deliver world-class performance and enhanced reliability, lowering operational costs for those requiring general purpose plant air in support of assembly, manufacturing, mining and conveying applications.

“Our customers are under unprecedented pressure to be leaner, more productive and more energy efficient,” explains Riaan van Wyk, regional sales and services leader for Ingersoll Rand in Johannesburg. “The Next Generation R-Series represents a new benchmark in compressor performance that can greatly reduce our customers’ energy footprint while maintaining reliable compressed air to keep their operations running smoothly.”

The new air compressors improve performance through a state-of-the-art airend – the heart of every air compressor. The new airend design was developed through advanced analytics and modelling, and includes, amongst other things, an optimised rotor profile that can provide an efficiency improvement of up to 13% compared to previous models.

The new rotor profile also contributes to best-in-class airflow capacity, delivering up to 11% more airflow than previous models. The improved airflow creates a more reliable air supply, reducing downtime and increasing production efficiency, even in extreme operating conditions. An enhanced bearing arrangement and sealed drive system further improves performance and reliability, while reducing the maintenance requirements.

The compressors in this series are built to withstand extreme conditions, with an advanced motor design that is engineered for operation in challenging environments. The compressors are available in high or low ambient temperature options.

The newly revised, analytics-modelled airflow and piping system further con-

tribute to energy efficiency by ensuring a low pressure drop. This saves energy and lowers utility bills while minimising sound output to create a safer, more comfortable work environment.

The Next Generation R-Series features the sophisticated Xe-Series controller, allowing easy remote access to, and control of, the compressed air system through a web browser. Users can receive information on compressor performance and events by email, adjust compressor settings remotely and programme compressors according to specific events through real-time clock schedules. This means users can automatically start or stop compressors for shift changes or preventative maintenance.

The new series of Ingersoll Rand compressors also enhances reliability with Progressive Adaptive Control™ (PAC) systems software that continuously monitors key performance parameters and automatically adjusts settings to match the application’s needs. The adaptive controls provide built-in performance analysis for a wide range of load requirements, thus reducing downtime risks.

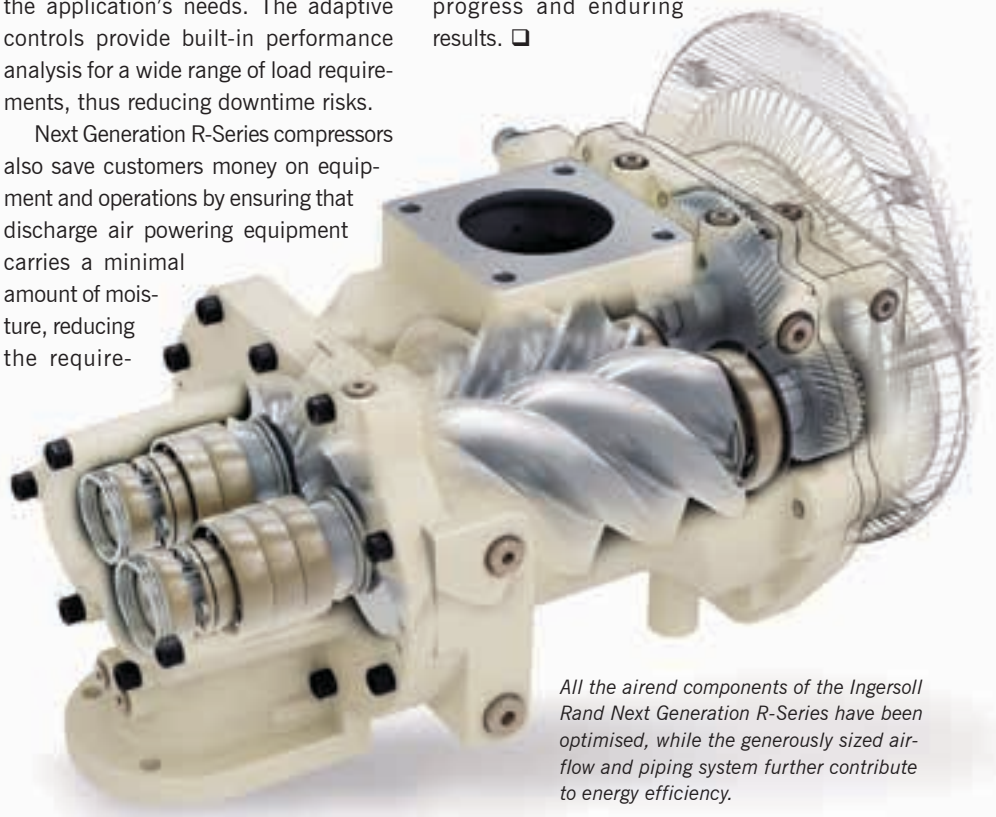
Next Generation R-Series compressors also save customers money on equipment and operations by ensuring that discharge air powering equipment carries a minimal amount of moisture, reducing the require-



The Next Generation R-Series oil-flooded rotary screw air compressors from Ingersoll Rand enhance reliability, improve maintenance intervals and reduce compressor life cycle costs.

ments of large downstream air dryers.

Ingersoll Rand strives to advance quality of life by creating comfortable, sustainable and efficient environments. The company’s brands include: Club Car®, Ingersoll Rand®, Thermo King® and Trane®, which all work together to enhance the quality and comfort of air: in homes and buildings; in transport vehicles; for the protection of food and perishables; and for increased industrial productivity and efficiency. The company is a US\$13-billion global business committed to a world of sustainable progress and enduring results. □



All the airend components of the Ingersoll Rand Next Generation R-Series have been optimised, while the generously sized airflow and piping system further contribute to energy efficiency.

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Two-in-one filter solution for compressed air lines

Atlas Copco Compressor Technique's new UD+ single-filter compressed air solution, which replaces two previous generation filters, offers a 40% lower ΔP pressure drop while removing contamination in compressed air down to 0.01 ppm.

In-line filters are commonly used in industrial applications to decontaminate the compressed air line, removing concentrations of water, dust – and oil in the case of an oil-injected compressor – generally found in compressed air.

The two-filter solution is currently used by over 50% of oil-injected compressor applications to achieve suitable quality compressed air, according to Atlas Copco Compressor Technique's Industrial Air business line manager, Charl Ackerman. "The Atlas Copco general-purpose coalescing filter (DD) removes liquid water and oil aerosols down to 0.1 mg/m³ (0.1 ppm) and particles down to 1.0 μm from the air, which must then be passed through Atlas Copco's high efficiency coalescing filter (PD) to remove aerosols larger than 0.01 mg/m³ (0.01 ppm) and particles down to 0.01 μm ," he explains.

To minimise the energy loss normally associated with compressed air filtration, the filter design must combine maximum contaminant removal efficiency with a minimum pressure drop. Atlas Copco has developed a combined technology in the new patent-pending UD+ cartridge filter solution that is capable of removing contamination in compressed air down to 0.01 ppm from a single filter unit.

"This remarkable solution has been achieved without increasing the size of filter housings and with a net

pressure drop reduction of 40%," emphasises Ackerman.

The secret of the UD+ filter's success lies in a filtration concept known as Nautilus shell technology. While the traditional one or two layers of dense filter media efficiently remove debris, they tend to clog easily, particularly during the removal of wet contaminants. The new nautilus technology is based on spiral pathways for the air to move through; the filter media is wrapped around itself and the filtration area is significantly larger while being less densely packed due to the use of more open, glass fibre media. The filter clogs more slowly, reducing the pressure drop while retaining filtration efficiency.

At a cost of 20% below that of the double-filter system, a 40% lower pressure drop, lower maintenance costs and numerous environmental advantages, Atlas Copco's UD+ advanced technology presents the ideal universal filtration solution for any reticulation line. "Atlas Copco's 2-in-1 nautilus concept is defining new standards in filtration for compressed air lines," concludes Ackerman. □



Questions to ask before leasing equipment

Leasing equipment allows businesses to control expenses and conserve capital. It is appealing as it cuts out variable costs such as capital investment, interest rates, repair and maintenance, insurance and fuel.

Mpho Modjadji Ngamlane, industrial plant rental account manager for Rand-Air, the portable compressed air and power generation rental specialist, believes that the following questions are important in helping to determine how leasing can benefit companies.

How well does the leasing company understand your business? "It is important to partner with a leasing company that considers the factors relevant to the operational and financial needs. At Rand-Air we provide our customers with additional benefits through lifecycle asset management solutions by placing a large emphasis on being valued consultants," says Ngamlane.

What are the needs? "Why lease, what the equipment will be used for and for how long? The length of time of the lease will

help to establish the appropriate level of investment. We find it helpful to perform a cost benefit analysis comparing periodic leasing costs to the revenue generation from using the equipment. This helps in deciding whether or not leasing is a profitable financing option."

What is the process for ending or changing the lease? "Businesses that are looking at changing the terms of the lease need to understand that this could result in penalty charges or additional payments. A master lease facilitates changes in leasing needs and should be considered by companies seeking flexibility."

What are the lease payments and total costs? "The number of payments, the total monthly payments and any additional costs associated with insurance, tax and other charges are important to establish upfront to avoid future misunderstandings."

Can I upgrade or add equipment under this lease and how? "Since the leasing company may require a new leasing contract for additional equipment, businesses

that anticipate growth in the future, should negotiate a clause within their contract to add equipment under the original terms and conditions."

Is it my responsibility if the equipment is damaged? "Contractors should know their business' liability and responsibility for the equipment before signing a lease agreement. This will clarify responsibility for lost and damaged equipment."

Do I have any other obligations for the equipment? "Will the leasing company assume the costs for the equipment's insurance, maintenance, management and taxes?"

At the end of the lease, what are the options and are there any extra costs involved? "Generally, the options are to return the equipment, renew the lease or purchase the equipment at a fair market value. Specifying the preferred option in the original lease is important."

"Gathering as much information as possible at the outset assists in making informed decisions about lease financing and allows users to focus on the optimal use of equipment," Ngamlane concludes. □

Interactive glass to fuse IT and architecture

This article outlines some of the innovations that will be highlighted at glasstec 2016, to be held in Düsseldorf this September. Most notably, ultra-thin glass in thicknesses down to 10 μm is increasingly being merged with IT and used in architectural design.

Touchscreen displays, LED technology and ultra-thin glass developments suggest that the multifunctional diversity of glass is already leading to a merging of IT and architecture. Buildings, residential houses and public roads will incorporate information media and control elements. Buildings will carry information on their façades about the activities taking place inside. Road surfaces will automatically indicate and respond to hazards, displaying appropriate signs or messages – and these same roads may also provide households with electricity.

Glass façades that turn into projection screens delivering interesting information to the residents inside and passers-by are no longer visions of the future, they are technically feasible today. Architects of prestigious buildings no longer see a façade as a design element that conceals something. Rather, they include the façade in their modelling, giving it an interactive function. In doing so, they let themselves be guided, not only by energy efficiency and sustainability, but also by the benefit of glass as part of an IT system.

James Law, an architect from Hong Kong, calls this new type of architecture 'Cybertecture'. One of his projects currently under construction is Parinee I in Mumbai, India – an office centre that, in the future, will primarily be used by creative minds in the Indian film industry. Thanks to LED technology, the finished building will be an advertising medium of everything that is conceived within it. The façade engineering for this unique 160 m tower block is being provided by the international construction engineering house, Arup. The building has over 3 700 m^2 of multimedia displays and LED screens as well as lighting functions.

The interactive display panels can be combined to form bigger areas or each can display different content, independently. Passers-by do not need invita-

tions, but can share, for example, in a première celebration being held inside via real-time footage of celebrity guests displayed on the façade.

Needless to say, the transparent glass used for such façades can also let sunlight into the premises. Centrally controlled, the incident light is automatically adjusted to the time of day to control the building's temperature and to minimise energy consumption and reduce CO_2 emissions.

Solar roadways

There is a car park in the United States that, visually, reminds one of a beehive. The surface consists of honeycomb-shaped panels made from armoured glass with a load-bearing capacity of 1 500 t each. The road surfaces visibly light up, showing arrows, blocked zones and pedestrian crossings, both day and night. The panels contain solar cells that are charged by daylight. At night, they give energy to the LEDs integrated into the glass on the road surface. As a result, the markings remain clearly visible, can change colour to suit the situation and can flash to indicate, for instance, danger. The solar modules can also pass on saved energy to the panels in the form of heat, keeping the surface free from snow and ice in winter.

It may sound surprising, but this car park already exists. It is the test space for Solar Roadways, a project set up by Julie and Scott Brusaw from Idaho (USA). According to the couple, 1.0 km of road containing Solar Roadways' material would be sufficient to supply electrical power to 1 000 households.

In fact, the load-bearing capacity of this surface makes it technically suitable for use on an airport runway. And the resulting electricity could be used to charge electric airport vehicles.

The project is currently attracting ever-increasing support from the US administration and people are being



Parinee Tower is a lighthouse project centred on Indian film production in Bollywood, Mumbai. Photo: James Law Cybertecture International.

encouraged contribute financially through crowd funding.

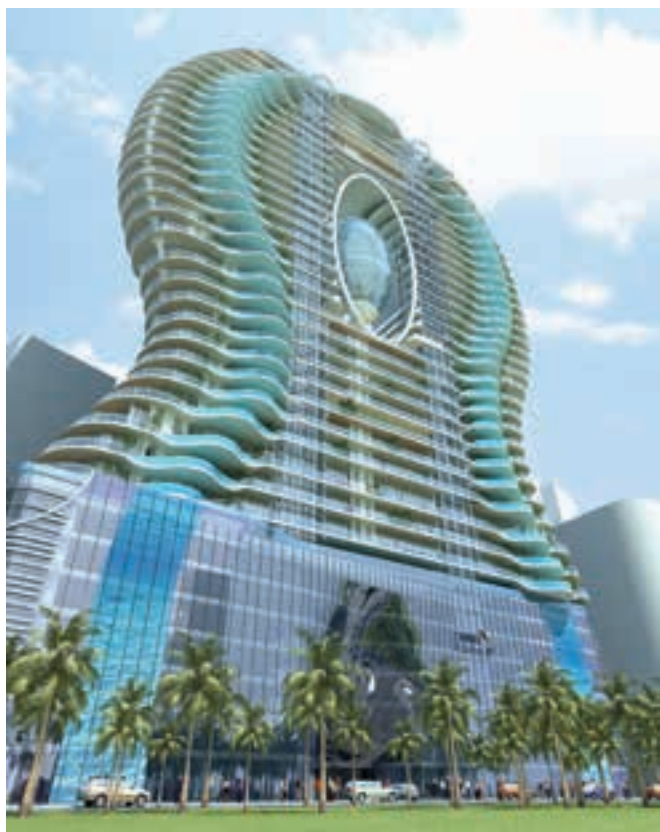
Clear vision in the car

This is a project developed by a team of researchers from the Massachusetts Institute of Technology (MIT) in the United States headed by Professor Geoffrey Grossman. The glass can react to sunlight to automatically produce shade, to light up or to transform the incoming light into electric power.

The Bavarian car manufacturer BMW has a major interest in this development. It is seeking a transparent and flexible carrier material that will make it superfluous to scrape ice off their cars – a laborious job that can take some time.

According to the team of MIT researchers, the carrier material has a thickness of less than one millimetre. It consists of chemical substances that can absorb energy and then give it off again in response to a defined stimulus, which may be electronic, acoustic or tactile. In the future this material can be used for coating car windscreens, absorbing and storing daylight and then releasing it again on demand, in the form of heat. Once activated, the glass becomes 10 °C warmer than its environment.

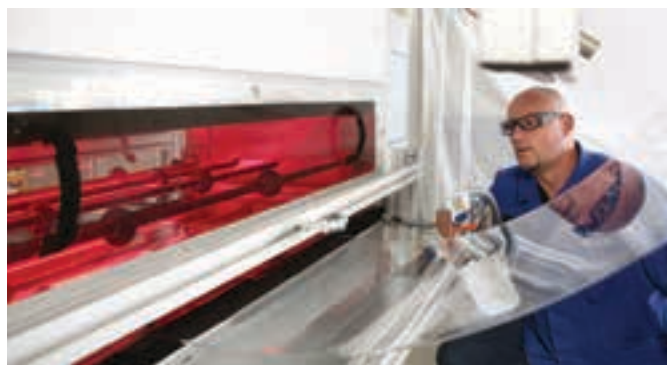
According to Grossman, the material



Bandra Ohm will be a residential tower block, shaped like the Greek letter omega and inspired by the fluidity and movement of water. Photo: James Law Cyberecture International.



This is what a city street might look like with a combination of different display elements on the solar roadways of the future. Photo: Scott and Julie Brusaw.



SCHOTT makes ultra-thin glass using a down-draw process, where the glass is continually drawn directly from the smelter through a nozzle, forming a glass ribbon. This ribbon is then coiled for further processing. Photo: SCHOTT.

can be made powerful enough so that the absorbed energy can be used to increase the range of an electric vehicle.

Display screen glass technology

Everyone has display screen glass at their fingertips on a daily basis, whenever they use their smartphones. In Germany alone it is used by 44 million citizens – and the trend is still upward.

It seems that wherever we go we are continually accompanied by ultra-thin display glass. And, of course, it needs to be particularly impact-proof and scratch-resistant, so that it can withstand normal stress. We also want it to feel good and be easy to clean – and it needs to weigh as little as possible. This creates a rather difficult balancing act for the producers.

Glass continues to be an unrivalled material for touch screens. But we are seeing more and more power and functionality having to be accommodated in fewer and fewer square centimetres of space. This means that the heat produced by our devices is increasing due to ever more powerful, yet smaller electronic components. The solution to the problem is ultra-thin display glass, glass being an ideal material for retaining its stability and shape despite rising temperatures.

The secret of thin glass is in the ma-

terial composition. The constituent that has gained ground in the glass industry is aluminium silicate, which is highly resilient and reduces reflection. Multi-touch screens are produced from float glass that has been chemically pre-stressed via ion exchange. A semiconductor film is then attached to the glass to add optical and capacitive properties.

Production gets even more delicate when we look at ongoing developments in ultra-thin glass. Operating under the name KONFEKT, three major companies in the industry – SCHOTT AG, tesa SE and Von Ardenne GmbH – are currently working on a project to develop ultra-thin glass for use in organic electronics and OLED applications. The project is supported by the German Federal Ministry for Education and Research.

The aims are ambitious, researching all the various manufacturing and finishing processes in connection with 'glass from the roll', and indeed in such a way that glass can be used for functions in organic electronics, such as OLED technology. Users particularly appreciate the basic properties of glass, i.e. it is impermeable to gas and water and can protect sensitive componentry from moisture and oxygen ingress.

The underlying process has been de-

veloped by the German glass manufacturer, SCHOTT, which is using a down-draw process, whereby a glass sheet is drawn down through a cooling section. Accurate process control is applied to achieve the tightest of manufacturing tolerances with respect to uniformity of thickness for large yet very thin surfaces. The process makes it possible to produce glass to a thickness of 25 μm – half the thickness of a human hair (50 μm). Applications are already being found in biotechnology and sensor applications and the material is now available in sheets, wafers or rolls.

Innovations and further developments of ideas such as these we will be showcased at glasstec 2016 in Düsseldorf from 20 to 23 September, with selected outstanding innovations being highlighted at a symposium called Glass Technology Live on 21 September, being held under the auspices of the VDMA Glass Technology Forum. □

The glass can react to sunlight to automatically produce shade, to light up or to transform the incoming light into electric power. BMW is seeking a transparent and flexible carrier material that will make it superfluous to scrape ice off their cars.

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Materials engineering in practice: What's in a number?

In this month's column from Wits' School of Chemical and Metallurgical Engineering *Tony Paterson* discusses the overlap in properties of differently classified structural steel grades and highlights the use of his department's Gleeble materials testing system to better quantify operational material properties.

Steel grades are described by alphanumeric descriptors. These differ between classification systems. Last year I was asked to verify that a contractor had used the correct structural steel. The chemical composition had been determined, but this composition could have covered structural steels with a yield variation of up to 50%. Tensile tests were requested and proved decisive. The correct steel had been used.

This is a reality for structural steels developed over the past three decades. As metallurgy has improved the understanding of the chemistry/structure/property processing performance relationships has expanded and manufacturers have developed increased reliability and predictably in production.

Through mechanical and heat treatment processes, structural steels with higher stress capacity have become commercially available. Considering steel structures over decades one can see the progressive introduction of lighter more highly stressed members. The effect has been to increase stresses on welds and to increase deflection. When structural sections were heavier, deflection was masked by scale. This all means that welding management has become more important.

Modern structural steels derive their mechanical properties from a combination of chemical composition, thermo-mechanical processes such as hot rolling of sheet or sections, heat treatment and the final manufacturing processes such as stretching. The effect of heat treatment is best explained by reference to the various production process routes that can be used in steel manufacturing, where the main products are as-rolled, normalised, normalised-rolled and thermo-mechanically rolled (TMR) steel. The effect is that different structure and property characteristics can be generated from steels with very similar compositions. An example of three locally produced

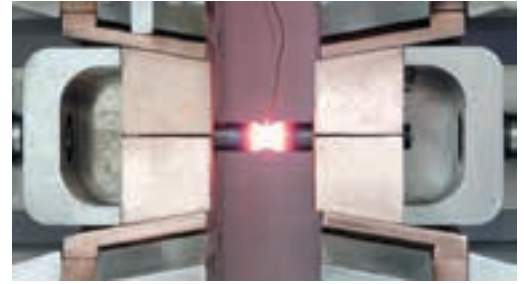
steels demonstrating a variation of 50% increase in yield of strength is shown in the table below.

This issue is exacerbated by the impact of world trade. Steels with near identical composition manufactured by different companies in different countries described by different nomenclature compete in the world market. This makes engineering selection more complex as seemingly equivalent material may act in different ways.

The tacit simplifying assumption of structural designers is a homogenous, isotropic material. Finite element programmes do not differentiate between the wrought nature of the wrought major structural components and the cast structure of the welds used to join the components. Whilst we have the FEA design tools, we do not have enough information about the material properties, particularly in the important joint regions where stresses often peak as they change direction. Within wrought materials, the hot rolling direction is also important. Whilst metallurgists know that the simplifying assumptions are not representative of the materials, the question of their significance against other uncertainties, such as loading, arises.

Current research at Wits intends to explore the variability of output of a single grade including the variations induced by tolerance levels in hot working temperatures and by structural differences in the sections themselves.

Five sets of sample plates from successive different batches of S355 steel from the same manufacturer have been secured. The research builds on the Gleeble's ability to reliably repeat sets of heating, holding and cooling conditions. Within each batch, eight sets of samples



The Gleeble is a fully integrated digital closed-loop thermal and mechanical testing system that has the ability to reliably repeat sets of heating, holding and cooling conditions.

can be tested, four in the rolling direction and four transverse to the rolling direction. Each set of four are then tested as parent material; perfectly matched filler with perfect weld (parent material simulated weld); mechanised SAW weld, and manual welding. A subset of experiments on the 'perfect' weld, will also investigate the impact of atmospheres, the distinction between welding in a relative humidity of 30-40% and a relative humidity higher than 60%.

Whilst not part of the experiment under consideration, other work will consider the impacts of active gases on metallurgy, with the atmosphere as one active gas. Not all active relationship between gases and the weld pool are positive. High relative humidity, i.e, water vapour, is one example where potentially adverse reactions can occur.

Each sample will be subjected to a suite of rates of heating, holding and cooling representative of typical welding processes. What will be measured? As the standard samples are 11.1 mm square and 71 mm long, the samples can be subjected to impact and tension tests after welding simulation to determine mechanical properties. Similarly the samples can be sectioned to determine microstructures.

With sufficient samples and sufficient numbers of data points, we will be in a better position to model the impacts of rolling direction, of welded joints and of the impacts of different atmospheres.

The long-term intent is to better inform structural engineers about material properties so that FEAs used to design structures can better represent actual material properties. □

Strength grade	C%	Mn%	P%	S%	Si%	CEE
S235	0.22 max	1.60 max	0.05 max	0.05 max	0.05 max	0.49
S275	0.25 max	1.60 max	0.04 max	0.05 max	0.05 max	0.52
S355	0.23 max	1.60 max	0.05 max	0.05 max	0.05 max	0.50

Stainless steel handrailing: accident and maintenance free

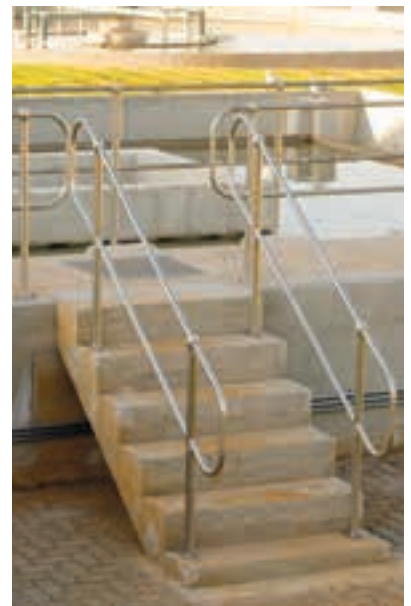
Recognised and accepted as the handrailing of choice in the food and beverage, cosmetic, mining, petrochemical and sewage industries, the Mentis stainless steel tubular handrailing system is corrosion resistant and maintenance free.

Elaine van Rooyen, marketing manager at Andrew Mentis, says that stainless steel handrailing has become increasingly popular in certain applications. "Stainless

steel offers excellent stain and corrosion resistant properties and is an attractive alternative to traditional mild steel or painted handrailing systems," she says. "In addition, where handrailing is corro-

sion resistant the wear normally associated with standard handrailing installed in metal unfriendly environments is inhibited, so accidents associated with broken handrailing will be excluded."

Mentis' 304 stainless steel and 3CR12 handrailing systems are completely different to the company's standard mild steel



Stainless steel handrailing has become increasingly popular in applications such as wastewater treatment plants.



Mentis' stainless steel tubular handrailing system is corrosion-resistant and maintenance free

handrailing system. The stanchion is 44.5 mm in diameter with a 2.0 mm wall thickness and is formed from a single length of tube. The centre hole for the knee rail is drilled and then flared on both sides. The top is also flared and a half round cap is welded into place. The base plate is 8.0 mm thick and welded to the tube.

"The stanchion base plates are designed to allow moisture to drain from the stanchion itself, adding to the corrosion resistant benefits," van Rooyen says.

This Mentis stainless steel handrailing system has clean, modern lines and stanchions are supplied in a range of standard angles with accessories to match. The bends and closures available for the mild steel system are also available for the stainless steel system. This approach, manufacturing a variety of components, offers versatility with different bends and end closures available. The hand, knee rail and bends are manufactured from 31.7 mm tube with a 1.5 mm wall thickness. Bends and closures have swaged ends, again allowing faster installation and preventing moisture from entering the joints.

The components of the tubular handrailing system are manufactured to allow ease of installation and no special tools are required.

"This system is available in 3CR12, 304 and 316 stainless steel polished to a satin finish. This choice of grades offers almost unlimited versatility for interior and exterior commercial applications," van Rooyen concludes. □

Stainless steel cable ties keep order on solar farm

Transformers have exposed cables running from all the devices that measure temperature, voltage and gases. These wires need to be effectively channelled to a central box using a strong, durable cable bundling solution, such as Banding & ID Solutions Africa's tough multi-lock cables, which are being used at a large solar project in the Northern Cape.

The project, located in Prieska, is the third solar power plant constructed under the South African government's renewable energy procurement programme, in an effort to achieve the country's renewable energy goals and contribute significantly to the electricity grid. Construction of the Prieska solar project began in April 2015 and is set to be completed by the end of 2016.

Transformers play an important role in reducing high voltage electric-

ity that is received from power lines into the substations. The transformers supplied to the solar farm have cables running through them that hang loose and stand a chance of being damaged or becoming defective. Therefore, the multi-lock cable ties supplied by Banding & ID Solutions Africa ensure that the cables are organised, reducing the chance of errors from the transformers.

Banding & ID Solutions Africa business manager Rosa Remendos notes that the company distributes and manufactures Band-It stainless steel strapping and buckles under license from USA-based Band-It-Idex, a world leader in quality engineered band clamping and fastening solutions. "Band-It cable ties are made from high-strength, corrosion-resistant 316 stainless steel coated with Nylon 11, which has excellent chemical and weathering resistance for long life expectancy," she says. □



Plastics initiative to boost quality and productivity

DPI Plastics, a leading manufacturer of PVC and HDPE water reticulation and drainage pipe and fitting systems, has embarked on various capital-intensive projects to boost the quality and productivity at its Johannesburg and Belville manufacturing facilities.

These initiatives include an ongoing mould replacement programme in Johannesburg, which has seen the production of a brand-new mould for 50 mm bend pipe fittings.

"We are replacing some of the older moulds and fittings, in most cases opting for new multi-cavity moulds," Renier Snyman, sales and technical manager at DPI Plastics, explains.

"First of all, this will improve the quality of the fittings, without altering the dimensions. Secondly, it will also result in a dramatic increase in production output," Snyman points out.

"This is quite a capital-intensive programme as these moulds are costly to produce." Snyman reveals that DPI Plastics will take delivery of its new P-trap mould from Portugal within the next couple of months.

Another important development at this

leading pipe system and fitting supplier and manufacturer is the addition of a second large-bore extrusion line at its Johannesburg manufacturing facility. This follows on from the installation of the original Krauss Maffei 630 mm bore extrusion line in 2013.

"Our big bore lines are so highly occupied at the moment that it has resulted in longer lead times, which is the main motivation for us to install another large-bore line," Snyman says. This will also help to cater for larger projects, such as the DPI Plastics' current contract to supply 630 mm pipe for a major irrigation project in Zambia.

Snyman says that, in addition to the new big bore line, DPI Plastics will be adding a new smaller extrusion line dedicated solely to research and development purposes, which makes the company unique among pipe manufacturers in South Africa.

"This will not only speed up the production process for new products, but also intensify our focus on innovation as a company strategy. No other pipe manufacturer has these kinds of facilities for research purposes, and neither do they make significant investments into ongoing R&D," Snyman concludes. □



Napoleon Potlo, production manager for injection moulding at DPI Plastics.

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Engineering excellence from

Murray & Roberts Cementation is currently sinking two vertical shafts and a decline to take the De Beers Venetia Diamond Mine in Limpopo Province underground. In response to the traditionally onerous, high-risk and labour intensive methods used, the company has introduced a series of innovations that are likely to change the way shaft sinking is done in South Africa forever. *MechTech* talks to Murray & Roberts Cementation's Japie du Plessis, project executive designate and Jan Vermaak, mine engineering manager.



Japie du Plessis and Jan Vermaak.

Murray & Roberts Cementation has been in the South African and global mining industry for more than a century and is a reputed leader in mine access development, contract mining, raise- and shaft-boring technology and related mining services.

"But with regards to sinking operations of vertical shafts, there have been very few game changing innovation over the years," says Du Plessis, adding that the process has long been based on drilling blast holes on the shaft bottom using shaft drill rigs designed 30 years ago; the laborious and dangerous loading and hoisting of blasted rock; and the difficult manual handling and alignment of shaft shutter formwork before the concrete lining can be poured.

"We have carefully looked at current methodologies and technologies and put together a series of clever innovations to make pre-sink and main-sink shaft construction safer, quicker and less labour intensive," he tells *MechTech*.

Murray & Roberts Cementation's new pre-sinking method

At the heart of the company's pre-sinking innovation was the development of what is now known as the pre-sink gantry: "This was a challenge put to our very experienced and competent Murray &

Roberts Cementation team of engineers. Not only were the challenges technical, but the goal was to fully comply with all health and safety regulations and mining legislation.

"From the outset, the team agreed to challenge the status quo at every opportunity and to focus not only on the hoisting system, but to also look at all the operations that are carried out during pre-sink operations," Du Plessis says.

Describing the conventional shaft pre-sinking process, he explains that hand-held S25 rock drilling machines were traditionally used to drill a pattern of blast holes. Initial access to the shaft bottom is by means of ladders until a depth of 25 m has been reached, after which the working platform, or stage, is introduced to the shaft-sinking operation. This stage is normally suspended from beams on the bank level. Blasted rock is loaded into kipples with 5.0 t capacity using Eimco 630 pneumatic rocker shovels. The loaded kibble is then hoisted out of the shaft with a Scott Derrick crane, which has the ability to slew away from the shaft to allow the rock to be emptied into a dump truck.

The new Murray & Roberts Cementation pre-sink gantry that was deployed at the Venetia project combines stage and kibble hoists and the blast cover handling operations into one rail-mounted gantry. The stage is suspended from the gantry on steel wire ropes attached to two 8.0 t stage winders mounted on purpose-built platforms to the sides of main girders in double fall.

Before blasting, the stage is raised out of the shaft to a height clear of the shaft collar. The gantry, which is physically connected to the blast cover, is then moved on its rails to the side of the shaft, rolling the blast cover into place over the shaft.

After blasting and clearing the shaft of



the blast fumes by means of forced ventilation, the gantry is rolled back across the shaft. The fully equipped stage, which is automatically aligned and very accurately positioned via a fully integrated PLC, is then lowered back into the shaft to the required depth.

The main hoist of the gantry, used for kibble hoisting and slinging, were custom designed to enable a pre-sink of up to eighty meters below collar elevation. It is able to raise and lower a kibble with a 10 t payload at a conveyance speed of 0.5 m/s.

Also incorporated into the gantry system is an automatic tipping frame. "In the past, a man had to physically hook the lazy chain onto the kibble when it arrived at the surface to allow it to be emptied," Du Plessis explains. "Now, the kibble is slewed into its docking position where it is automatically positioned and hooked onto the frame. Then, by lowering the hoist, the bucket is tipped, discharging its 10 t load into a 20 t truck below. Since 200 t of rock needs to be excavated per blast during pre-sink, this streamlined

SA's shaft sinking specialist



Above: The vertical shaft mucker (VSM): The use of VSM systems with clamshell muckers at Venetia is a South African first.

Left: A view of the Venetia headgears for the production and service shafts.

Right: The vertical drill rig (VDR): Murray & Roberts Cementation has incorporated mechanised drilling systems underneath the pre-sink stage.



loading system significantly reduces risk as well as tipping cycle times.

Since Murray & Roberts Cementation's pre-sink gantry is rail mounted, on completion of the first pre-sink operation at Venetia, it was possible to transport the entire system on temporary rails to the position of the second shaft. "For Venetia we drove the whole set-up, including the stage and the portal cranes, across to the new pre-sink site at the mine. The set up stage for the second pre-sink was completed inside of five days, a process that used to take us up to a month," Du Plessis reveals.

Turning attention to innovations on the pre-sink stage itself, the company has also significantly improved the safety and effort required for drilling. "We have incorporated mechanised drilling systems underneath the pre-sink stage. The system consists of six vertical drill rigs supported on swivel arms suspended underneath the stage. Each operator guides the drill and manoeuvres it to match the pattern of holes required for the blast. An inline pneumatic air leg on

the rock drill extends to create thrust on the rock drill between the stage and the floor and, after drilling, for drill retraction. Much less physical effort is involved and the operator simply guides the drill's position – and there are no longer any manual drill operations on the shaft bottom," Du Plessis explains.

Also simplified is the shaft lining process: "Previously, we had to handle the shuttering and formwork from rigger mounts drilled into the shaft lining. But we have now developed proprietary shuttering, suspended from the sinking stage. The shutter depth is 6.0 m, thus after each 6.0 m of excavation, the shutter is positioned 12-18 m above the shaft bottom – and this shutter can be left in place during drilling and blasting operations," says Du Plessis.

The shuttering is suspended from the lining above using suspension rods, which remain embedded in the concrete lining after pouring and protrude through the shutter at the bottom. To seal the bottom end of the shutter, scribing support bars are pushed out towards the

sidewalls, curved scribing planks are laid and fine steel mesh is used to seal to the rock interface. A series of steady brackets between the formwork and rock holds the shutter securely in place to contain the self-levelling concrete while it sets.

Air hoist are used to hold the top section of the shutter in position in preparation for concrete pouring. The concrete is then poured into the shuttering using concrete kettles, or kibbles, to supply the concrete from surface. Once the concrete has settled, the shuttering is ready to be moved to the next position. The key

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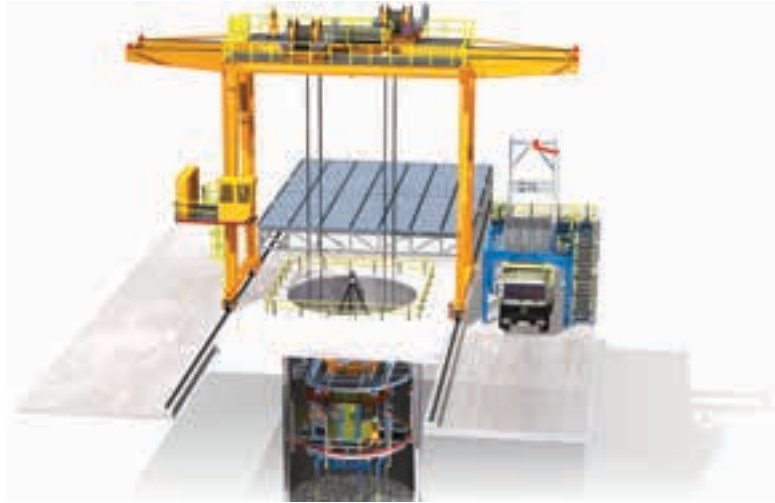
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An illustration of the gantry: The stage is suspended from the gantry on steel wire ropes attached to two 8.0 t stage winders mounted on purpose-built platforms to the sides of main girders in double fall.



The new Murray & Roberts Cementation pre-sink gantry that was deployed at the Venetia project combines stage and kibble hoists and the blast cover handling operations into one rail-mounted gantry.

plate bolts are loosened, the curb ring is removed and the whole system is lowered a further 6.0 m. Via screw couplings, a new set of suspension rods are attached to those protruding from the set concrete and the formwork is re-assembled in the new position.

“Both pre-sink operations for the Venetia Underground project have now been successfully completed,” says Du Plessis.

Main sink innovations

Murray & Roberts Cementation's mine engineering manager, Jan Vermaak, proceeds to tell *MechTech* about the company's additional innovations for main sink operations. “Once we are finished with pre-sinking, we erect the full headgear for the main sink. For the main sink we use a five-deck stage, which is 22 m high and it weighs 75 to 80 t, unequipped.

“With the introduction of stage-mounted drill jumbos, the stage does not need to be moved up the shaft for the traditional excessive distance during the blasting operation. We can now drill a burn cut round as opposed to the traditional V-cut round. Thus, the stage is only raised to a level 50 m above the blast area since we do not create the fly rock we experienced with the V-cut drilling pattern,” Vermaak says.

Conventionally, in Africa and all around the world, shaft-sinking companies make use of cactus grab muckers to lift and load blasted rock into kibbles. “This is another high-risk machine, because the cactus is on a steel wire rope that has to be swung and dropped onto the rock pile by operators. It is, therefore,

inherently unsafe as it requires many people in the bottom of the shaft for the manual manipulation of the kibbles,” Vermaak says, adding that it is also labour intensive.

Murray & Roberts Cementation therefore decided to abandon this technology in favour of a more modern technology developed by colleagues in Canada. Called a vertical shaft mucker (VSM), the big advantage of this technology is the use of clamshell muckers to lash the rock. “The operator is positioned vertically above the mucker, so the whole unit is aligned for easy and accurate positioning of the clamshell and the safe transfer of rock to the kibble. The operator has full visual cover of the working area below him. Two systems with full manoeuvrability are used simultaneously, to push kibbles into position, and only one person is now needed on the shaft bottom to manage the connection and disconnection of the kibbles. The two VSMs are used in tandem to position the kibbles correctly in the bottom,” Vermaak says, adding: “the use of VSM systems at Venetia is a South African first.”

Also differentiating Murray & Roberts Cementation from its competitors is the drop-down fifth deck. “While all other main-sink stages have the cactus grab suspended underneath the fifth deck, we have added an additional flat concrete deck, that can be dropped down and covered to simplify shuttering and lining processes,” he continues.

“When we do the concrete lining, we need to scribe the whole area around the walls. The scribing bars and other equipment have to be passed down through the kibble opening. This is traditionally

done off the third deck, but this space is very cluttered and work has to be done around kibble holes, guides and screens.

By removing the cactus grab from below the stage and making use of VSMs instead, “we have been able to add a flat deck that can be lowered with covers for the kibble hole openings”. All of the holes are covered to create a flat unrestricted surface to work from. While assembling the concrete deck, the workmen “go down with full body harnesses, which are attached to dedicated life lines provided for this purpose”. But once the shutter plates are lowered and positioned, these act as safety barriers for the lining process.

“We also use a self-blinding mesh to blind the gap and prevent concrete leakage. In addition, we have developed our own self-levelling concrete to avoid having to use vibrators for compacting,” Vermaak informs *MechTech*. “And we bring this concrete down in a concrete kibble instead of having to use concrete supply pipes from the surface, which cause the concrete to arrive at the shaft bottom under very high forces,” he says.

Du Plessis concludes: “While key advantages of these innovations are that fewer people are needed and the shaft sinking can be completed more quickly and economically, we have also managed to significantly reduce the safety risks and improve the working conditions of our workers in the shaft.

“For us, this constitutes engineering excellence by a special group of people that, under huge pressure to meet specific project deadlines, has managed to conceptualise, design and fabricate a system that is way beyond previous generation technologies,” he says. □

Maintenance-free heavy-duty QF couplings

“Timken Quick-Flex industrial couplings are designed for efficient performance in diverse applications – from light duty, high speed/low torque drives, to extremely heavy duty, low speed/high torque drives,” says Carlo Beukes,

general manager: drive belts & iron-ware divisions, BMG. “The primary purpose of couplings is to transmit torque from a driving shaft to a driven shaft and to accommodate shaft misalignment within the drive. Couplings also dampen vibration, torque fluctuations and torsional shock loads, even in arduous applications.

These Timken Quick-Flex (QF) couplings consist of two steel coupling hubs, which are attached to the drive and driven shaft. A urethane element wraps around the two hubs and provide a simple, yet effective drive mechanism. The only spare part required is a standby element that can be quickly changed when necessary.

Inserts, which are resistant to chemicals, are manufactured from different grades of urethane to suit various industries. The red insert is suitable for most high-speed applications with high levels of vibration, the stiffer blue insert is designed for higher torque applications and the black insert can withstand extremely

high torque requirements, replacing grid and gear couplings.

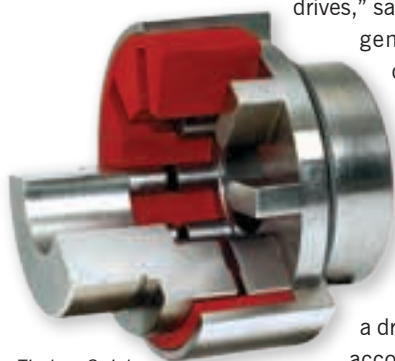
An advantage of these flexible couplings over conventional units is that they can directly replace virtually all comparable sized couplings. QF couplings require no lubrication and are easy to install and maintain. Due to the high torque capacity of this range, the selected QF solution is often smaller than the replaced coupling. This leads to a weight saving on the drive and also reduces stress on other components.

Three different elements per size are available, each with a different torque rating. Important features include: excellent balance allowing for high-speed applications – up to 12 000 rpm; low maintenance with no lubrication requirements; and reduced downtime. These couplings accept angular misalignment

of up to 2.0° and parallel shaft displacement of up to 7.92 mm.

Once the two coupling hubs, the insert and the cover have been installed and aligned for the first time, the coupling hubs do not need to be moved again for the life of the equipment. Unlike a standard jaw-type or gear couplings, there are no metal-to-metal contact points between the hubs. This prevents any possible damage to the ironware during an element failure. The urethane insert can be easily changed without moving the hubs or shafts and no re-alignment of components is necessary.

Quick-Flex couplings are compatible with shaft sizes from 10 to 286 mm and can accommodate a speed range from below 100 to 12 000 rpm. Torque ratings range from 43 Nm to 188 795 Nm, depending on the selected element and cover design. www.bmg.co.za



Timken Quick-Flex couplings are designed for efficient performance in diverse applications.

Pneumatics training course schedule released

SMC Pneumatics has released its training schedule for 2016, which boasts three to four day courses in Johannesburg, Durban and Cape Town. From April 2016, customers can undergo quality training courses at SMC’s new state-of-the-art training facilities presented by a dedicated and qualified training team with national training manager, Riaan van Eck, at its helm.

Courses include: Basic pneumatics, Electro-pneumatics, Basic hydraulics, Electro-hydraulics and Mechatronics. Additionally, SMC Pneumatics also prides

itself on the constant pursuit of customisation and thereby offers special training courses should businesses require a tailored curriculum.

“By designing our curriculum to meet the changing needs of the industry, we are able to offer comprehensive up to date courses that can truly drive business value.

“All of our courses cover the relevant, key aspects of fluid power and mechatronics – ranging from basic theory to practical examples – to ensure that our customers are kept in-the-know and are able to use our products and applications to the best of their abilities,” says van Eck. www.smc Pneumatics.co.za

Largest tool range under one brand in SA

The largest single-brand tool range in South Africa is currently available from Jonnesway, which is distributed by Bearings International (BI). This extensive range caters for the aviation, industrial, automotive and refinishing industries. It comprises a complete automotive, pneumatic and hand tool range.

“Jonnesway promises quality in order to meet professional market demands. This forms a key part of our strategy to be a total solutions partner for our customers,” says Lucas Pretorius, product manager for Jonnesway at BI.

Specialised tools from Jonnesway include automotive kits, body tools, bearing-related products, brake and suspension undercar tools, electronic tools, files, garage and workshop tools, as well as hydraulic gear and bearing pullers.

Pneumatic power tools from Jonnesway

include air grinders, air ratchets, air saws, knives and hammers, air control units, air screwdrivers, drills and impact wrenches. The professional hand tool range consists of bit sets, combination wrenches, standard and impact sockets, hex key sets, heavy-duty screwdrivers, various types of pliers and toolbox sets.

Jonnesway tools are manufactured to meet and exceed DIN and ANSI standards and include both metric and imperial sizes. The brand is also very competitively priced in the professional tool market, with a lifetime warranty on hand tools.

Jonnesway is the official tool brand for the World Skills competition, as well as being the preferred brand for various global training centres, including the Imperial Training Academy and the MATA Aviation Training Academy. www.bearings.co.za



Riaan van Eck, training manager for SMC Pneumatics South Africa.

Fluid couplings for platinum mining applications

The most widely used hydrodynamic power transmission technologies used in modern platinum mining are fluid couplings and Voith's high-quality range of hydrodynamic-based power transmission solutions, which are now available to the sector at considerably reduced costs.

This follows Voith having successfully completed a cost optimisation exercise on a global scale, following a year-long focus on internal optimisation processes – commercial manufacturing, business cost optimisation and rationalisation.

According to Voith South Africa area sales manager, Gary Allison, quality has not been compromised in any way. "There has been absolutely no compromise on quality in terms of materials, processes and manufacturing. Instead, we used advanced algorithms to determine where smaller components could be used to reduce cost, without affecting performance."

The hydrodynamic principle of a fluid coupling allows driven machines to be more gently accelerated. Fluid couplings limit torque, provide load sharing and dampen torsional vibrations. This protects the drive system from damage – even under extreme operating conditions – while reducing downtime and ensuring an uninterrupted production process.

"Our drive solutions are reliable and specifically tailored to each drive system, from individual couplings to complete driveline solutions. With transmittable



The Voith TVVS fluid coupling is predominantly used on belt conveyor drives for the mining and materials handling sectors.

power from 300 W to 6.0 MW, our fluid couplings are ideally-suited to the platinum sector," adds Allison.

Despite a sluggish market, Allison is optimistic that Voith will achieve long-term growth in the platinum sector. "Projects are currently limited, as there are no new mines or shafts being built. This is being globally driven by commodity prices. Companies have to optimise their resources to stay afloat – and this is where our cost advantage plays a major role."

What also sets Voith apart is its aftermarket service. "In tough times, operations need to be able to rely on suppliers that provide full back-up and on-site product support when required. This forms part of our value-added service offering, which is a major driver in maintaining contracts and winning new ones when markets turn," Allison concludes.

www.voith.com

Micromine student wins Dublin poster prize

Fourth year student Chloe Mitchell put Micromine to use in her Master's project 'Comparison of the style and nature of breccia-hosted Ni-sulphide mineralisation within the Munali intrusion, Zambia' and consequently won this year's Mineral Deposits Study Group (MDSG) student poster prize at the annual winter meeting in Dublin in January 2016.

Mitchell used Micromine's implicit modelling functions to predict the location of the feeder zone of the intrusion, in pursuit of additional resource potential. "Micromine was really useful in determining the morphology of the ultramafic intrusion surrounding the Munali gabbro. I was looking for any indication that the feeder zone to the intrusion might be located beneath the Enterprise mine, so I entered the drill-hole data into the drill-hole database and used the

lithological intersections to show where the ultramafic intrusion was beneath the surface. I think the model shows the potential feeder zone really well," reported Mitchell.

From this 3D model, Mitchell was able to identify a potential feeder zone and thus suggest an area for further exploration. "I chose implicit modelling because I wanted to create surfaces from lithological boundaries in the drill-hole data and I had read that this was the best way to do so. Also, the implicit modelling tool was really easy to locate and follow, and I was able to experiment until I had created a shape that I was happy with," she explains.

When asked what Micromine features and benefits she found most useful, Mitchell said, "Generally, just how user-friendly the program is, and how I managed to navigate my way around

Agri Hubs for slurry fertiliser discs

The new SKF Agri Hub for fertiliser injector discs has been specially engineered to boost farm productivity and profitability through increased performance and improved machine uptime, while minimising the impact on the environment.

Under mounting pressure to increase yields and keep input costs to a minimum, farmers look to OEMs for equipment that delivers ever-greater reliability, efficiency and performance. "This can be a challenge, particularly for slurry fertiliser discs, which operate under extremely harsh and corrosive conditions," says SKF key accounts manager for agriculture, Charl Engelbrecht.

He explains that, typically, these machines incorporate conventional metallic hub assemblies to mount the cutting disc onto the slurry fertiliser injector machine. "However, the low corrosion resistance and poor sealing performance of these conventional units often result in poor reliability and premature failure. The seasonal replacement of these units is an expensive exercise for farmers with respect to time and money."

To overcome these challenges, SKF has specially designed and engineered the Agri Hub for slurry discs. These independent fertiliser spreader disc attachments feature a corrosion and water resistant glass fibre-reinforced polyamide housing for improved reliability and extended service life. The fact that this unit is greased for life means no re-lubrication is required, saving the farmer time and lubrication costs.

SKF's Mudblock seal and advanced hub bearing unit seals achieve excellent sealing performance, keeping the soil from being contaminated. In addition, the Agri Hub is 50% lighter compared to a metal unit of the same dimensions. Combined, these features result in a highly reliable, corrosion-resistant, cost-effective, maintenance-free unit that is easy to install.

www.skf.com



it having done the Micromine module that the University of Leicester offers. Micromine helped me to visualise in 3D and present data to allow other people to clearly see the shape of the ore body."

Says Dave Holwell, senior lecturer in applied and environmental geology at the University of Leicester, "We have been using Micromine in our teaching now for three years, to unanimously positive feedback from students about its user-friendliness and the chance to develop industry-relevant technical skills."

www.micromine.com

Mine developer adopts 3D printing technology

Known for its use of best-in-class technology, Murray & Roberts Cementation has added 3D printing technology to its capability portfolio and believes that this will add greater functionality during project design stages.

Allan Widlake, business development executive at Murray & Roberts Cementation, says the use of 3D printing technology allows engineers to take

designs from CAD or other modelling software and convert it into physical 3D models. “The primary advantage is that the physical model and the virtual model are almost identical and the ergonomics of the structure can be visually checked to ensure functionality.”

It is significant that the first model produced by Murray & Roberts Cementation is of the Ivanplats’ Platreef Shaft 2 headframe. The 1:260 scale model is an accurate physical rendering of the headgear. It was printed using ceramic as opposed to plastics for aesthetic purposes and this took just 17 hours.

“3D printing of structures allows for the assessing of the constructability of the design and we believe that this could become a vital tool as it gives a far more realistic perspective. In the case of the headgear we were also able to confirm that there is sufficient space to access all components of the headgear from a servicing perspective,” Widlake says.

3D printing, also called additive manufacturing, is the process of creating three-dimensional objects from a digital model. Advances in 3D printing technology have seen it become more affordable, allowing reasonably priced models to be produced and, from a planning perspective, this means that engineers can use these 3D printed models to discuss with crews exactly how the construction will be done. This provides a much more tangible idea of the construction required.

Murray & Roberts Cementation was responsible for the design of Ivanplats’ mechanised, high tonnage Platreef Shaft 2 headframe. It will be the main produc-

tion shaft, capable of hoisting 6.0 Mtpa of ore and transporting large mechanised equipment between the surface and underground.

By comparison with most steel frame PGM headgear in South Africa, it will be a considerable concrete structure – 100.5 m in height with a lined shaft 10 m in diameter. The headframe will house all the equipment necessary for operating the shaft, thereby reducing the surface footprint. During sinking, maximum use of permanent infrastructure was achieved in order to minimise the changeover delay from sinking to permanent conditions.

Shaft 2 will be 1 080 m deep and will feature two high mass, high speed 40 t skips running at 18 m/s. It will also be capable of conveying 40 t of material or 225 people in a single deck using a cage and counter weight arrangement. □



Printed using a ceramic material, the first 3D printed model produced by Murray & Roberts Cementation is of Ivanplats’ Platreef Shaft 2 headframe.

Industry diary

May 2016

Pump Guy: Larry Bachus

9-12 May, Johannesburg
16-19 May, Secunda
2KG Training
Phindi Mbedzi
phindi@2kg.co.za

Copperbelt Mining Trade Expo & Conference 2016

12-13 May
Kitwe Showgrounds, Zambia
leatitiavs@specialised.com
www.cbm-tec.com

African Utility Week 2016

17-19 May
Cape Town, South Africa
+27 21 700 3500
auw-info@spintelligent.com
evan.schiff@spintelligent.com

Southern African Metals and Engineering Indaba

To be held at the Industrial Development Corporation (IDC) in Sandton from 26 to 27 May 2016, the 2nd annual Southern African Metals and Engineering Indaba will be officially opened by former deputy president Kgalema Motlanthe.

The IDC’s Divisional Executive of Corporate Affairs, Zama Luthuli, says: “The Indaba provides an occasion for industry players and Government to engage and come up with solutions to address issues impacting the sector.”

SEIFSA chief executive officer, Kaizer Nyatumba, says the Federation was delighted to welcome the IDC on board “as a strategic partner for the 2016 Metals and

Engineering Indaba”.

Some of the issues to be discussed during the Indaba include: Moving forward or going back: Is manufacturing in southern Africa doing better than it did a year ago? Government policy Interventions for a sustainable, globally competitive steel sector; Transformation as a strategic weapon/business enabler in Southern Africa; Partners, not adversaries: how to forge a stronger partnership between business and labour to improve southern Africa’s international Competitiveness; and several more.

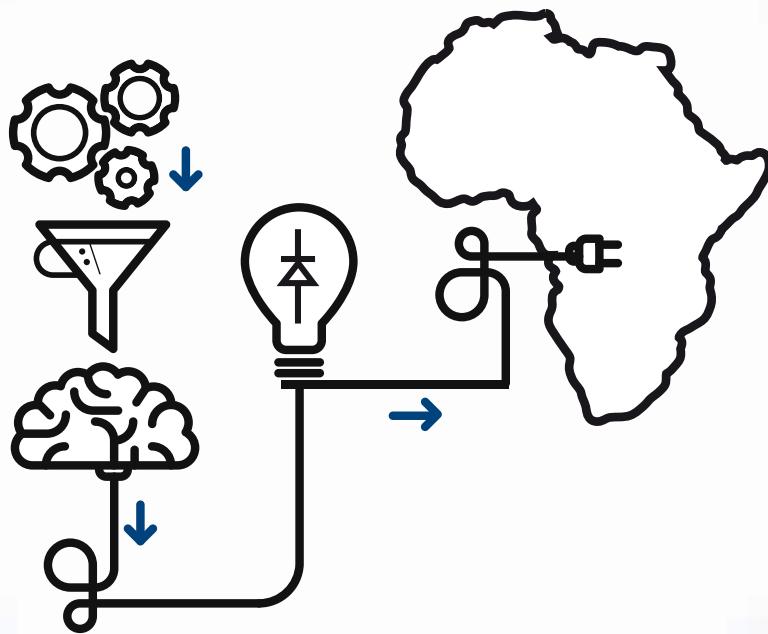
For more information contact SIEFSA communications manager, Ollie Madlala.

ollie@seifsa.co.za

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