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Let's Solve Water



THIS MONTH:

- Excellence in the use of steel
- Phoenix hybrid sounding rocket launched
- New high-performance 3D printers and materials
- Material engineering in practice: from cast iron to lightweight steel

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**Published monthly by
Crown Publications cc**

Crown House
Cnr Theunis and
Sovereign Streets
Bedford Gardens 2007
PO Box 140
Bedfordview 2008

Tel: +27 11 622 4770

Fax: +27 11 615 6108

e-mail: mechanical@crown.co.za

Editor:

Peter Middleton

Copy editor:

Erika van Zyl

Advertising:

Norman Welthagen

e-mail: normanw@crown.co.za

Design & layout:

Darryl James

Publisher:

Karen Grant

Director:

Jenny Warwick

Circulation:

Karen Smith

Reader enquiries:

Radha Naidoo

The views expressed in this journal are not necessarily those of the publisher or the editor.



Transparency You Can See

Average circulation
(July–September 2014)
3 725

Printed by:

Tandym Print – Cape Town

‘Matric’ results and career success

Every year, I get irritated by the frenzy created by the release of the ‘matric’ exam results. It has become part of the post-Christmas holiday routine for the media to seek out the smiling students celebrating their (unexpected) success, those that have triumphed over adversity to scrape through and, on the opposite extreme, those unhappy souls that have had their bright futures derailed. The personal success/failure stories are not really the root cause of my irritation, though. What I resent most is the notion that this exam, with all its frailties, is lauded by so many as the key indicator of career success.

Officially, ‘matric’ no longer exists. The school leaving qualification awarded to students successfully completing Grade 12 in South Africa is called the National Senior Certificate (NSC). The term ‘matric’ comes from the wording that used to be used on NSC certificates ‘Matriculation endorsement’, which certified that the candidate had fulfilled the minimum requirements for entry into a South African university – and the word ‘matriculation’ is defined as ‘the formal process of becoming eligible to enter a university’.

But only a minority of students, in any country of the world, actually progress to university level education. The Stats SA’s 2013 General Household Survey (GHS) found that the percentage of people aged 18 to 29 attending university by population group was at 3.2% for black people, 3.1% for so called coloured people, 18.7% for whites and 9.2% for people of Asian origin. While this clearly indicates a slow rate of transformation in our society, it should also send a loud and clear message that ‘matric’ as a university entrance examination is an inappropriate measure of success for the majority of our integrated population.

The NSC splits the certification requirements into four levels: Bachelor’s, Diploma, Higher Certificate and Basic. The Bachelors level represents the traditional university entrance requirements. To receive a ‘Bachelors certificate’, students must achieve 50% or more in four subjects with at least 30% in all remaining subjects and more than 40% in their home language. Only about 28% of those who wrote the 2014 NSC exams (150 752 students) achieved at this level. And, since these are merely ‘minimum requirements’ almost all universities are now imposing additional entry requirements and/or examinations for students, depending on the specific career being pursued.

At the opposite end of the spectrum are the minimum requirements for a ‘basic’ NSC certificate, which are 40% in three subjects, one of which should be a home language and 30% in three other subjects. The national 75.8% pass rate quoted by media and politicians is based on this ‘basic’ level and, of the 532 860 Grade 12 students who wrote the ‘matric exam’ as full-time candidates in 2014, 128 986 failed to achieve this level.

The true value of this basic certificate is also unclear. The entry requirements for Nelson Mandela Metropolitan University (NMMU) point towards statutory minimum requirements as follows:

- For Higher certificate courses: 40% in the language of teaching and learning (LOTL), either home language or first additional language; 30% in either maths or maths literacy; 40% in life orientation; and 50% in the four other vocational subjects
- For Diploma courses: 50% in three fundamental subjects including LOTL and 60% in four compulsory vocational modules.
- For Bachelor’s degrees: 60% in three fundamental subjects including LOTL and 70% in four compulsory vocational modules.

A basic NSC certificate, therefore, fails to meet any of these ‘statutory’ entry requirements for further education.

For these and other reasons, Jonathan Jansen, vice-chancellor and rector of the University of the Free State says “I would seriously consider not sending my child to school in South Africa” and would “worry myself senseless when I enrol my child in Grade 1 knowing that she could be among the more than half-a-million children who would not make it through to Grade 12.”

In terms of advice for university candidates, he says: “If your average mark in the NSC is below 70%, you should consider not going to university and, if you do, be prepared to work very, very hard.”

Having discarded outcomes-based education, we seem determined to popularise the ‘gate-keeping’ system from our past. While we need more and better university graduates, and our education system must be able to feed such candidates into tertiary institutions, alternative pathways for those unsuited to academic study are also essential.

By over focusing on ‘matric’ we are losing sight of the need for work-ready school leavers and the annual frenzy is perpetuating educational poverty for the majority of our youngsters.

Peter Middleton





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SKF South Africa (Pty) Limited
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ON THE COVER



TotalCare: flexible and affordable pump reliability

With a series of investments amounting to nearly R2-million during 2014, Xylem in South Africa has taken its TotalCare offering several steps further. *MechTech* talks to David Havenga, the company's growth centre manager for Transport, Aftermarket and Services, about the reliability and risk aversion benefits of adopting this new approach to pump servicing.

For more information contact:
David Havenga,
Xylem growth centre manager
Tel: +27 11 966 9300
david.havenga@xyleminc.com
www.xyleminc.com

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TotalCare: flexible and affordable

With a series of investments amounting to nearly R2-million during 2014, Xylem in South Africa has taken its TotalCare offering several steps further. *MechTech* talks to David Havenga (left), the company's growth centre manager for Transport, Aftermarket and Services, about the reliability and risk aversion benefits of adopting this new approach to pump servicing.

Xylem's Flygt, Godwin, Lowara and Vogel pump brands and Wedeco treatment equipment are all market leaders in the global pumping industry, developed based on significant investments in research with a strong focus on reliability and efficiency. But key to long-term reliability and lowest possible operating and lifecycle costs is service.

"From a servicing point of view, access to the expertise and know-how built into Xylem product brands is the only way to ensure pumps perform at their best," begins Havenga, adding that: "our TotalCare service offering is designed to offer the best support possible to all of our customers, based on specific needs and budgets."

TotalCare, which is being standardised across the globe, consists of 12 well-defined service packages. "The idea is that, without the need for lengthy discussions, customers can choose the specific packages that best suit their application and, since the service scope and price are defined in advance, they pay only for the services required. The more basic the service, the easier it is on budgets, but the more advanced, the better the reliability and the lower the risk," Havenga explains.

Describing the 12 offerings, he says that the process starts with Xylem's Design and Consultancy package. As with any engineering project, engineering consultancy services are required. Where pumps are involved, Xylem offers feasibility studies; design proposals for new installations; or plans to remodel, expand or upgrade existing facilities. "This is an ideal way to ensure the right pumps of the right size are chosen for particular applications," he suggests. The second service package, Installation and Commissioning services, follows and offers operators "peace of mind" by taking responsibility for project management and installation

supervision – all the way to system start-up and commissioning.

Following commissioning of a new or upgraded plant, however, maintenance and servicing issues need to be addressed to ensure the long-term sustainability of the facility. At the heart of TotalCare is Xylem's Preventative Maintenance Agreement (PMA), a cost-effective service level agreement to enhance operational reliability through a combination of preventative maintenance and warranty options. "PMAs, based on needs-based choices from the suite of TotalCare packages, allow customers to fix their long-term maintenance costs so that they do not escalate or breakdown as pumps age. More importantly, the preventative maintenance approach substantially reduces risks, such as lost production time or sewage spills. Ultimately, PMAs offer peace of mind and substantially reduced operating costs," says Havenga.

"As we all know, our water infrastructure is not being properly maintained and PMAs are an ideal solution to that problem. The agreements, depending on the combination of TotalCare packages selected, transfer some of the responsibility for keeping pumps healthy and reliable to Xylem, removing the maintenance burden and the unpredictable budgets from pump users. This approach gives operators the opportunity to free themselves from the trap of constantly having to repair ailing and unreliable pumps, enabling them to improve long-term reliability and operational efficiency," he argues.

Packaged services available for TotalCare-based PMAs

Repair and Maintenance is the basic offering, through which Xylem offers to improve uptime through a broad range of repair and maintenance services conducted either onsite and/or at one of its local workshops. "In October, we took



delivery of our first mobile workshop, which comprises an Iveco Daily van fitted with R400 000-worth of equipment and tools – and it can tow a R300 000 mobile crane on a purpose-built trailer," says Havenga. "This is a complete, self-sufficient vehicle kitted with everything required for onsite pump servicing and repairs. We can send the vehicle anywhere in southern Africa and we will also be investing in dedicated vehicles for Rustenburg, Cape Town and other regions" he adds.

Also in support of its expanded Repair and Maintenance package, Xylem has invested a further R250 000 on tooling and R1-million on machines and assembly equipment for refurbishment and repair operations at its assembly and repair shop in Boksburg.

"On the skills side, we prefer to use millwrights as technicians, who have the ability to combine skills across the mechanical and electrical trades to successfully assemble, install, repair, refurbish and optimise complex industrial machinery. They have all of the fitting and turning skills, but these are complemented by strong electrical skills, which means we don't have to send an electrician to site to accompany the fitter," Havenga continues.

Xylem currently operates two teams of service technicians, with different core specialisations: "Our first service team focuses on the Vogel and Lowara multi-stage pumping products, typically used for mine dewatering, high pressure water transport and pumping from boreholes. The second team is more experienced on the sewage and wastewater side, where Flygt pumps dominate," he says.

pump reliability



Monitoring and Supervision is the next package listed in the global TotalCare offering: “We don’t yet offer this package, but we are willing to implement it should a customer express an interest. This is a maintenance management and plant optimisation package integrated with monitoring and control hardware and technology. We provide basic alarms as well as optimisation and performance benchmarking services,” Havenga tells *MechTech*.

Extending this package, and also not yet implemented in South Africa is Plant Operation and Maintenance, an offering to take complete control of big pumping facilities. In the long term, Havenga sees this offering as an ultimate solution to local skills shortages and maintenance capacity. “By allowing us to take full management control of pumping issues at a facility, clients can focus all of their attention onto core business, entrusting us with all plant operation and maintenance responsibilities. This makes best use of both their expertise and ours,” he suggests.

An Inspection and Auditing services package is available for operators seeking to minimise downtime and maximise profitability. “It involves regular inspections by our qualified service engineers and includes audits for energy efficiency, equipment condition and reliability,” explains Havenga. “A big part of this offering is energy efficiency optimisation, where we do a condition audit and then detail how we can improve a pumping system to make it more efficient – by replacing old pumps for more efficient equivalents, for example or by right sizing the pumps. The traditional pump se-

lection approach was to specify a pump that was too big and then to throttle it to the required flow. But throttling wastes energy. Nowadays, we prefer to slow the pumps down to achieve the required flow or to switch them on and off in cycles to achieve the necessary average flow. Both these approaches are more energy efficient than throttling,” he advises. Other optimisation strategies, according to Havenga, include: using VSDs, trimming impellers, fitting a smaller motor or, for sewage pumps, installing sophisticated controls such as SmartRun™.

Peace of mind for operators also comes from knowing that equipment and spares for scheduled maintenance or emergencies are on hand and readily available. Xylem TotalCare’s Parts and Logistics offering is well established to meet these needs. Also now an integral feature of the local service offering is its Rental and Onsite Services package, which operates through Xylem’s dewatering division. “Renting gives clients access to best-in-class dewatering or bypass pumping equipment without having to justify capital expenditure. Rental is ideal for short-term use to cover downtime periods of the installed units; for long-term ‘lease’ agreements; or for clients preferring to ‘try-before-you-buy’,” Havenga suggests.

Asset Refurbishment and Training and Technical Support packages complete the maintenance-related service offering. “Asset management is about protecting the value of ageing assets and minimising capital expenditure, and training helps to ensure that equipment operators and service staff have

1. Xylem has taken delivery of its first mobile workshop.

2. The mobile workshop is a complete, self-sufficient vehicle kitted with everything required for onsite pump servicing and repairs.

3. Repair and Maintenance is the basic TotalCare offering, through which Xylem offers to improve uptime.

the knowledge and skills to optimise equipment and plant performance. Our engineers, with extensive expertise and experience in Xylem products and their applications, are in the best possible position to provide training and technical support services,” he advises.

Globally, Xylem offers its Financial Solutions package in response to the trend towards utility-type billing contracts such as those used by cell-phone service providers. In the context of pumping, the ultimate idea is that pump operators are billed per litre of product pumped. “We in South Africa are not there yet, but it’s coming. As a starting point for financial services, we are talking about hire-purchase (HP) agreements as well as rent-to-buy options, though,” Havenga points out.

“Philosophy wise, isn’t it better to use maintenance specialists who can properly meet a pump’s demands?”

“We see Xylem’s TotalCare service offering as a complete circle. Once installed, preventing problems and downtime should be the starting priority. This is followed by action to repair and optimise pumping systems. Closing the circle is savings, in terms of both money and energy, which is the logical priority of any municipal, industrial or commercial pumping operation,” he concludes. □

Zest WEG wins infrastructure projects in Liberia

The Zest WEG Group is showcasing its full suite of products and manufacturing capabilities at a flagship infrastructure and iron ore mining project in Liberia. This after Group company, Enl Electrical, clinched two major contracts for ArcelorMittal at Buchanan Port in Liberia as well as at the Tokadeh Iron Ore Mine near Yekepa in Nimba County.

"These projects will serve as a vehicle for the Zest WEG Group product portfolio to arrive on site,"



The Zest WEG Group's Enl Electrical will construct 6.6 kV overhead power lines for a ship loading facility at the Port of Buchanan in Liberia.

Trevor Naude, managing director, Enl Electrical says. One of Africa's largest electrical construction companies, Enl Electrical, forms a significant part of the Zest WEG Group's value addition and total service package for the African mining industry.

"While the Zest WEG Group is well known as an importer and distributor of WEG electric motors from Brazil, one of the largest ranges of its kind in the world, our full product line up includes transformers, switchgear, variable speed drives, motor control centres, gensets and renewable energy solutions. We also have three fully fledged manufacturing facilities in South Africa that we are in the process of expanding as we increase our footprint in Africa," Louis Meiring, CEO, Zest WEG Group, says.

Steel and iron giant ArcelorMittal is currently mining and shipping five million tonnes of iron ore a year from

its Phase 1 operations in Liberia. A Phase 2 expansion project will boost shipments to 15-million tonnes, with first production earmarked for the end of 2015. The first contract focuses on a ship loading facility at Buchanan Port, where Enl Electrical will construct 6.6 kV overhead power lines in addition to all medium voltage infrastructure, electrical infrastructure and instrumentation works.

The second contract relates to mine infrastructure at the Tokadeh Iron Ore Mine, which has a rail link to Buchanan Port. "We are responsible for all overhead line infrastructure from medium voltage to all the electrical work and instrumentation," Naude explains. "This flagship project represents what Enl Electrical has been striving towards since its inception. We are positioning ourselves as the electrical infrastructure construction team within the Zest WEG Group."

www.zest.co.za

SEIFSA launches excellence awards

To encourage growth and celebrate excellence in the metals and engineering sector, the Steel and Engineering Industries Federation of Southern Africa (SEIFSA) has introduced the annual SEIFSA Awards for Excellence. To foster a culture of excellence in these industry sectors, the awards offer 10 different categories and SEIFSA invites manufacturers in metals and engineering operating in southern Africa to submit entries.

Categories include: Most Innovative Company; Health and Safety; Corporate Social Initiative; Customer Service; Most Transformed Company; Artisan Training; and Environment Stewardship. SEIFSA's member companies and affiliated associations will also be honoured at the awards function, which will take place in March 2015.

Commenting on the need to introduce the industry awards, SEIFSA marketing and communications executive, Adelia Pimentel, says, "It is of paramount importance that companies play a crucial role in socio economic upliftment, are recognised for their contributions and encouraged to continuously do more."

Companies operating in these vital economic sectors are encouraged to not only enter any of the categories offered, but to also consider taking up the various marketing opportunities available.

www.seifsaawards.co.za

Worldskills, TVET Mechatronic Competition

Teams of young mechatronic students gathered at the Festo offices in Johannesburg during December for the start of the Worldskills Competition in Mechatronics. Worldskills is the largest vocational education and skills excellence competition in the world. From regional competitions across the many disciplines, winning teams progress to the Worldskills National Competition in January 2015. National winners represent South Africa in the global Worldskills event in Sao Paulo, Brazil later this year.

Speaking at the opening of the event was Horst Weinert, manager of Festo Didactic – a global sponsor of the competition – and a former South African Worldskills expert for mobile robotics. "Mechatronics, the combination of mechanical and electrical engineering, is the way of the future. It has been recognised as a scarce skill by Merseta and mechatronic technicians and engineers are well-paid people who will be running the factories of the future" Weinert advises competitors.

"The silent revolution of mechatronics can be seen in our everyday lives. A modern car, for example, requires not only a spanner but also a laptop to service it. Qualified mechatronic technicians are a real need in industry and are key to the future success of South African industry,

and for the world," he explains.

Addressing the coaches who mentored and accompanied the students to the competition, Weinert reminded them that they provide the skills for these young people to run the factories of the future. "In this, the decade of the artisan, we can only be proud to have the opportunity to participate in Worldskills and put our local talent on the global stage," Weinert concludes.

The winning team, Victor Hlaise, Xaccheus Seema, Tressure Mokgohloa and David Setlhake from Tshwane North College, take home all the equipment they need to compete in the Worldskills National competition to be hosted in Cape Town during January, 2015.

www.festo.co.za



From left: Horst Weinert, manager of Festo Didactic; with the owning team from Tshwane North College; Victor Hlaise, Xaccheus Seema, Tressure Mokgohloa and David Setlhake.

PnP DC adopts Crown warehouse equipment

Pick 'n Pay's (PnP) Cape Town Airport distribution centre (DC) has bought eight new Crown machines from Goscor Lift Truck Company (GLTC) in an upgrade exercise. PnP's Sedick Hill says he is more than satisfied with the performance of the machines and the service from Goscor in Cape Town. "We have been working with Crown equipment for some time and, when it became time to upgrade some of the older Crown equipment, we had no hesitation in continuing with it," says Hill.

He adds that this decision is also due to the good service received from Goscor over time. "There is never a problem if we need service or parts. They understand that downtime can significantly affect our bottom line," he says.

The WT 3000-series pallet trucks, according to Goscor Lift Truck Cape Town's Anthony Fouché, are an "excellent choice" and one of Goscor's "most popular items". They offer capacities of up to 2.5 tons with electronic steering and the entire pallet truck line is loaded with innovative features: FlexRide™



From left: Roger Moore, GLTC regional sales manager; operator John Louis; Anthony Fouché, GLTC; and Shamiel Rylands, Pick 'n Pay Cape Town Airport DC operations manager with the four Crown WT3000 pallet trucks.

operator suspensions, e-GEN® braking systems, Access 123® control systems; Entry Bar safety switches; and quick-exit side restraints.

Goscor's range of Crown ESR reach trucks also plays a part in the PnP solution. "From the narrow-chassis 5220 model to the top performing 5280S, Goscor customers benefit from this machine's superior ergonomics, visibility, durability and proven technology, which assist the operator and keep running costs low," says Fouché.

www.goscor.co.za

BMG acquires SA manufacturer, Klep Valves

BMG – Bearing Man Group – part of Invicta Holdings Limited, has extended its operations in the fluid technology sector with the recent acquisition of Klep Valves. "This strategic acquisition follows an 18 month period where Klep Valves supported BMG in our expansion into the dynamic valves sector," says Gavin Pelser, managing director, BMG. Klep Valves, which forms part of BMG's Fluid Technology division, will retain its manufacturing facility in Krugersdorp under the BMG banner.

"This development augurs well for both companies: BMG will broaden its product range and service offering and, with the combination of its positioning as a respected manufacturer and BMG's extensive distribution reach, Klep Valves is set to significantly extend its market share."

Klep Valves specialises in the manufacture of diaphragm, pinch and wedge gate valves, which are designed for enhanced operating efficiency and extended service life in diverse sectors. The company's offering includes soft,

natural, rubber-lined diaphragm valves, which are widely used in mineral processing and mining and slurry applications. Other lining materials include butyl, nitrile, jumbo (NAX), halar and hard rubber.

BMG's national branch network of over 130 branches supports this range with a technical advisory and support service, to ensure optimum efficiency and extended service life of every valve. The company also offers a total process and lubrication management service, to meet exact market demand.

www.bmgworld.net



Klep Valves specialises in the manufacture of diaphragm, pinch and wedge gate valves, which are designed for enhanced operating efficiency and extended service life.

In brief

The first DuPont-hosted 'Brain Trust' on infrastructure development was held in Johannesburg during December last year. "Issues can be solved if we innovate and collaborate, because no company or organisation can solve Africa's challenges alone," says DuPont P&IP business leader, Richard Ntombela, referring not only to collaboration between the private sector and government, but also between business in South Africa and other African countries.

As part of the upcoming **Africa Energy Indaba** scheduled to take place in Sandton, Johannesburg in February 2015, **Macfarlanes** is sponsoring the Africa Energy IPP (independent power producers) & PPA (power purchase agreements) conference and workshop. Scott Brodsky and a team of Macfarlanes energy legal experts will be facilitating the workshop, which will examine the requirements for successful IPPs and bankable PPAs.

At a conference entitled '*Connecting science to transform agriculture in Africa*' held during December, the **Forum for Agricultural Research in Africa (FARA)** announced its Science Agenda for Agriculture in Africa (S3A). "This will be a major programme for the continent over the next decade," says Calestous Juma, professor at Harvard Kennedy School and visiting professor at MIT. The forum envisions that, by 2030, Africa is food and nutrition secure, a global scientific player, and the world's food-basket.

In order to help develop engineering skills in South Africa, **WSP** in Africa has entered into a sponsorship agreement with Engineers Without Borders (EWB), an on-campus organisation that provides student engineers with the opportunity to work on community projects. According to Mathieu du Plooy, CEO of WSP Africa, "engineering skills are a scarce commodity the world over. Currently there are too few qualified and experienced engineers in the country to meet the targets of the Strategic Infrastructure Projects (SIPs) aligned to the National Development Plan (NDP)."

Stratasys, the 3D printing and additive manufacturing solutions provider, announced the StreetScooter C16, an electric production vehicle available for under €10 000, on its stand at EuroMold in Frankfurt last year. StreetScooter C16 is expected to weigh 450 kg excluding the battery, have a range of 100 km and deliver a top speed of 100 km/h.

Increasing access to modern forms of energy is crucial to unlocking faster economic and social development in sub-Saharan Africa, according to the **International Energy Agency's (IEA)** Special Report in the 2014 World Energy Outlook series. More than 620 million people in the region live without electricity, and nearly 730 million people rely on dangerous, inefficient forms of cooking.



Excellence in the use of steel

In this special report, *MechTech* summarises the steel construction project winners from last year's Steel Awards 2014, hosted by the Southern African Institute of Steel Construction (SAISC).

Such was the quality of the steel structure at the Malapa fossil excavation site, which was the overall winner and winner of the Association of Steel Tube and Pipe Manufacturers of South Africa's Tubular category, that Steel Awards 2014 convenor, Spencer Erling was prompted to say: "It is surely the first time since I have been managing the Steel Awards process – this year is number 13 – that the overall winner has ticked so many boxes as to why this project represents excellence in the use of steel."

In 2008, Professor Lee Berger of the University of Witwatersrand was using Google Earth to look for possible fossil deposits in the Cradle of Humankind. What caught his eye was a nearly circular ring of trees, something that indicates a possible cave entrance or potential fossil deposit. The rest is paleontological history.

The brief for the Malapa fossil excavation site was to build a removable structure over the dig site to protect the site and the exposed fossils from the extremes of the weather and to allow for as much 'dig time' as possible. It had to also blend in with the ring of trees and the rest of the bush on the hillside

The structure had to, in addition, have a tourist-viewing platform, a crawl hoisting structure to lift rocks weighing up to one ton, and maximum possible natural light had to be able to

penetrate into the covered area. The access walkway to the viewing platform had to be like 'a blanket over a baby' so as not hinder the movement of the natural wildlife – hence no handrails were permitted.

The final shape when viewed from above is like a beetle with eight legs. But how can a structure be designed when one does not know where the foundations will be? Enter Peter Fellows, the engineer. It was decided that during construction, once positions were chosen, rods would be drilled into rocks around the site, onto which base plates would be welded. This required that the eight support columns be adjustable to suit the plate positions identified.

The roof was to be 'rondavel-like' in shape but not necessarily round, from which would hang the viewing platform and hoisting structure.

The detailing and fabrication of a tubular structure such as this require special skills, which were provided by teams from Spiral Engineering, one of the few companies in South Africa with the capacity to build such complicated structures.

To accommodate the site location – with a 7.5 km farm track access road that runs through a riverbed – special trucks with limited capacity were used on the farm. After four unsuccessful tries, a 30-ton all-terrain crane with a long enough radius and capacity to

access the structure without damaging the trees and the bush, reached the site.

The judges concluded that the determination of the whole team, the quality of their work, the fact that when you visit the site the roof is not visible from more than a few metres away, and that the construction team left the site virtually as they found it, made this project "excellent in the use of steel" for every possible reason.

Category winners

No. 1 Silo, part of the first phase in the Silo precinct development of The V&A Waterfront, won the Architectural category. This 10-storey development consists of an east and west wing built on two levels of a mega-basement covering the whole site.

Structural steelwork was the solution to provide slender support to the facades, walkways, bridges, lifts and feature stairs, while economically extending the cantilevers of the conventional post-tensioned slabs framing the atrium.

The roof of the atrium is positioned above an open volume area spanning 17 metres. A composite steel and concrete Bondek slab was designed to serve as the primary support and waterproofing line to an accessible and functional roof. Another critical design element of the atrium was the feature staircase that served the five office levels.

Heritage requirements regarding the treatment, restoration and reinstatement of the existing structures were of the utmost importance and underpin-



2

1. The Malapa fossil excavation site took top honours at the Steel Awards 2014.

2. The Waterfront Silo Development, Architectural category winner, used structural steelwork to provide slender support to the facades, walkways, bridges, lifts and feature stairs.

3. The Tugela River Pedestrian Bridge (KwaJolwayo), Bridge Category winner at the Steel Awards 2014.

ning the heritage silo and buildings constructed in the 1920s was a great challenge to the structural engineers and contractor.

No.1 Silo has been awarded a six-star rating by the Green Building Council of South Africa and is the country's latest and largest green office building. It is only the second office building to be awarded this rating in South Africa and the first in the Western Cape.

In awarding the Tugela Pedestrian Bridge the top spot in the Bridge category, the judges agreed with the project team that this bridge "merits an award in view of its portrayal of the benefits that technical solutions and efficient design using structural steel can bring to rural communities."

This 134 m structural steel suspension bridge over the 8.0 m deep Tugela River at KwaJolwayo, upstream of the Tugela Ferry in the Msinga area of rural KwaZulu-Natal, has resulted in a life-changing, safe crossing option for communities on both sides of the river, enabling them to access commercial and educational opportunities that were previously inaccessible, particularly during the summer months.

The design focused on the fact that the lower the mass of a structure, the less material is required, with correspondingly lower capital and envi-



3

ronmental costs. Structural steel was chosen as the ideal material to prove the above and the inaccessible, deep gorge provided the ideal situation for the engineer.

The final design consists of four suspended cables supporting a row of steel Y-frames, which in turn support a 1.2 m steel deck, with the suspension portion of the bridge structure consisting of two equal spans of 60 m.

The Corporate Office Building category was won by 30 Jellicoe, a building situated in the heart of the Rosebank CBD. The judges said that the slenderness and proportion of the tapered tubular steel columns give the building an elegant aesthetic that sets it apart from its neighbours. "The ripple that is created by the louvre blades adds another level of detail that finishes off the overall concept," they reported.

In the light steel frame building (LSFB) category, McDonald's was declared the winner for its entry of seven fast food outlets: Goodwood, Rustenburg, Silverlakes, Somerset West, Epping, Tembisa and East London. These buildings not only displayed excellence in the use of light steel framing but also clearly demonstrate why 500 000 m² of LSFB floor area has been built in the past year.

McDonald's chose LSFB because it could meet its energy efficient building goal and because speed of construction is one of light steel framing's main advantages. By using LSFB McDonald's not only reduced material waste by 30% and transport costs by 80% but also the insulating layers reduced the building's energy requirements by 17 to 20%, compared to conventional building designs.

The first LSFB McDonald's outlet was in Goodwood, Cape Town and the entire shell of the building, including internal walls and exterior painting, was completed in two months. Roadworks and the installation of kitchen equipment took a further month, giving a total construction period of three months. A comparable double-storey building using conventional masonry construction would have taken at least seven to eight months to complete.

The Mining and Industrial category winner was the Bakubung Platinum Mine headgear. "This is a structure with thousands of bolts, all fitting without modification and tightened to specification, which is testimony to 3D detailing using Tekla and the accuracy of fabrication. What a pleasure to see and experience the exceptional quality and final presentation of the steel work," said Erling.

In the final award of the evening, the Rosh Pinah Zinc Corporation (RPZC) in Lüderitz, Namibia, won the Factory and Warehouse category for its zinc and lead storage warehouse, a 90 by 67 m building surrounded on four sides by buttressed concrete retaining walls.

The challenge was how to support the arch roof across an area that spans 65 m using steel that could be fabricated and erected in Lüderitz, well known for its strong onshore winds and corrosive environment.

Square hollow sections (SHS) for all the truss members were the natural choice for reason that included: ease of fabrication; internal members can be cut by saw; no special developments are necessary for connections; the perimeter of the SHS is big enough to permit straightforward fillet welds for end connections; and, by keeping the members straight, the curvature for the roof can be created using different purlin lengths.

In addition, no wasting of top and bottom chords is incurred as would happen had the members been curved; and tubular profiles are ideal for dealing with the prevailing winds.

Erling says that each year the ability of South African architects and engineers to build aesthetic steel structures becomes increasingly apparent. "The quality of the entries improves each year and 2014 was no different. I congratulate the winners and all those who entered," he says. □

Premium brands fundamental to equipment reliability

Bearings International is a southern African leader in the supply of premium brand products to industry, which, argues Shuttleworth Ntsie, enable equipment reliability to be optimised so that customers can move their businesses forward through increased uptime and lower costs of ownership.

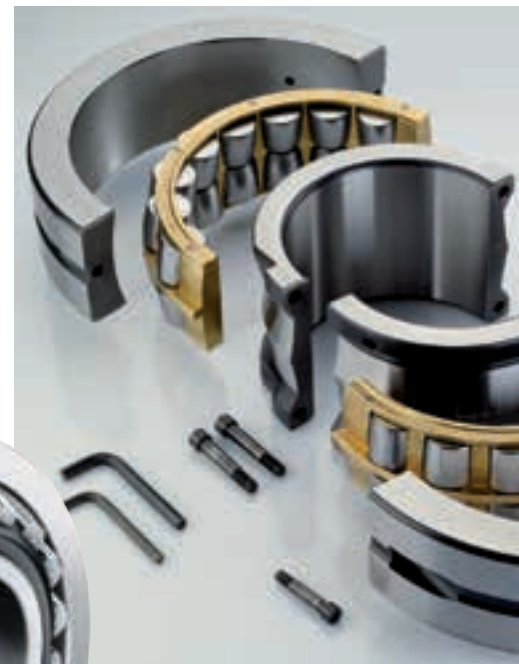
“**E**quipment reliability is the proverbial golden egg for any plant, quarry or mine because uptime, production and productivity levels all hinge on uninterrupted operation,” says Bearings International sales director, Shuttleworth Ntsie. “But it goes one step further because the reliability of equipment that operates under extreme conditions, such as crushers for example, is determined by the quality of its components. This is where premium brands take centre stage, offering world-class quality and the latest technology through ongoing R&D by the respective OEMs. We hold the OEMs to account for brand quality and maintain strong relationships with all our OEM suppliers, on whom we can rely for excellent technical backup. Because our customers depend on us to supply best-in-class products, we do not just sell brands; we partner with our customers offering end-to-end solutions for optimum equipment operation. In other words, we sell trust.”

Bearings International excels when it comes to arduous applications like crushing where poor control of product flow or ‘heave’ after blasting can lead to oversized boulders being fed into primary crushers, which can badly affect efficiency and reliability with a knock-on effect on production. “Lump sizes larger than between 0,5 and 1,0 m can cause crushers to jam, reducing the life of components such as bearings,” explains Coenie Van Deventer, national product manager – Schaeffler Bearings Products at Bearings International. “Schaeffler’s quality range of FAG roller bearings and SNS housings are central to the smooth running of equipment at mines and quarries such as primary, secondary or tertiary crushers that are subject to continuous impact loading as well as for conveyors. Schaeffler has been the OEM for the FAG premium brand for

over 100 years and the products are designed to offer best possible cost-to-performance ratios.

“The FAG range covers 60 industrial sectors and a staggering 225 000 applications,” Van Deventer continues. For main bearings in jaw crushers, Van Deventer recommends FAG E1 spherical roller bearings in X-life quality, which have been especially engineered for extremely heavy loads and are used wherever angles must be adjustable. They work reliably under tough ambient conditions, delivering up to 70 % longer service life. Advantages such as high static reliability, lower strain on the lubricant due to reduced friction and low bearing temperatures translate to higher machine efficiency and reduced operating costs for the end user.

FAG spherical roller bearings are also the premium solution for conveyors at crushing sites and FAG’s split spherical roller bearing solution is recommended to speed up bearing replacement, particularly in difficult to access areas. Van Deventer explains, “The unique design of the split spherical bearings allows for quick and simple mounting and replacement of bearings which can significantly



Above: FAG’s split spherical roller bearing solution is recommended to speed up bearing replacement.

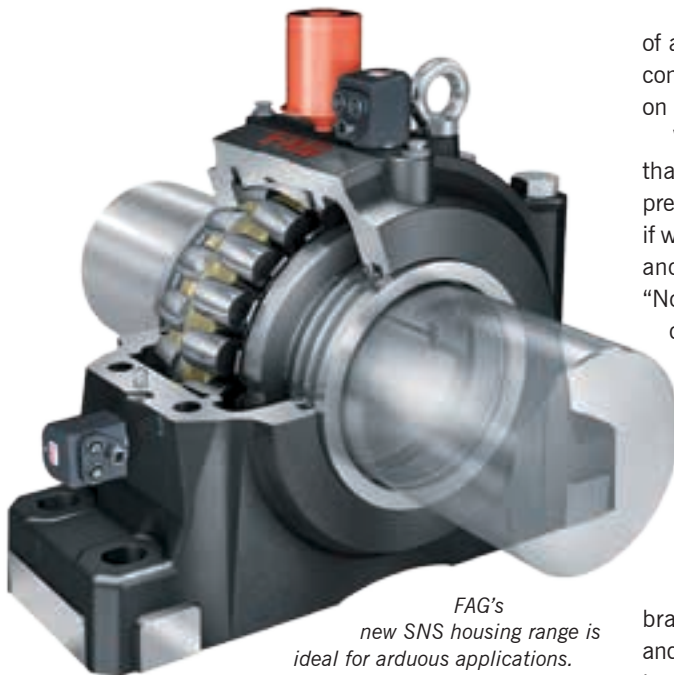
Left: For main bearings in heavy equipment such as jaw crushers, Van Deventer recommends FAG E1 spherical roller bearings in X-life quality.

reduce downtime and associated costs.

“We also offer housings solutions for arduous crusher applications. FAG’s new SNS housing range extends the life of bearings on conveyor drives and are manufactured from high impact tough, fatigue resistant, high-specification SG50 (spheroidal graphite) cast or ductile iron.” In addition to higher load ratings and longer life, according to Schaeffler, the optimised housing design ensures a more even distribution of load through the bearing, which can increase bearing life by more than 50%. The new housing also provides a very high sealing efficiency against the ingress of contamination of foreign matter. “These housings are 100% compatible and interchangeable with any conventional plummer block solution,” adds Van Deventer.

Turning to after-sales service, Van Deventer says that reliability engineering which involves the specification of the right product to best suit the required operational reliability as well as the monitoring of the product’s condition and performance in the field is without any doubt the smart way to go.

“Condition monitoring can safely extend component life beyond L10 and provide early warning of imminent fail-



FAG's new SNS housing range is ideal for arduous applications.

of a bearing or gearbox or any rotating component to be accessed wirelessly on smartphones or tablets.

Wrapping up, Van Deventer stresses that the higher investment cost of a premium brand component is minimal if weighed up against increased uptime and component and equipment life. "No one can afford a plant to stand due to equipment failure which involves production losses due to unplanned downtime and costs for maintenance and replacement parts. This makes opting for premium brand solutions from Bearings International a no-brainer."

Bearings International's premium brand product range covers general and specialist bearings and accessories; transmission and conveyor chains; gearboxes and geared motors; electric motors and variable frequency/speed drives; couplings, pulleys, vee- and wedge-belts; oil seals, conveyor belts, industrial hoses as well as industrial adhesives, hand cleaners and lubricants for a wide spectrum of applications across mining, quarrying, general industry and agriculture. □

ure so that timely action can be taken to prevent catastrophic failures and costly unplanned downtime," asserts Van Deventer. Bearings International's Field Maintenance Services and Reliability Services divisions offer a highly flexible range of maintenance services, from bearing fitment to condition monitoring services.

FAG recently launched a condition monitoring solution for bearings called SmartCheck. Connected via Ethernet to a computer network or an onsite remote router station, SmartCheck consists of a permanently installed vibration sensor that remotely monitors lubrication levels and bearing condition on an ongoing basis. The system enables the condition



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WEG W22 generators power Windsor Castle

Two specially designed generators based on WEG W22 premium efficiency motors, are being driven by Archimedes screws to produce electricity for Windsor Castle in the UK.

A project delivered by Southeast Power Engineering of the UK has seen a mini power station installed on the River Thames at Romney Weir to generate electricity using environmentally friendly water-driven Archimedes screw generators. The completed design features two WEG W22 Premium Efficiency IE3 generators being driven by the screws via a gearbox to produce electricity, which now powers Windsor Castle.

The WEG W22 units are 'special' products for this application in the sense that they are generators based on the WEG W22 motor. On starting the rotation of the Archimedes screws, the W22 draws electricity and is driven as a motor. Then, once turning at a suitable speed, the motor function changes over to that of a generator and the rotation of the screw is maintained by the water, which drives the W22 as a generator in order to produce electricity.

The scheme is the brainchild of David Dechambeau, managing director of Southeast Power Engineering, who has overseen every step of the design and installation process. "In order to make this project sustainable, it was essential that we select the most efficient equipment for the construction of this power station. The design called for a reliable generator with superior efficiency ratings and, on balance, the WEG W22 unit definitely fitted the criteria and it was straightforward to install."

The power station has been generating electricity since July 2013 and is in the final stages of testing and commissioning. It comprises two Archimedes screws manufactured by Landustrie, each weighing 40 tonnes, connected to the WEG W22 IE3 class premium efficiency generators, which can deliver 320 kW at peak flow, exceeding the original design criteria.

The WEG W22 IE3 generators were designed and manufactured in Portugal at WEG's dedicated European



Above: A mini power station installed on the River Thames at Romney Weir produces 'green' electricity by means of water-driven Archimedes screw generators based on two WEG W22 premium efficiency IE3 generators.

Right: The W22 units are 'special' products for this application in the sense that they are generators based on a W22 motor. At 96% efficiency, they were a critical part of the power transmission design to ensure the six-year return on investment target was met.



manufacturing site. They are rated at 185 kW each and produce electricity at 400 V, which is then fed via a 500 kVA transformer to an underground line that connects to Windsor Castle and to the national grid.

Efficiency was a key target for this application, as the installation has a fixed return on investment (ROI) period. At 96% efficiency, the WEG motor/generators represented one of the best investments Southeast Power could make in the power transmission design to ensure their six-year ROI target was met. The installation has a minimum guaranteed design life of 50 years while Southeast Power has a 40-year tenancy of the site, which means that reliability and longevity were also very important considerations. If the screws stop turning, there is a direct consequence in terms of revenue.

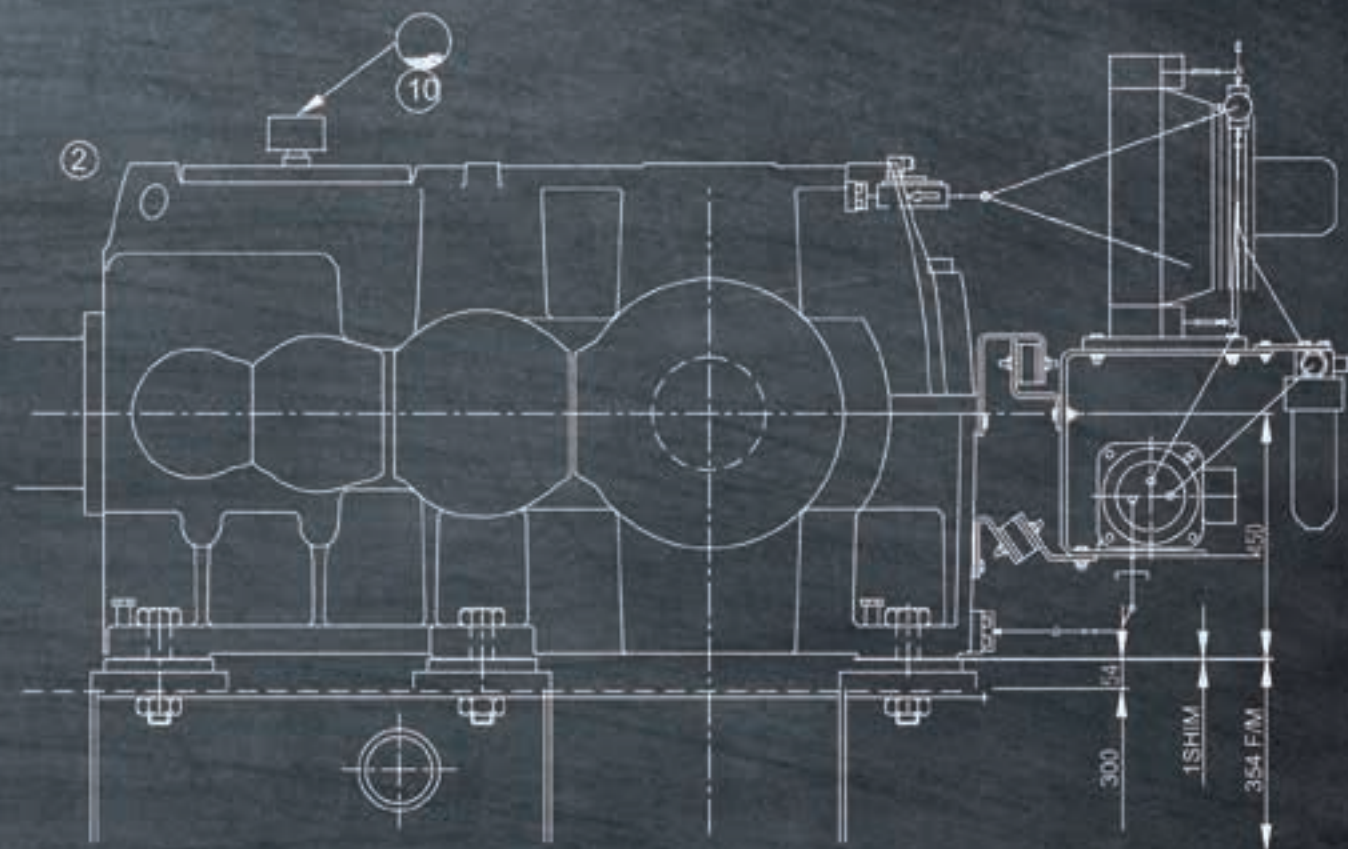
"This was a very important project for us, not only because we are supplying the Royal Household, but also as an initial stepping stone for a number of

similar projects. It is essential that we install the most efficient and ecologically sound power plant possible. The work we are completing now will help to deliver future projects using similar technology as demand for sustainable power increases," Dechambeau concludes.

WEG is represented in Africa by the Zest WEG Group, a leading supplier of electric motors, vibrator motors, variable speeds drives, softstarters, transformers MCCs, containerised substations, diesel generator sets, switchgear and co-generation and energy solutions as well as electrical/instrumentation engineering and project management services.

The Zest WEG Group operates a strategically positioned network of support operations across Africa, which includes eight branches in South Africa and operations in Mozambique, Tanzania, Zambia and Ghana, with distributors in Botswana, Namibia, Zimbabwe, Zambia, Kenya, the DRC, Nigeria, Cameroon, Angola and Mauritania. □

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Bearing developments for extended service

BMG's bearings division – which has secured exclusive supply, service and distribution agreements with leading manufacturers, including NSK and NTN – introduces the latest technologies, trends and products to the local market on a regular basis to better meet required demand.



Above: NSK is continually developing products with greater strength and higher accuracy. The NSKHPS range incorporates a new compact internal design and the latest materials and manufacturing technology.

Right: NTN Ultage WA-type sealed spherical roller bearings, with larger roller diameters and a maximum number of rollers, provide the industry's highest load carrying capacity.

“Recently launched spherical roller bearings for industrial machinery, include the NTN Ultage series and the NSKHPS series. NSK has also developed new high capacity cylindrical roller bearings – the EW and EM series,” says Rouff Essop, general manager, bearings division, BMG. “Standard bearings have been developed by manufacturers, employing new technologies and materials, to produce spherical and cylindrical roller bearings that offer extended service life, greater reliability and improved ease of use” he adds.

WA-type NTN Ultage sealed spherical roller bearings, based on the internal design of NTN's standard EA-type spherical roller bearings, have larger roller diameters and the maximum number of rollers, which gives them the industry's highest load capacity. The rollers in these bearings are guided with window-type pressed steel cages. The new WA series, with a light, compact design, offers up to five times longer service life than previous models.

Contact type rubber seals prevent the intrusion of foreign matter and a specially designed lip structure maintains constant contact pressure of seals to secure the dust-proof capability, even

in under-aligned conditions.

NTN sealed spherical roller bearings, which are pre-lubricated with long-life grease, do not require cleaning or greasing when being mounted. An oil groove and holes on the outside diameter of the outer ring, ensure there is adequate greasing into the inside of the bearing.

New developments of NSK EM and EW cylindrical roller bearings include a greater number of larger rollers than conventional bearings, to offer higher load ratings. One piece, high strength roller guided machined brass cages ensure improved performance and reduced wear. The service life of these bearings has been doubled.

Noise and vibration levels have been reduced by about 70% and the limiting speed has been increased by up to 25%. A special pocket profile enhances roller guide accuracy and ensures improved lubricant flow.

NSK is continually developing products with greater strength and higher accuracy. The NSKHPS range incorporates a new compact internal design and the latest materials and manufacturing technology.

These spherical roller bearings, with a 25% greater dynamic load rating than previous models, have a running life nearly double that of conventional bearings of the same size. The maximum limiting running speed has improved by 20% and a special cage design eliminates the need for a guide ring, allowing for the placement of additional larger rollers, which in turn increases load capacity.

During rotation of conventional spherical roller bearings, slip between the raceway and roller causes fatigue, which eventually leads to flaking. To counter this, NSK has developed a special treatment on the surface of the outer ring that improves traction of rollers and controls the rotational speed of these rollers.

In addition, a nitriding treatment on the surface of the cage, which forms a fine, hard and more uniform surface, reduces cage wear in harsh operational conditions.

BMG, which has grown significantly over the last 40 years, has over 120 outlets throughout Southern Africa and continues to expand on the continent. The company's extensive range now encompasses bearings, seals, power transmission components, electric and geared motors, as well as belting and fasteners. BMG also distributes filtration, hydraulics and pneumatics systems, tools and equipment.

Ten specialist divisions, with advanced technical skills, support the company's commitment to applying technical knowledge and depth of experience, to maximise the efficiency and profitability for every customer.

Through its critical focus on entire production processes, BMG's extensive range of quality branded components, engineering solutions and technical services, optimise productivity and enhance process plant operating reliability. □

Turnkey solution for Mpumalanga sugar mill

This article from SKF South Africa describes a turnkey bearing solution that increased equipment reliability, component service life and mean time between repairs (MTBR) for a long-standing key customer in the sugar industry.



An Mpumalanga-based sugar mill contacted SKF for support with the replacement and alignment bearings on 11 fans, four screw conveyors and three sugar dryers.

In November 2013, an Mpumalanga-based sugar mill contacted SKF authorised distributor, Bearing Services Nelspruit, with a request for support with the replacement of bearings and the alignment of 11 fans and four screw conveyors.

“During our site visit to determine our customer’s exact requirements, we also obtained an additional project scope for the replacement, geometric

alignment and commissioning of support roller bearings on three sugar dryers,” says Sean Weir, SKF key accounts manager – Pulp and Paper and Sugar.

SKF received official instructions to proceed with the complete project during the first week of January 2014. Five specialist technicians, a project manager and additional members sub-contracted for rigging made up the project team. Work commenced on March 3, 2014 and according to Weir, the team only had six short weeks during the mill’s first quarter maintenance shutdown to replace the bearings.

SKF’s scope of services to assist the customer in achieving the ultimate objective of restoring the operational integrity of the equipment included: The installation of bearings, seals and power transmission components; the inspection of drive components, balancing, belt, shaft and geometric alignments; and base-line vibration analysis on commissioning.

SKF products and services delivered during the course of the project were representative of all five of the company’s global core technologies: bearings and units; seals; power transmissions (pulleys, drive belts, sprockets and drive chains); as well as lubricants. In accordance with SKF’s precision maintenance practices, dimensional and geometric form conformance of associated components were examined and repaired or replaced accordingly. In addition, knowledge transfer in the form of formal and informal training as well as recommended maintenance procedures formed an integral part of the project.

SKF successfully concluded the project on March 28, 2014 and after nine months of trouble-free operation, the customer is reporting that, to date, no repairs have been necessary on the equipment that previously had a MTBR of only 1.5 months. “The sugar mill has a knowledgeable and competent service partner in SKF and we remain committed to supplying quality products supported by comprehensive services to assist our customer in maximising up time for overall improved mill productivity,” concludes Weir. □

Service exchange gearboxes for wind turbine

During June, 2014, the manufacturer-independent service company seebaWIND Service GmbH exchanged the gearboxes of two 1.5 MW wind power plants at a Polish wind farm in Western Pomerania, completing the task within three days. This rapid turnaround time was achieved by six service technicians from seebaWIND Service, who used a gearbox bridge so that the turbine rotors did not have to be removed. “This way, we could save over a week of work as well as significant costs, which would have been incurred on account of the additional logistics and cranes,” explains Dirk Hennig, deputy service leader at seebaWIND Service.

The technicians exchanged the irreparably damaged gearboxes on two Fuhrländer FL77 plants at a height of 100 metres, the turbine’s hub height. Only one crane was needed to mount the components. A second crane, which would have created significantly higher

costs, was not needed thanks to the installation of a gearbox bridge. Using this bridge construction, seebaWIND’s specialists fixed the main shaft onto the main supporting frame, thereby stabilising both the rotor as well as the main shaft. “Both gearboxes, weighing 15 tonnes each, could be exchanged in record time this way,” adds Hennig, pleased.

Efficient maintenance – even abroad

“The greatest challenges in exchanging a gearbox lie in the logistics and the wind conditions,” explains Hennig. “Such an action has to be well planned. All replacement parts, materials and cranes have to be in the right place at the right time.” In addition, specialists are needed,

who know the specific logistical features in the foreign country, for example, special transport permits or industrial safety regulations.

“Exchanging the gearboxes in the wind farm in Western Pomerania has shown that we can master these logistical challenges with great efficiency. Ultimately the wind farm operator also profits from this,” says Hennig. □



A service team from seebaWIND exchanges the gearbox of a wind power plant in Poland.

GE technology increases energy efficiency for ArcelorMittal Bremen

ArcelorMittal has selected GE's Power Conversion Business to upgrade the dc drives and control systems at its Bremen hot rolling mill in Germany.

According to the Ernst and Young's Global Steel Report, 2014, energy costs, excess capacity, environmental issues and an increasingly competitive marketplace are some of the key factors redefining the steelmaking industry. Faced with these challenges, steel makers are modernising and revamping existing plants to improve their sector's appeal by improving energy efficiency and reliability; increasing spare availability; and decreasing maintenance cost.

In an effort to increase competitiveness, ArcelorMittal has chosen GE's Power Conversion business to replace their existing dc drives and control system with GE's water-cooled Powersemi PW100 in an important upgrade of their Bremen hot rolling mill.

"GE Power Conversion is one of the most experienced companies in the market for modernising and revamping high power drives for steel plants," says Andreas Dalchow, managing director, Hot Strip Mill at ArcelorMittal Bremen. "We know GE's high-performance controller (HPCi), power electronic controller (PECe) and its power interface board (PIBe) solutions well and are pleased with their performance and benefits."

ArcelorMittal, headquartered in Luxembourg, is one of the leading steel companies in the world. The Bremen hot steel mill is one of the largest of its kind and one of the core production units within the group. Its strip mill currently reaches a maximum speed of 1 300 m/min and has a production capacity of 4.5-million metric tons per year.

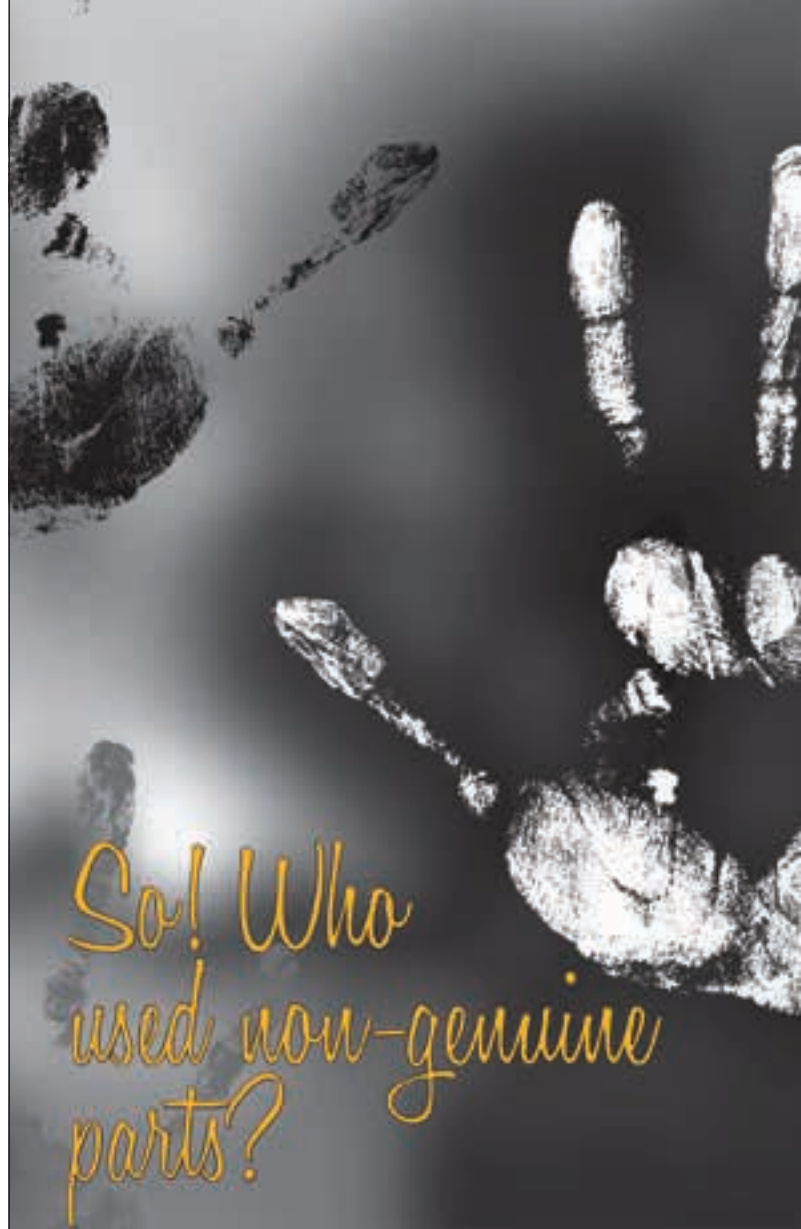
The new dc drives to be provided are fitted with HPCi controller technology using PECe and PIBe. This results in a freely programmable, modular system with a real-time multi-tasking operating system. It features modular hardware and software and is used, in particular, for its fast information processing of time-critical tasks in process control and related areas. It is also used as the controller of GE's low and medium voltage drives.

"Given the tough environment, steel makers are looking for modern technologies that provide improved energy efficiency and reliability, and solutions that provides a lower carbon footprint to comply with environmental regulations," said Mike Archibald, GE Power Conversion's Global Services Leader. "There is certainly a growing need for service in this industry and GE is proud to support our customers in all these aspects."

The project is expected to complete by the beginning of 2017.

GE's Power Conversion business applies the science and systems of power conversion to help drive the electrification of the world's energy infrastructure by designing and delivering advanced motor, drive and control technologies that evolve today's industrial processes for a cleaner, more productive future. Serving specialised sectors such as energy, marine, oil and gas, renewables and general industry, through customised solutions and advanced technologies, GE Power Conversion partners with customers to maximise efficiency.

GE is headquartered in Fairfield, Connecticut. In 2011, the company was listed on Fortune 500 as the 26th-largest firm in the US by gross revenue and the 14th most profitable. □

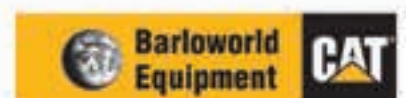


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New high-performance 3D printers and materials

With the launch of 11 new high-performance products at Euromold 2014 in Frankfurt during November, Stratasys, leading global provider of 3D printing and additive manufacturing solutions, is accelerating access to advanced 3D printing capabilities.

Stratasys, headquartered in Minneapolis, Minnesota and Rehovot, Israel, is a leading global provider of 3D printing and additive manufacturing solutions. The company's patented FDM®, PolyJet™, and WDM™ 3D printing technologies produce prototypes and manufactured goods directly from 3D CAD files or other 3D content. Systems include 3D printers for idea development, prototyping and direct digital manufacturing. Stratasys subsidiaries include 3D printer manufacturers MakerBot and Solidscape; as well as digital-manufacturing service companies RedEye, Harvest Technologies and

Solid Concepts. Registered trademarks and brands include: Fortus, Objet, Connex and PolyJet.

At EuroMold 2014, Stratasys launched an unprecedented 11 high-performance 3D printers and materials to help customers improve their competitiveness and deliver high-end prototypes, production aids and manufactured parts with greater ease, speed and efficiency.

Capabilities being introduced include:

- Triple-jetting technology, which is now available across platforms, provides companies with different application and budget requirements access to a large variety of material combinations including flexible, rigid and colour options in a single part from the convenience of compact, office-compatible 3D printers manufactured as industrial-scale systems.
- Up to 20 % faster FDM production times, are ideal for companies looking for efficiency and ease of use when delivering complex prototypes, production aids or final manufactured items or parts.
- Customers can create 3D tools for food processing and to perform steam sterilisation of medical devices. Aerospace and automotive customers now benefit from enhanced speed, toughness and chemical resistance, with new advanced ULTEM 1010 FDM material capabilities.
- Unmatched material versatility: With the compact Objet30 Prime, customers now have access to 12 3D printing materials at the desktop level, providing consumer goods, electronics, medical-advice and other in-



The Objet260 Connex 1, 2 and 3 series is a compact and office friendly platform, while the Objet350 Connex 1, 2 and 3 series deliver the same capabilities with larger build sizes. All six of these 3D printers now provide triple-jetting workflow advantages similar to those available on the Objet500 Connex3.

dustries with greater freedom to test design concepts with advanced working prototypes and parts.

- Faster, more productive hands-free operation with the introduction of soluble support for the Objet Eden-260VS, ideal for companies looking to deliver high volume, high-output prototyping without compromising finish or detail

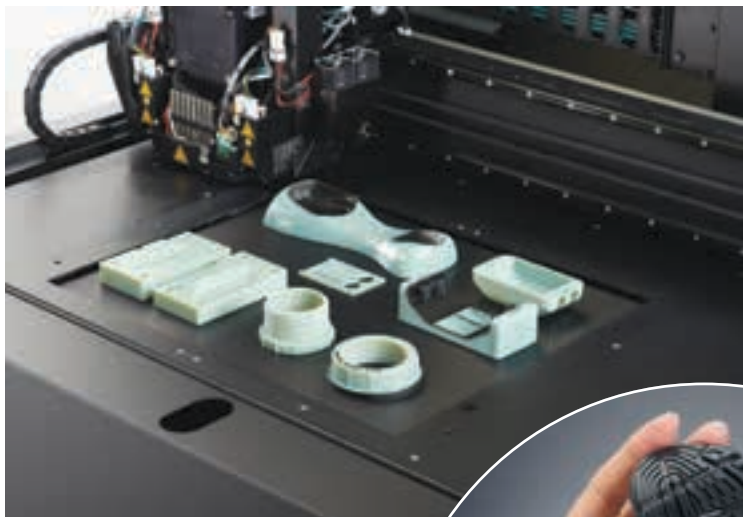
Triple-jetting technology for the office and design studio

With the launch of the popular Objet500 Connex3 colour multi-media 3D printer earlier this year, Stratasys introduced its unique triple-jetting technology that began a new era of colour and multi-material 3D printing. Recently, Stratasys announced six new PolyJet-based 3D Printers, making triple-jetting technology much more accessible for companies with different application and budget requirements. Using triple-jetting technology, designers and workgroups can cost effectively produce prototypes, tools, injection moulds and end-use parts featuring vivid colour and unrivalled production realism.

The Objet260 Connex 1, 2 and 3 series is a compact and office friendly platform, while the Objet350 Connex 1, 2 and 3 series deliver the same



Competitively priced, the Fortus 380mc is designed for high-performance prototyping and production tooling in a variety of standard and engineering thermoplastics.



Above: *Objet350 Connex 3D printers, along with the well-established Objet500 Connex3, will support VRML-exported CAD files in addition to the traditional STL, and they will all deliver colour, multi-material 3D printing.*

Right: *With the compact Objet30 Prime, customers now have access to 12 3D printing materials at the desktop level.*



capabilities with larger build sizes. To increase productivity, all six 3D printers provide triple-jetting workflow advantages, such as hot-swap and fewer material changeovers. Further enhancing ease of use and workflow, the Objet260 and Objet350 Connex 3D printers, along with the well-established Objet500 Connex3, will support VRML-exported CAD files in addition to the traditional STL, and they will all deliver colour, multi-material 3D printing.

New Fortus FDM systems

Leveraging the success of its FDM-based Fortus 3D production systems, Stratasys is launching two new Fortus 3D systems: the Fortus 450mc and Fortus 380mc. Designed for reliability and ease of use, the systems have a new touch-screen interface that allows users to make adjustments to their print jobs without disrupting operations. The new machines can achieve up to 20% quicker build times for complex geometries. Competitively priced, the Fortus 380mc is designed for high-performance prototyping and production tooling in a variety of standard and engineering thermoplastics. Featuring a larger build envelope than the 380mc, the Fortus 450mc employs the most advanced FDM thermoplastics and is ideal for mid-sized functional pro-

totypes, production aids and end-use parts in specialised materials.

Desktop 3D Printer with material versatility

Providing customers with new levels of material versatility and product realism, the new Objet30 Prime Desktop 3D printer offers 12 material options including rubber, rigid, high-temperature and biocompatible materials, with quiet operation and an office-friendly footprint. The Objet30 Prime is ideal for consumer goods, electronics and medical-device applications. Besides its two standard build modes, the system exclusively introduces a third print option – draft mode, which enables 36-micron layer 3D printing for faster build speeds to quickly test prototype concepts.

Soluble support technology for finer-details

Optimised for creating delicately detailed models with complex geometries and very thin walls, the Objet Eden260VS 3D printer combines ultrafine 16-micron resolution with



Above: *Glasses 3D printed on the Objet500 Connex3 using Opaque VeroYellow, rubber-like black and translucent yellow tint in one print job.*

soluble support technology – offering lower cost-per-part for rigid material 3D printing. Combined with its reliability and footprint, the Objet Eden260VS is a great choice for service bureaus and consumer goods designers requiring cost-effective prototyping for assembled parts with fine features, such as dental and medical applications.

ULTEM 1010 resin

Designed specifically with manufacturers in mind, ULTEM 1010 combines superior heat resistance, tensile strength and chemical resistance and can be sterilised using steam autoclaving for medical applications. It is also biocompatible and has the only food-contact certification of any FDM thermoplastic. These properties make ULTEM 1010 the right choice for aerospace, automotive, food production tooling, medical device manufacturing and functional prototyping applications.

“The global design and manufacturing market continues to push toward creating smarter products with greater efficiency. Because we believe in, and support this trend, we have announced a range of solutions that focus on ‘democratising design’. Our customers, whatever their size or industry, can now access a wide spectrum of cutting-edge 3D printing capabilities that deliver competitive advantage,” concludes Gilad Yron, senior vice president, product management, Stratasys. □

P2000 X-Ray security software launched

Johnson Controls has released turnkey software to manage and control X-ray machines used in mines and elsewhere for security.

The P2000 X-Ray software from Johnson Controls interfaces to body X-ray machines and carries out full body gender-specific stop-and-search scans, with radiation dosage-control record keeping that is approved by the Department of Health. This is a first in South Africa and the world. With advanced functionality, intelligent algorithms and the ability to integrate with third-party security systems, the P2000 X-Ray system takes safe and smart use of X-ray machines for security purposes to the next level.

Says Marius Brits of Johnson Controls: "The P2000 X-Ray has been developed over the last 12 months by local and international Johnson Controls specialists, with application-specific input from industry experts. Built at the request of a major mining client in South Africa, the P2000 X-Ray addresses all the key challenges and

requirements of organisations that make use of X-ray systems to manage staff and property security.

"This solution fills a clear gap in the market, helping organisations better protect their assets and take care of their people while giving them greater control. We expect the P2000 X-Ray solution will be of significant interest to a number of industry sectors, such as mines, prisons and hospitals, and government and military facilities," Brits adds.

The software has come out of testing, has gone live at a major mining client and the installation has received approval from the Department of Health. Following its official launch to the industry at the Managing Mine Security Conference at the Gallagher Estate on 1-2 October 2014, the software is now available to all.

Notes Brits: "It has been difficult to optimally control the stop-and-search and X-ray process. Adherence to health and safety regulations, especially managing radiation dosage, is a primary concern, but so are reliability and the ability to leverage data from related systems to more accurately and intelligently target potential threats or deal with high risk incidents. Our new system integrates to CCTV systems to allow full control and provides an audit trail of the entire X-ray transaction for investigative purposes.

"The P2000 X-Ray combines Johnson Controls' global experience in multiple industry sectors with local expertise and best practices in technology development to deliver an effective, feature-packed solution that addresses health, safety, and security issues."

Built on an open source platform, P2000 X-Ray software offers advanced functionality through the integration of X-ray machines with other security systems, such as access control and CCTV as well as back-end systems such as HR and SAP. Intelligent algorithms ensure stop-and-search remains genuinely random and that radiation dosages are managed and measured according to regulations.

Algorithms assess data from various systems, combining them to profile and identify individuals deemed high risk, and alert security staff to these



The P2000 X-Ray interfaces with a number of X-ray machines and Johnson Controls will continue to collaborate with equipment manufacturers to integrate their brands.

incidents. All data logs are synchronised, across multiple X-ray machines at a single site, as well as across multiple sites, ensuring near real-time access to data.

The system is easy to maintain, as all components (key electronic, biometric, mechanical and electrical components related to the X-ray system) are subject to a continuous automated health check with alerts to prompt maintenance planning.

The P2000 X-Ray logs all user actions, system decisions and errors; reviews them and issues reports that identify where thresholds are exceeded or not met. A graphical report depicts key performance indicators related to the process and allows the system to be managed from any viewing station by an authorised user. The regular scheduled and automated reports also provide insight into operator and process performance.

The system can be configured to meet the needs of different organisational structures: different numbers and location of X-Ray machines; various viewing stations and booths; and the inclusion of specific features, such as image management and dose control, is incorporated.

What mines need

Full body X-ray scans are done at mines to prevent theft of valuable metals, minerals or other objects. However, there are safety and security regulations as well as internal policies that govern the process. Among others, no employee may be subjected to more than a safe amount of radiation, a scan may not take place if a supervisor is not



Full body X-ray scans are done at mines to prevent theft of valuable metals, minerals or other objects. Built on an open source platform, P2000 X-Ray software offers advanced functionality through the integration of X-ray machines with other security systems, such as access control and CCTV as well as back-end systems such as HR and SAP.

present, nor may male viewers assess a scan of a female employee, and vice versa. The P2000 X-Ray has a number of safeguards and intelligent alerts that facilitate this process, increasing efficiency, introducing greater rigour, and limiting wastage.

The P2000 X-Ray, via a tamper proof algorithm hard coded into the system, selects employees at random for scanning. To prevent overexposure to radiation, the P2000 access control solution interrogates the client's SQL database system to check previous exposure of individuals. The algorithm then assesses the amount of checks required through the rest of the defined period (e.g., per annum), assesses related data and makes a decision whether to scan the individual or to do a dummy scan. Process and X-ray information across multiple machines and multiple sites is synchronised daily, ensuring security staff and the system are basing decisions on accurate information.

It also makes use of data from access control and CCTV systems (including video analytics) to identify anomalies (e.g., objects dragged or workers entering unauthorised areas) to target potential high-risk incidents, groups or individuals. In addition, all system decisions and errors, and actions by users (operators, viewers, supervisors and related security staff) are logged and reviewed to ensure security policy is being correctly implemented.

The solution offers a number of functions to improve the efficiency and effectiveness of the process. Viewer stations, which are remote from the X-Ray area and booths to prevent collusion, may be allocated male or female viewers and this is noted in real-time by the system. The system will check if a supervisor and viewer of the correct gender are present before allowing a scan to be done. This prevents unnecessary radiation exposure and increases process efficiencies.

In terms of management, all X-ray machines can be managed from any viewing station, or a collated view can be obtained using pre-defined reports to manage X-ray performance. The reports incorporate KPIs and present them in graphical formats for easy comprehension. KPIs may include operator interventions per 100 scans, dummy scans as a percentage of total scans, up-time of the machine, and average

2nd-generation RepRapPro now available in SA

RS Components (RS) has announced availability of the new version of the RepRapPro Ormerod 2 3D printer, which offers extensive versatility and functionality in an easy-to-assemble kit. 3D printing enables electronic and mechanical engineers to quickly and easily realise early design concepts by creating fast-turnaround prototypes, potentially saving months in the product design cycle.

The RepRapPro Ormerod 2 is an open source, single-colour low-cost 3D printing machine and one of the most versatile 3D printers available. It is easy to expand in functionality, fast to replicate and fast to assemble. All the RepRapPro printers, including previous machines such as the Ormerod and Mendel, are capable of self-replicating their own plastic components. The Ormerod 2 brings several advantages compared to its predecessor, including simpler and more integrated assembly with improved instructions and wiring looms for simple plug-in connection – and no soldering is necessary.

The design offers much easier adjustment of the bed level; improved y-axis belt location and retention delivers easier adjustment of belt tension; and a new bed probe now features a four-wire differential device that provides much easier access to the extruder for cleaning purposes. In addition, the power supply is now a 100-240 V worldwide input power supply and is a dedicated 12 V supply, rather than being an adapted supply, which is more compact with its integration into the machine with no trailing wires. EMI emissions have also



The fully assembled RepRapPro Ormerod 2 3D printer, now available in kit form in South Africa from RS Components (RS), offers build volume and speed of 200×200×200 mm and 1 800 mm/min, respectively; accuracy of 100 µm and layer resolution of 10 µm.

been reduced, resulting from a fully shielded design that meets the Class A CE mark.

Specifications of the Ormerod 2 printer include: build volume and speed of 200×200×200 mm and 1 800 mm/min, respectively; a deposition rate of 33 cm³ per hour; accuracy and layer resolution of 100 µm and 10 µm, respectively; and the ability to print using either PLA or ABS thermoplastic materials. The open-source software designed to run the machine is fully compatible with the original Ormerod printer and will run on a relatively low-powered computer running Windows, Linux/Ubuntu or Mac OS.

Like the first Ormerod, the Ormerod 2 uses the FFF (Fused Filament Fabrication) process, which can build 3D objects in a range of plastics and also in a variety of colours. The price? Roughly R10 000, depending on the exchange rate. □

dose measured per scan.

Viewers assess the scans and will indicate whether a physical search is required. The P2000 X-Ray software system gives security personnel new tools to improve their ability to detect anomalies. Reference scans are done on every new employee to identify any metal in the body – e.g., fillings or internal metallic surgical supports. The P2000 X-Ray system enables viewers to compare new scans to these scans to identify any new materials in or on the body. In addition, simple features, like the ability to zoom in or switch to an inversion of the scan, have been added to allow the viewer to more closely inspect details. Special filters adopted from the medical radiological industry are used to identify anomalies inside the body so that advanced image processing can be done. This enables viewers to indicate

to security staff conducting physical body searches where to look for illegal items. This is a great improvement on having to blindly do a full search.

A further refinement – currently under development – is auto detection of materials of a specific density (gold, platinum, etc.) via the scans.

The software is modular, so can cater to the needs of different types of organisations using different processes, and security software. The P2000 X-Ray interfaces with a number of X-ray machines and Johnson Controls will continue to collaborate with equipment manufacturers to integrate their brands. The full P2000 X-Ray suite can be implemented or the user can select to only make use of dose control functionality. Remote image management can be specified, as can the number of X-ray machines and booths. □

Acquisition reflects increasing use of hydraulic lifts

Following the August 2014 acquisition of Skyjacks Tailifts (Pty) Ltd by Micron Investment Holdings, the two companies have relocated to a new site in Anderbolt, Boksburg, on Johannesburg's East Rand. Micron's managing director, Stan Contat (right), talks about the increasing use of hydraulic tail lifts and the changing trends in the South African market.



As South African industry begins to reflect the increasing use of mechanical lifts in the international transport arena, Micron Investment Holdings has geared up to supply and support a growing range of forklift attachments and customised hydraulic tail lifts to

the local market. In August 2014 the group acquired the business of Skyjacks Tailifts (Pty) Ltd and is poised to relocate this new acquisition, together with its sister company, Micron, to a shared site in Anderbolt, Boksburg, on Johannesburg's East Rand.

"Micron has secured more than 50% of the forklift attachment market through a combination of quality equipment and comprehensive product support for the life of the equipment," says Micron's Stan Contat. "We've cherry-picked a number of agencies from around the world to provide best-fit solutions for our customers and underpinned this offering with full maintenance contracts on our products, 24/7 product support and a comprehensive spares holding.

"We recognised that Skyjacks Tailifts has a lot of synergy with Micron's offering, in terms of hydraulic valve banks, hoses, cylinders and seal kits. We saw its acquisition as a tremendous milestone on our journey to achieve our vision of growing into a materials handling group capable of supplying products into mega-industries across sub-Saharan Africa, industries such as warehousing and distribution, yellow metal and cranes. We're a young and innovative group on a growth trajectory, primarily through acquisitions, and we are currently evaluating another two potential purchases."

Contat is confident that the hydraulic lift market will continue to grow as utilisation increases. Although local industry has traditionally shied away from this equipment in favour of using labour to load and unload goods, recent changes in health and safety legislation governing heavy lifting is likely to prod companies towards hydraulic lifts. This trend could well be given momentum by

the increasing labour issues confronting industry across the board.

"Overseas, the truck driver is also the tail lift operator," Contat continues. "In addition, the driver will often operate an electric pallet jack and handle the entire process of unloading goods at their destination. Although we operate in a comparatively poor part of the world, there are definite signs that the local market going to follow this trend.

"In our country, small to medium companies are still somewhat unwilling or unable to make the upfront expenditure on lifting equipment, even though they would be assured of improved total cost of ownership in the longer term. They are still making short-term decisions. The multinationals, however, have long understood the concept of total cost of ownership and they tend to view this kind of purchase as an investment," he argues.

On the supplier side of this issue, he suggests that too many local companies are putting sophisticated lifting equipment and accessories into the market that they are unable to support. "This, coupled with untrained operator abuse, results in good products getting a bad reputation," he adds.

"All these factors have helped us to position Micron and Skyjacks Tailifts as companies that not only supply quality products, but are also able to support them and give customers real uptime and satisfaction that positively impacts their entire logistics chain."

The management of both companies is underpinned by a philosophy of sustainability, gaining a robust competitive edge against companies that operate "hit and run" policies. "It immediately becomes obvious to new customers that both Micron and Skyjacks Tailifts are able to satisfy customer needs for competitive pricing and equipment support throughout the operating life of their lifting equipment," Contat says.

"We're applying the lessons we've learnt at Micron to Skyjacks Tailifts, with some exciting early successes in this really competitive sector," he reveals. "We've had two absolutely fantastic months since taking over the company. One of the ways we've achieved this is to combine Micron's 20 service technicians with Skyjacks Tailift's smaller crew to create an efficient field service team that operates throughout the country.



Although local industry has traditionally shied away from using hydraulic equipment in favour of using labour to load and unload goods, recent changes in health and safety legislation governing heavy lifting is likely to prod companies towards hydraulic lifts.



"Once a truck mounted lift is accepted as the appropriate solution, our manufacturing team will custom build your selected product," Contat assures.

Energy recovery and die press solutions

Voith Turbo H+L Hydraulic has launched a servo-driven die press and die cushion combination: the Voith CSH Die Cushion Drive and its partner, the PSH Press Drive. This servo-hybrid drive solution, due to the application of energy recovery principles, can reduce energy consumption of component pressing processes by up to 80 %.

With its new CSH die cushion drive, which consists of a servo pump with a double-acting die cushion, Voith has launched an innovative drive concept for demanding forming processes. The CSH die cushion drive needs no valves and reduces energy consumption of the press significantly. In combination with the efficient PSH press drive, press operators can save up to 80 % on energy use by adopting this solution for the future.

Conventional die cushion drives have a die cushion and a pressure-relief valve, which means the work done by the die cushion is irretrievably lost following each pressing operation. In contrast, the Voith system feeds the mechanical power of the servo pump back to the process through the motor to regenerate electrical power. This reduces net energy consumption and makes unprecedented energy efficiency levels achievable. Furthermore, the servo-hybrid CSH die cushion drive uses a smaller oil reservoir, less oil and requires no costly cooling to dissipate wasted energy.

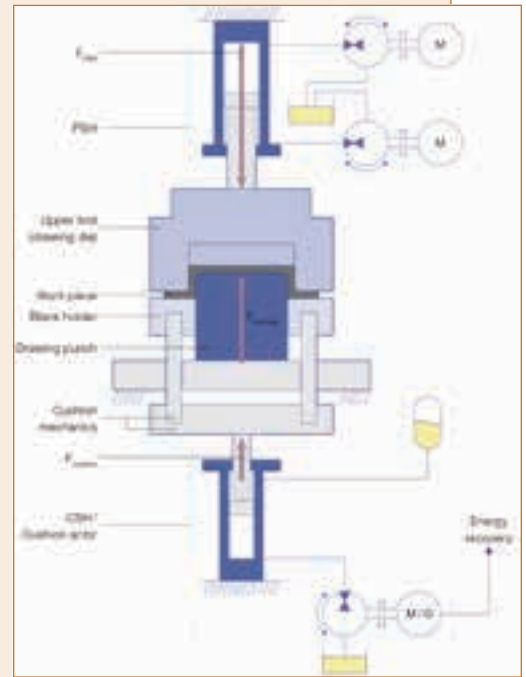
This die cushion drive with its double-acting die cushion is ideal for forming processes involving complex geometries. The advantages are obvious: the CSH provides exceptional repeatability; and is freely programmable in terms of speed,

force, position control, and acceleration. The result is not only increased process variability, operators also benefit from increased productivity while simultaneously improving the quality of the parts produced. How is that possible? The accelerated die cushion adjusts to the position-time curve of the ram and, in contrast to a single-acting die cushion, reduces tool impact on the workpiece. This improves surface quality, protects the machine and tool, and prevents damage such as cracks and creases on workpieces.

New energy efficiency standards

The PSH press drive from Voith is known for high energy efficiency. The intelligent control system permits a very flexible use of the press. The PSH therefore guarantees the best possible matching of power and speed to the pressing process. Thus, the press only uses as much energy as required by the relevant process phase.

With the combination of a PSH press drive and the new CSH die cushion drive, Voith has now developed a system that sets new standards in the world of servo presses: Press operators can save up to 80 % on energy use by adopting this combination, which will improve total cost of ownership (TCO) while simultaneously increasing productivity. The unlimited programmability of the drive concept



The combination of the servo-driven PSH press drive and the new CSH die cushion drive reduces energy consumption by up to 80 % by using energy recovery principles after completion of a pressing operation. The displaced hydraulic oil from the exhaust sides of the double acting cylinders drives the servomotors backwards to regenerate electricity.

gives operators new capabilities when it comes to demanding forming processes.

Both the PSH and the CSH can be easily scaled up into the megawatt range.

Voith Turbo H+L Hydraulic is a subsidiary of Voith Turbo and specialises in intelligent drive solutions and systems for customers in the oil and gas, energy, mining and mechanical engineering, marine propulsion, rail and commercial vehicle industries. □



The CSH die cushion drive from Voith.



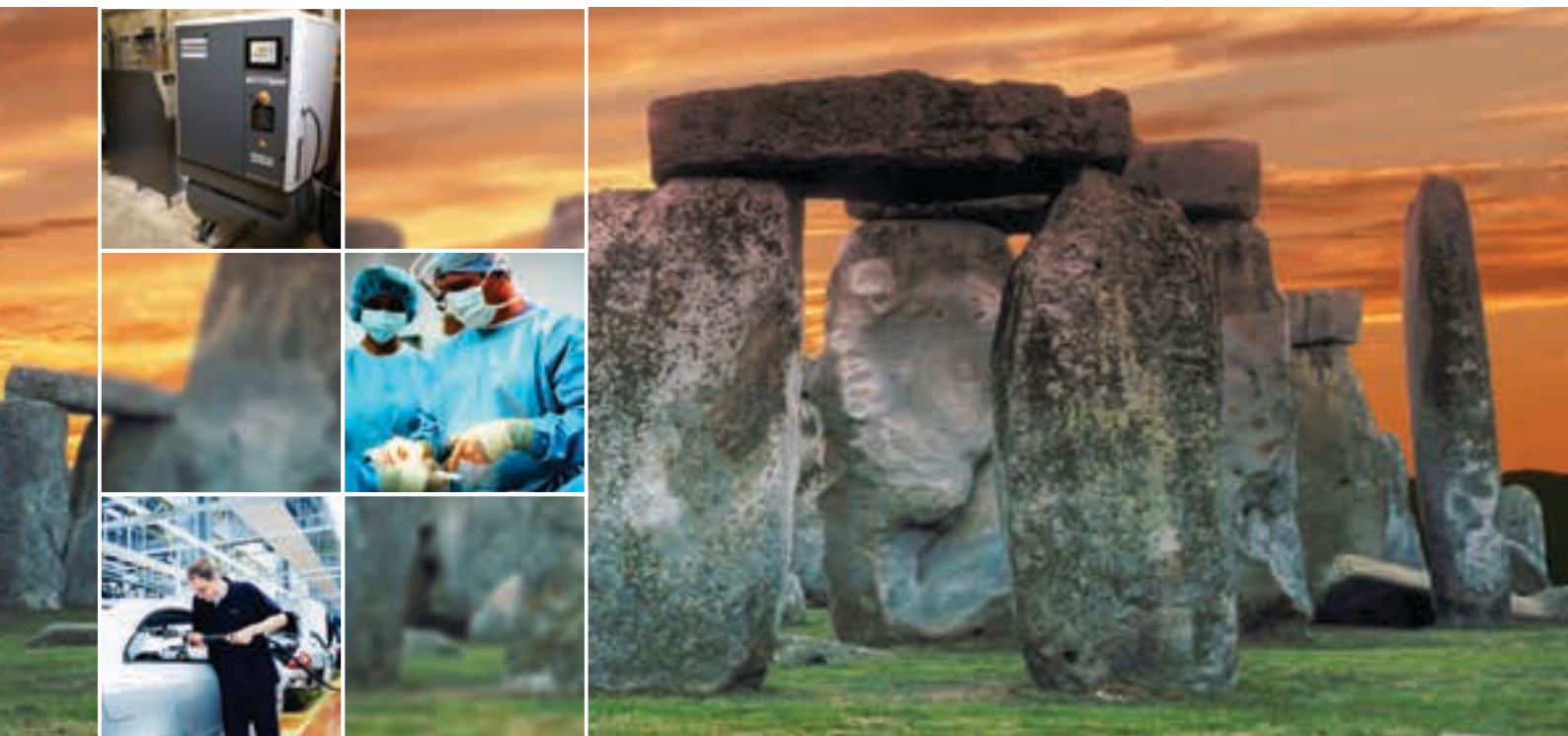
The heart of PSH and CSH die cushion drives are Voith servo pumps.

“We’re focusing strongly on imprinting the Micron culture on Skyjacks Tailifts. This culture is based on a commitment to customer satisfaction, on

giving our employees every opportunity to grow their careers within the group and, of course, on making a profit at the end of the day. All three of these

factors are viewed through the eyes of sustainability, ensuring that we are creating an environment in which our group can grow,” Contat concludes. □

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Sustainable Productivity



Atlas Copco

Optimised hitch control for Indian ploughs

This article reports on the customisation by Bosch Rexroth of its Eurocentric EHC-8 electro-hydraulic hitch control solution to suit the Indian agricultural market with its rugged and more variable ground conditions.



The saturated, muddy sludge that can characterise Asia's arable land presents unique performance challenges for electrical and mechanical components.

Bosch Rexroth, distributed in southern Africa by the Hytec Group of Companies, has optimised its EHC-8 electro-hydraulic hitch control in order to replicate the same precise regulation of power and positioning for the lifting and lowering of towed agricultural ploughs in Asia as has been delivered to European and North American markets.

In the transatlantic environments for which it was principally designed, the EHC-8 enhances agricultural applications through a greater control of implement depth, which increases the accuracy of tillage, turning soils gently and uniformly for improved yields. The same levels of project satisfaction were not, however, originally replicated outside of these regions due to the vastly different climactic and terrain conditions and yields, necessitating Bosch Rexroth to modify and re-engineer certain core components and mechanical designs that comprised the EHC-8 control to meet the specific needs of Asia's agricultural markets.

The first step of tailoring such a solution, was a detailed analysis of the operating conditions. Many regions are affected by monsoon climates, high rainfall and high humidity conditions in which excessively saturated land poses unique challenges to the use of mechanically-propelled implements. The winter months endured by these regions, conversely, present hot, dry and

dusty conditions, extending the loading demands on equipment components.

Designed for extremes

In optimising the hitch control for operation in these conditions, two components in particular required modifications: the angular sensor and the control panel. The control panel was optimised for enhanced rough terrain capability through the application of a protective film, while increased brightness offered greater visibility under intense sunlight. The control panel was installed into the operator armrest to provide maximum ergonomic operability for improved

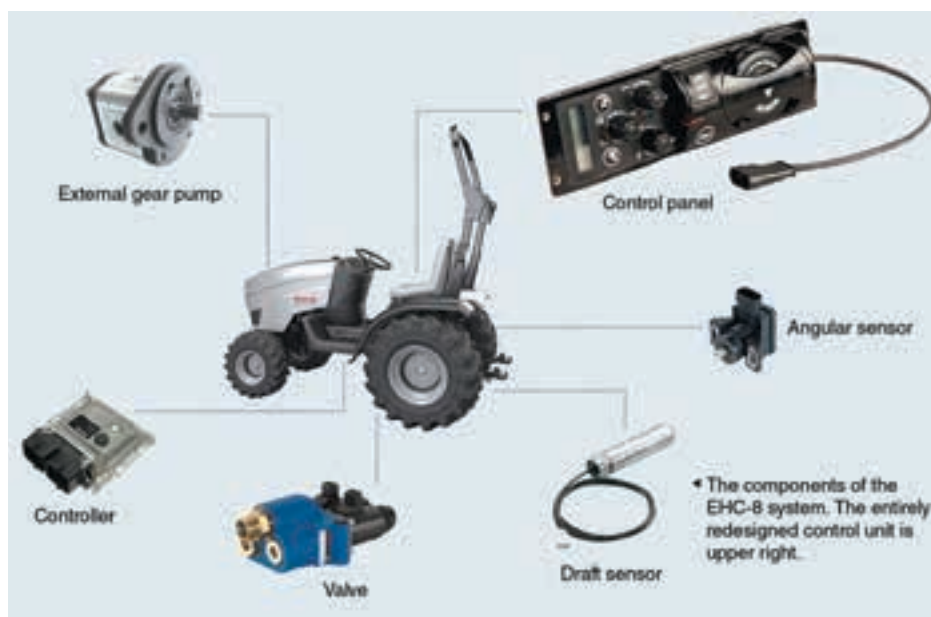
productivity and operator safety.

Another modification required to enhance the hitch's viability in these conditions was resistance to leaks. The IP 67 protection code adhered to in European environments was not suited to the dusty conditions experienced in Asia, requiring a modified sensor and the separation of electrical components from the mechanical space.

The controller software also had to be adapted, shifting from the European lower linkage to upper linkage control. Because this configuration only requires one power regulation sensor instead of two, Bosch Rexroth was also able to reduce production costs.

The company reduced costs in several other areas as well. Because the plastics used in the construction are sourced locally, sourcing them is cheaper, in addition to being more tolerant of the local conditions, offering a slightly more durable service life. Local manufacturers are also producing the EHR5 hydraulic valve, which regulates the flow of hydraulic fluid to the cylinders for greater precision of movement control for the lifting unit.

Further research and development is planned for the hitch control beyond the commencement of mass production in the first quarter of 2015, including the implementation of a power measurement sensor tailored to local power ranges. □



The modified components used in the EHC-8 electro-hydraulic hitch control, including the angular sensor and redesigned control panel.

Low-pressure air blower range

Atlas Copco ZS air blowers integrate the proven benefits of screw technology to reduce energy costs by 30%.

Atlas Copco Compressor Technique's low-pressure ZS and ZS+ VSD air blower range with its twin-screw design is based on the company's pioneered oil-free screw technology and sets a technological standard for energy efficiency in the low-pressure compressed air market.



Atlas Copco developed the ZS and ZS+ VSD air blower range based on its oil-free screw technology, which uses internal compression.

These positive displacement blowers provide a continuous and reliable supply of 100 % oil-free air, TÜV-certified according to ISO 8573-1 CLASS 0 (2010), offering customers the benefits of high efficiency, reliability, quiet operation (less than 80 dB (A)), high controllability, easy installation, low maintenance and long equipment life.

Low-pressure compressed air is widely used for applications such as wastewater aeration at treatment plants; dilute phase pneumatic conveying of dry powders, and flue-gas desulphurisation of emission stacks. "The blower market for small volume flows has been largely dominated by blower technology such as twin-lobe and Roots-type blowers – typically used for early turbochargers in vehicles – which have not seen any major technical improvements over the past 50 years," says Pieter van Wyk, Atlas Copco Compressor Technique business line manager for Oil-Free Air.

Recognising a market need, Atlas Copco developed an air blower solution based on its oil-free screw technology that uses internal compression instead of external compression; a technology

that Van Wyk says is far superior to any other traditional blower technology. "This development enables us to offer the market an alternative low-pressure blower that runs at a similar duty to traditional lobe-technology units, but includes all of the features and benefits associated with modern screw compressors."

The ZS range integrates the proven benefits of screw technology and will cut energy costs by an average of 30 % when compared to twin-lobe and Roots-type blowers. Although the ZS blower does not represent the lowest capital cost solution on the market, the significant energy cost savings associated with the efficiency of a screw compressor lowers the lifecycle costs substantially. Van Wyk points out that the energy savings alone make up for the initial purchase cost and will realise quick returns on investments. "Over a five year period, 80 % of the total costs of a 160 kW blower will be down to energy, while the remaining 20 % will be equally split between the initial capital cost and the ongoing maintenance costs.

"Screw compressors are not generally associated with the most efficient technology, but when it comes to the 1 000 to 8 000 cc/hour flow range, our

Power tools combine air performance with mobility

Innovative new high power cordless tools that deliver the power and performance of an air tool while providing the mobility of a battery tool are being launched by Chicago Pneumatic. The new impact wrenches, impact driver and drill drivers offer superior power and battery performance for increased productivity, durability, ease of use and mobility.

The powerful and efficient CP8848 ½-inch impact wrench, the flagship product of the series, is the perfect companion for those working in the industrial maintenance, repair and operation (MRO) sectors. The CP8848 boasts a custom-designed motor and durable gearbox that provides a powerful 775 ft-lbs. (1,050 Nm) of torque and weighs just 6.9 lbs. (3.1 kg).

The advanced technology of the 20-Volt/4Ah CP20XP and 12-Volt/1.5Ah CP12XP Lithium-ion batteries provide the operator with more power and a runtime that is twice that of other conventional products.

The shock resistant and durable bat-

teries slide smoothly into the tools' cradle and are released via a quick release button. They feature triple protection circuitry and individual cell monitoring to prevent overheating and overloading during extended periods of use. The easily visible charge gauge provides accurate battery level information to help minimize downtime.

"For too long, industrial MRO professionals had to make a choice between the power of air tools or the mobility provided by cordless equivalents," says Luis Clement, Chicago Pneumatic Tools vice-president. "Our new range of cordless

tools eliminates that dilemma and helps them get their job done faster and more comfortably."

Completing CP's new cordless line are the compact CP8828 3/8-inch impact wrench, the lightweight CP8818 ¼-inch impact driver, the strong and versatile CP8548 ½-inch hammer drill, and the ultra-compact CP8528 3/8-inch drill driver. Each of these tools provides superior power and torque while ergonomic handles and strategically placed switches guarantee ease of use. In addition, tool components and the housing were engineered to provide maximum reliability and durability for increased tool life.

All CP cordless tool packs come with two batteries and a charger. Extra batteries and chargers are available. In addition, CP offers a range of genuine accessories, from drill bits to impact wrench sockets.

The new CP cordless tools, batteries and chargers come with a three year limited warranty, which may vary by country. The entire range is now available from Chicago Pneumatic Tools' authorised distributors. □



screw technology, without any doubt, offers the best efficiency,” continues Van Wyk, “and the ZS+ oil-free variable speed drive (VSD) (22-355 kW, 30-475 hp) air blower range takes the two key prerequisites of reliability and energy efficiency to another level.”

The ZS+ VSD is supplied as a state-of-the-art, ready-to-run package with completely integrated VSD convertor and proven Elektronikon® controller. “Our premium solution also comes with its own on-board PLC to precisely control the unit’s volumetric flow and discharge pressure. It is also fully compatible, via Modbus or Profibus, to a company’s SCADA system in a plant room, enabling a customer to very quickly get a complete picture of what his compressors are doing.”

Continuous monitoring is directly associated with efficiency as better control and visibility helps to build efficiency across the whole process in a plant. “Add to this a proactive maintenance regime, component reliability is further improved and equipment life span is extended with a direct and positive impact on uptime.”

The 100% oil-free air delivery of the ZS blower is absolutely essential in many applications where end-product contamination must be avoided at all cost. In an oil-injected compressor, the oil removes some of the heat when it is separated from the compressed air. But because the blowers run oil free, they run hot so they are fitted with an additional water-cooled jacket around the housing to extract heat from the air.

ZS blowers are made to last and screw technology has a much longer trouble-free running life. All ZS blowers are guaranteed for five years, but Van Wyk notes that the average lifespan is between seven and nine years. “As only bearings and seals will wear, only preventative maintenance is needed over an approximate five year period. A Roots-type blower won’t last much more than a quarter of that time,” he reveals.

Excellent component accessibility further enhances maintenance and extends service intervals in the ZS blower range. “And in the event that a seal does go, the design prevents any oil from mixing with the air. The oil is trapped in a redundant chamber and vented to the atmosphere to prevent contamination via the screws,” concludes Van Wyk. □

Small rotary compressors enhance reliability

Ingersoll Rand, a global leader in compressed air systems and services, power tools, fluid and materials handling equipment, is extending its R-Series line of compressed air solutions to include small rotary compressors with V-Shield™ technology to reduce leaks and improve reliability.

Built on a common platform, the new R-Series compressors are available from 5.0 to 11 kW with flows of 13.76 m³/h (8,1 cfm) to 100 m³/h (57,5 cfm) and pressures up to 14,8 bar (200 psig) on fixed speed units and 11 (145 psig) when coupled to variable speed drives. These new R-Series models are available for order from December 2014 through Ingersoll Rand representatives.

“The compact design of the R-Series makes it the ideal workplace compressor with a 20 % reduction in footprint and sound levels as quiet as a dishwasher,” says Davor Horvat, product manager for contact-cooled machines at Ingersoll Rand in Europe, Middle East and Africa.

V-Shield technology

With the application of V-Shield™ technology, the leak path and connections on the R-Series compressors have been reduced by more than 15 %. V-shield™ technology ensures all critical fittings are secured with O-ring face seals in a method that is nearly free from distortion. Leaks are virtually eliminated and performance isn’t sacrificed, regardless of how many reconstructions are made. Leaks are also reduced by the use of polytetrafluoroethylene (PTFE) braided, stainless steel hoses for all oil-carrying lines.

Other advancements on the R-Series 5-11 kW include:

- Totally enclosed fan cooled (TEFC) motors with premium IE3 efficiency.
- Simple design and fewer components, reducing maintenance.
- Large, convenient electronic controls and a digital output display come standard to support easier programming and operation.

Tri-voltage motors and total air systems

R-Series fixed speed compressors come standard with tri-voltage motors that adapt to the supply voltage, while variable speed motors come in multiple voltage options, allowing for more flexibility when configuring the system. An improved, leak-free, next-generation air end features an integrated separation system to optimise air and oil separation for peak air quality.

All R-Series units are available as fixed



and variable speed units that can be configured with integrated dryers as a total air system (TAS). Each TAS unit comes with high-performance dryers, a three-in-one heat exchanger and an independent fan circuit to consistently generate dry, clean air.

“When customers select our total air system configuration, the R-Series from Ingersoll Rand is a complete plug-and-play solution that, as a standard offering, generates the cleanest, driest compressed air right out of the box,” adds Horvat.

Easy to use and compact

An innovative new design vertically stacks the drive components of the R-Series 5.0 to 11 kW, reducing the equipment’s footprint by 20 % and providing easier access to the components when maintenance and service are necessary. To further optimise its performance in limited workspaces, the drive components are mounted on an Ingersoll Rand vibration isolation system reducing noise pollution and vibration.

Ingersoll Rand products range from complete compressed air systems, tools and pumps to material and fluid handling systems. “Our diverse and innovative products, services and solutions enhance our customers’ energy efficiency, productivity and operations. We are a \$12-billion global business committed to a world of sustainable progress and enduring,” Horvat concludes. □

Material engineering in practice:

from cast iron to lightweight steel

In this new regular column to be presented quarterly by members of the School of Chemical and Metallurgical Engineering from the University of the Witwatersrand, Tony Paterson muses about the changes in the use of iron and steel, from Ironbridge to aerospace structures.



The first iron bridge was opened on New Year's Day 1781 and still stands in the town of Ironbridge, west of Birmingham.

In Ironbridge, a town 40 minutes West of Birmingham in the UK, is one of the forerunners of the industrial revolution, the first iron bridge ever built. Construction began in 1779; the bridge opened on New Year's Day 1781, and it still stands today as a tourist attraction and monument.

The bridge, itself, was built in cast iron, but cast iron is a hard, brittle material that is difficult to work. Cast iron's restriction was that it could only be used in compression. The bridge's design, therefore, mirrors the then current timber frame designs, with all the elements cast as equivalents to wooden members and assembled to be in compression at all times.

Since the invention of the Bessemer process in the 19th century, mass production of steel has become an integral part of the world's economy. Steel is malleable, relatively easily formed and a more versatile material. It is also suited to both compressive and tensile forces. Better design, therefore, became possible. But joining proved to be a challenge in terms of force flow if one was to avoid bulky joints. Hot rivets were commonly used and can still be seen in many significant structures of the time.

Alignment of forces became possible with the development of welding. This alignment enabled the use of thinner sections as the moments associated with riveting or bolting were eliminated. This development also meant that a relatively small selection of flat and shaped sections and thicknesses could be combined to form a myriad of different structures to meet operator requirements. This led to the rapid development of the welding sector during and after the Second World War.

The growth in demand after the Second World War started to accelerate in the early 60's. Welding became widely used as technology improved. From the seventies on, the developing skills shortages led to the development of cleverer machines that could be operated by lower skilled operatives. A good example is the lathes and milling machines of the 1960s compared to modern multi-axis machine tools. Welding machines, which relied on highly qualified experienced welders, began to be programmed to reduce the man machine interface. Automation led to more predictable outputs for specific input conditions. In parallel a combination of materials development

and manufacturing capability led to the availability of stronger, more reliable plates, sheets and sections. Processes such as friction stir welding enabled reliable extension of plate sizes. Laser welding enabled tighter energy control and modern 3D printing in metal now enables assemblies to be manufactured as single complete components.

If one examines structures erected during the sixties and seventies, one is struck by how much heavier they are than more modern structures for the same purpose. The stresses in the parent material has to be lower due to the inherently poorer mechanical properties, manufacturing and fabrication tolerance issues. As a result, welding stresses were also lower.

As one moves through the latter years of the 20th century, the advances of materials development, manufacturing, fabrication and welding become clearer. Structures became thinner, lighter and capable of carrying higher stress. Higher and lower temperature applications, involving improved creep and brittle fracture properties, respectively, have become accessible and are now applied. Simultaneously, welded joints have had to become more highly stressed. However, concerns such as distortion and deflection, functions of Young's Modulus rather than strength, previously masked by the heavier material thicknesses, are now proving to be new challenges. We do not sufficiently understand the relationship between the discrete theories of materials related to the microstructure and the continuous theories of material related to the macrostructure.

Additional challenges of the twenty first century arise from opportunities related to the triple bottom line of people, planet and prosperity. This puts more focus onto resource limitations and health. So what has this to do with welding?

Take resources as an example. Because of imperatives associated with light weighting and reliability, the aerospace sector has tended to avoid welding as unreliable. Many parts were either machined from solid material or riveted together, even where a permanent join was required. Finite material limits,

MAP gases and the poultry industry

Sub-Saharan African gas market leader Afrox boasts a range of industry-leading 'FoodFresh' modified atmospheric packaging (MAP) gases that prolong food shelf life safely and economically.

Poultry is an important protein source for millions of South African families, however it can be host to a range of pathogens that cause severe food poisoning if it is not adequately stored and transported. One of the most effective ways to minimise this risk is to ensure that the cold chain is not broken.

Even with an unbroken cold chain, however, shelf life remains an issue for fresh produce, which will start deteriorating after a few days. This is where modified atmospheric packaging (MAP) gases come into their own, by extending shelf life safely and economically.

Afrox manager for special products and chemicals, Marietha Strydom points out that the component gases in MAP are carbon dioxide, nitrogen and oxygen, which each contribute different preservation benefits. "These are all present in the air that we breathe and are 100% natural," she says.

The success of Afrox's FoodFresh MAP range lies in using the correct combination of these gases to inhibit deterioration of each specific type of food – by applying knowledge of the mechanism of deterioration. "Carbon dioxide is bacteriostatic and fungistatic, which means that it retards the growth of mould and aerobic bacteria, while nitrogen is used to displace oxygen where aerobic mechanisms dominate. It is also used as an inert filler gas to prevent package collapse," she explains.

Strydom indicates that the spoilage of chilled poultry stored aerobically is largely due to the growth of pseudomonas, especially pseudomonas fluorescence, P. Putida and P. fragi. "When these organisms reach populations of 100-million

per square centimetre, an 'off odour' can immediately be detected," she adds.

In an Afrox study, portions of fresh chicken under an atmosphere of 25% CO₂, balanced with nitrogen (N₂) lasted for ten days at a temperature of between 1.0 and 2.0 °C, in trays with non-permeable film, without developing off-odours. At 3.3 °C, it was discovered that growth of clostridium botulinum is possible in a MAP atmosphere. This toxin can cause severe flaccid paralytic disease in humans and is the most potent toxin known to humankind, natural or synthetic, with a lethal dose of less than 1,0 µgram in humans. It is, therefore, essential for the product to be constantly maintained at below 2.0 °C.

The studies revealed that higher CO₂ concentration provides greater protection, although the tray packaging deforms, as the CO₂ reacts with moisture to form a vacuum. Strydom adds: "Pure carbon dioxide is the answer for shipping bulk par-cooked chicken where a central kitchen distributes to stores, where the final cooking steps will be done."

Afrox's FoodFresh MAP gases and gas mixtures are rigorously monitored in the company's SABS ISO 9001 rated quality control laboratory. The products are certified as food grade quality, and distributed in dedicated food-industry branded cylinders.

Strydom believes that Afrox's FoodFresh range of MAP gases has revolutionised the poultry supply chain. "The FoodFresh range also gives companies a competitive advantage, as extended shelf life means longer production runs, fewer deliveries and reduced hours



Pure CO₂ is the answer for shipping bulk par-cooked chicken to kitchens where the final cooking is done.



The component gases in MAP include carbon dioxide, nitrogen and oxygen, which each contributes different preservation benefits.

spent restocking shelves, as well as reduced losses caused by spoilage," she continues.

The benefits are not limited to poultry, but also meat, fish, dairy products, confectionary products, dried products and fresh fruit and vegetables, but says Strydom "each food category has its own needs and unique requirements".

"Specific gas mixtures have been designed to meet these requirements, but we recommend that trials are done to determine the most suitable FoodFresh gas for each application before a final choice is made," she concludes. □

energy and global warming effects are leading to new manufacturing processes, many of which involve modern welding processes for aerospace purposes.

On the health side, process plants servicing the pharmaceutical, food, beverage, beer, wine and dairy sectors require hygienic fabrication and operation to guarantee product safety. Together with decreasing quality and availability of water, health legislation governing bacterial content of final products has increasingly tightened. Particularly in the mostly site-welded thin-wall pipes that interconnect tanks

and other process elements, biofilm formation on inside surfaces, and particularly in the weld HAZ, nugget and root areas, encourages both bacteria growth and microbial induced corrosion (MIC). Unfortunately, whilst good design standards for hygienic fabrication exist, major gaps are found in the lack of practical guidelines, education and, pertinent to South Africa, skills training and development together with appropriate supervision.

So, in summary, while we have come a long way, we have a way to go. The Gleeble 3500 thermo-

mechanical simulator recently installed at the School of Chemical and Metallurgical Engineering, University of the Witwatersrand, enables the controlled, repetitive production of particular microstructures. Amongst other applications, one research programme is intended to explore the discrete/continuous material interface of welds to assist in better finite element analysis modelling of whole structures. Once the baseline has been established for mild steels, more exotic materials such as those used for aerospace applications can be considered. □

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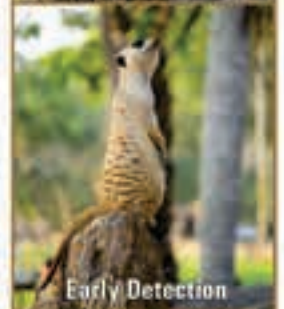
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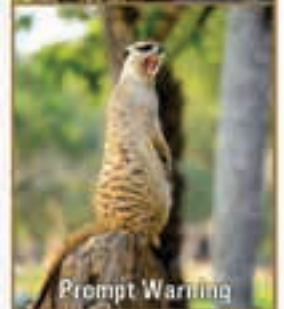
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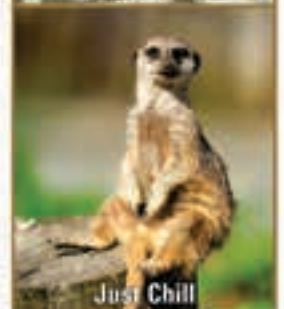
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The Meerkat's most important role is detecting danger levels guard. The Meerkat scans for potential danger, then warns the rest of the pack. They are also specially adapted to live in harsh environments.

CryoEase: for budget sheet metal engineering

Budget Sheet Metal Engineering, a family-run business that specialises in the manufacture of sheet metal parts and finished products, has recently switched from using cylinder gas from Air Products to the company's CryoEase bulk liquid solution. This article outlines why.

Air Products' innovative CryoEase mode of supply is a flexible gas solution aimed at providing "total gas management". Gary Lombard, CryoEase business manager at Air Products, explains: "When it comes to industrial gas requirements, we ensure total peace of mind for our customers. This means assuring them of the highest levels of long-term security of supply, in such a way that customers do not ever need to worry about gas availability. This frees fabricators up to concentrate on their own core business, thereby epitomising our company's commitment to 'service that delivers the difference'."

One of Air Products' long-term customers recently made the switch from a cylinder-based mode of supply to CryoEase, and is now reaping the multiple benefits.

Budget Sheet Metal Engineering, a family-run business that specialises in the manufacture of sheet metal parts and finished products, has used cylinder gas from Air Products for more than a decade. The nature of the business is such that demand is erratic and based on 'ad hoc' jobs of varying sizes.

"Depending on the job, consumption of gas can be quite significant, and we found that the cylinder method was becoming increasingly challenging," says Claudio Ferrari, managing director of Budget Sheet Metal. "There are various difficulties inherent in managing cylinder turnover, such as doing cylinder stock reconciliations and dealing with product loss."

When Budget Sheet Metal up-scaled its operational footprint from two smaller premises to one large, 2 600 m² facility in Randburg, the company decided to review its gas supply contract with Air Products, and looked at various options.

"We did our industry research, and this exercise confirmed for us that Air Products has similar organisational values and ethics; as well as an equally high regard for customer service ex-

cellence. In addition, it was able to provide us with a practical solution to our supply needs. Thanks to their recommendation regarding CryoEase, we have not looked back," Ferrari says.

Air Products, in turn, aims to build strong, long-term relationships with customers built on open communication and trust. "We were there when Budget Sheet Metal needed us and, armed with the correct and relevant information, we were able to work together to find a suitable solution," says Lombard.

CryoEase is a method of liquid gas delivery that suits a manufacturing or fabrication facility where gas requirements have outstripped cylinder volume capability, and where the premises are large enough to house a large storage tank. These criteria were all perfectly aligned to Budget Sheet Metal's requirements.

"The beauty of CryoEase is that we can manage supply on a long-term basis without our customer needing to be involved in the ordering process," says Lombard. "Our telemetry system alerts us well before levels run critically low – thereby eliminating the risk of an unplanned downtime due to an interruption in supply – which can be disastrous for any manufacturing operation."

Air Products supplies Budget Sheet Metal with high purity (HP) speciality gas mixtures for various fabrication processes, notably as a coolant for use on its laser machinery. The company, specialising in stainless steel, mild steel and aluminium, offers CNC punching, laser profiling, bending, jigging, welding (including robotic welding), grinding, de-burring and finishing. Its diverse product and service offering is bolstered by its use of a 3D computer-aided draughting (CAD) system, which gives enhanced accuracy and efficiency to the prototype design process.

For Budget Sheet Metal, which has enjoyed steady growth in recent years, it was critical to find an industrial gas supplier that could efficiently match its



From left: Gary Lombard, CryoEase business manager at Air Products; and Claudio Ferrari, managing director of Budget Sheet Metal.

increased volume requirements. "With Air Products' CryoEase system, we can meet high demand without interruptions in production. This is thanks to the size of the tank, which is based permanently at our premises, and to the fact that Air Products is consistently monitoring volume levels. We are furthermore impressed with the quality of the gas itself," Ferrari comments.

"With CryoEase, Budget Sheet Metal can focus on its operations without worrying about managing their gas, and without the fear of down-time or damage to materials in the event of an interruption in supply. Continuous flow means enhanced productivity, and enables the company to focus on growing the business. And as the business grows, Air Products will be there, managing our customer's supply and demand proactively, every step of the way," Lombard concludes. □

Phoenix hybrid sounding rocket launched



During August last year, the Aerospace Systems Research Group of the University of KwaZulu-Natal (UKZN) launched its Phoenix-1A hybrid sounding rocket at the Denel Overberg Test Range. *MechTech* talks to Michael Brooks, aerospace research group leader (right of picture) and research associate Jean Pitot.

Established in 2009 in UKZN's Mechanical Engineering department, Brooks says aerospace research is not new to the university and that Natal University had been active in the field since the 1950s. "We chose the name Phoenix to reflect the resuscitation of a programme started by our predecessors," he says.

The Phoenix research programme involves the development of a series of hybrid sounding rockets, for human capital development purposes and, eventually, for use by the African scientific community for physics research. Following successful lab-scale tests on wax/nitrous oxide rocket motors – along with the development of HYROPS, a hybrid rocket performance simulator that models rocket performance and flight paths – the group set about designing and making its Phoenix-1A, a hybrid rocket with a theoretical apogee of 10 km, capable of delivering a payload of 1.0 kg.

"A sounding rocket is a high-atmosphere, instrument-carrying rocket designed to take measurements and perform scientific experiments during a relatively short sub-orbital flight," Brooks explains, adding that hybrid motor technology is ideal for these types of applications and for student development.

Describing the three basic types of rocket motor, he says that liquid propellant technology is used for the larger rockets. Typically these have a tank of liquid oxygen and a separate tank of a fuel such as kerosene. The fuel and the oxidiser are mixed and ignited to create the expanding combustion gases that produce the rocket's thrust. "The hardware required to pump the oxidiser and fuel is very complicated, expensive and heavy. And it is dangerous to use these fuels at institutions such as universities," he says. "Liquid technology does not scale well, either, so it is not really feasible for small-scale sounding rockets."

At the opposite end of motor technology are the solid-fuel rockets that are, in essence, similar to those used for fireworks. "With solid-fuel rockets, the combustion fuel and oxidiser are mixed in advance, then packed into



The Phoenix-1A hybrid sounding rocket immediately prior to launch at the Overberg Test Range.

the rocket's combustion chamber. From the moment you ignite it, the motor will burn, and it can't be stopped until all the fuel is spent. As with liquid technology it is very difficult to do solid motor research at a university because the fuel is explosive and, therefore, dangerous," Brooks points out.

Hence the use of hybrid rocket motors. "A hybrid rocket uses a solid plastic, rubber or wax fuel and a separate liquid or gaseous oxidiser. The fuels are not premixed," says Brooks. The solid fuel UKZN is using is a cylinder of paraffin wax – Sasol 0907, a mix of saturated, long-chain alkanes – with a



Under development, UKZN's aerospace Group's Phoenix-1A, a hybrid rocket with a theoretical apogee of 10 km, capable of delivering a payload of 1.0 kg.



port drilled through its centre. The wax fuel fits snugly into the combustion chamber casing in front of the rocket's nozzle.

For the oxidiser, nitrous oxide (N_2O) is used, which is passed through an injector and into the front of the combustion chamber. On ignition, the N_2O dissociates into O_2 and N_2 – exothermically, which releases additional heat – and the wax melts and vaporises. The oxygen reacts with the hydrocarbon vapour to produce expanding combustion gases. These are channelled via a bell shaped nozzle at the back of the rocket, propelling it upward.

“The burn can be shut off or slowed down at any time, simply by regulating the flow of nitrous oxide through the injector,” Brooks explains. Hybrids have reasonable performance and are relatively safe. They are “ideal for training because they introduce students to the liquid propellant plumbing and flow issues necessary for the bigger commercial liquid-fuel rocket technologies – but at much lower cost – and the combustion principles of solid rockets,” Brooks tells *MechTech*.

“Nitrous oxide also self-pressurises,” adds Pitot. “When you fill a tank with liquid nitrous oxide, some of it evaporates and pressurises to a saturation pressure. Then, as the gas is used during the burn, the pressure goes down, but there is a self-compensation effect because evaporation tends towards restoring the saturation pressure. While



Above: UKZN's Aerospace Systems Research Group: Back row, from left: Clinton Bermont, Ugan Padayachee, Donald Fitzgerald, Seffat Chowdhury, Michael Brooks, Bernard Genevieve, Jean Pitot, Udil Balmogim. Front row: Preyen Perumali, Kirsty Veale, Robert Mawbey, Matthew Richings, Fiona Leverone.

Left: Phoenix-1A was launched at the Overberg Test Range in August, achieved a 2,5 km apogee and, after a flight of 40 seconds landed several km away.

pressure cannot be maintained constant for the duration of the burn, this certainly helps to support combustion and reduce variation,” he explains.

Because it is evaporation related, the nitrous oxide pressure is very sensitive to temperature. “At 20 °C, the equilibrium pressure is at 50 bar, but at 26 to 27 °C, the pressure goes up to 58 bar. For safety reasons – to avoid any possibility of blowback into the tank – we pre-charge the tank with helium to 65 bar immediately before launch,” continues Brooks. This pressure is dropped down to a combustion chamber pressure of 40 to 42 bar by the injection process.”

Pitot continues: “The solid wax fuel grain used in the combustion chamber is black, not white. We blacken the wax with carbon to stop radiation penetration during the burn, which can damage the grain. The shell liners are also very important in this regard. Any contact between the combustion gases and the chamber shell will simply melt through the shell and destroy the rocket,” he adds.

Phenolic liners are used around the outer surfaces of the wax fuel. “Phenolic is amazing stuff! It is used in the nozzle construction of some very big rocket motors,” Pitot says. “It degrades very slowly at high temperatures, absorbing an enormous amount of heat. While decomposing, a charred layer of carbon is formed on the surface that limits heat transfer deeper into the material. It can therefore insulate against temperatures of 3 000 °C, which help to keep the

outer casing of the combustion chamber cool,” he explains.

A further advantage of using a solid wax fuel is that it is not sensitive to cracks. “The nitrous oxide comes down the centre port of the wax, which liquefies and then vaporises. It is the wax vapour that fuels the combustion reaction, so minor cracks in the solid wax do not matter. A solid rocket fuel grain, on the other hand, combusts if exposed. So cracks in the surfaces will increase the exposed combustion area, raise the combustion pressure and can cause the motor casing to explode,” Pitot tells *MechTech*.

UKZN's Phoenix-1A hybrid sounding rocket is 4.4 m long, has a diameter of 200 mm and weighs 70 kg. It was launched at the Overberg Test Range in August, achieved a 2,5 km apogee – at a lower trajectory than predicted due to high surface wind on the day and a nozzle problem – and, after a flight of 40 seconds landed several km away.

“Phoenix-1A was designed idealistically, according to what we wanted it to be rather than what was easiest to manufacture. As a result, it was expensive and difficult to make. Our next vehicle will be made from less expensive materials, so the sizes and nozzle shapes will have to all be redesigned.

“We need a rocket that we can launch more often. So Phoenix-1B will be less expensive and more reliable. It has to be a workhorse vehicle that we can use for regular research – and we intend to deploy and recover it at least once a year,” Brooks concludes. □

Insight – intelligent bearing technology

Bearings have long been considered the heart of rotating machinery, but now, thanks to SKF Insight™, a smart technology developed for machine condition monitoring, they have a brain as well.

SKF's developments in various smart wireless technologies are being integrated into SKF bearings and enable the units to continuously communicate their operating conditions through internally powered sensors and data acquisition electronics.



By sensing directly on the bearing, SKF Insight™ is able to monitor damage from the first microscopic effect.

SKF Insight technology is ideal for

condition monitoring of critical machinery and technically challenging applications. The technology makes condition monitoring more widely available, especially in applications where it was previously impossible or impractical. With SKF's integrated diagnostic technology, customers can get even better control over the lifecycle of their machinery, leading to lower total costs, higher reliability and better machine uptime.

Prior to SKF Insight, condition monitoring techniques could only monitor damage after it had occurred. Now, by sensing directly on the bearing, SKF is able to monitor the damage from the first microscopic effect as it is happening and, with this information, customers can take remedial action to react to conditions causing bearing damage, such as improving lubrication or mitigating against transient overloads.

In addition, Insight makes it possible

to measure the load a bearing actually experiences rather than what it was designed for. This valuable information can be routed back into the design phase to improve both the system and bearing design.

SKF Insight technology features:

- Miniature sensor packages for the measurement of RPM, temperature, velocity, vibration, load and other parameters.
- Embedded-power generation;
- Intelligent wireless communication technology;
- Smart 'mesh network' communication technology that allows information to be routed via other connected bearings.

SKF Insight ensures better operational knowledge, better maintenance planning, optimised manpower and spare part management, which all lead to lower costs of operations.

www.skf.com

Nigerian service centre for air blower offering

Quality service and faster turnaround times will now be possible in Nigeria and the surrounding countries thanks to the establishment of a local service centre by blower and compressor supply specialist Airgas Compressors. Airgas is the sub-Saharan subsidiary of Ger-

man-based Aerzener Maschinenfabrik (Aerzen), one of the world's leading specialists in the design and manufacture of roots blowers, turbo blowers, screw compressors, rotary lobe compressors and gas meters.

The Johannesburg-based company

established a branch in Lagos, Nigeria in February 2013 with the aim of providing close proximity sales and service offerings to clients. "At present, the Airgas branch in Nigeria is only an office, however a workshop will be opened in early March 2015 to cater for all service requirements, including field service, repairs and overhauls," says Nigeria branch manager, Emmanuel Dazi. "Once the workshop is fully operational, the turnaround time on repairs and service will be reduced.

"Having the service centre in Nigeria will reduce the standard overhaul time to about three weeks, which is unrivalled in the Nigerian market," Dazi concludes.

www.airgas.co.za

Hydraulic rail benders for underground transport systems

Becker Mining South Africa's hydraulic rail benders have been developed for bending and forming rails on railway lines in heavy industrial and underground transport systems. "These rail benders – standard on many South African mines – are powered by 25 ton/250 kN hydraulic cylinders and activated by two stage hand pumps to cope efficiently in harsh operating conditions," says Eugene Davids, product manager for Becker Mining South Africa. "These robust



Becker Mining South Africa's hydraulic rail benders, which bend and form rails on railway lines in heavy industrial and underground transport systems on the mines, easily handle rail of up to 40 kg/m.

rail benders are manufactured locally at the company's Bellambi Mining and Industrial facility in Alrode, according to stringent quality and safety specifications."

For ease of maintenance, the pump and cylinder are detachable from the rail bender. The main frame of these rail benders are cast and forged from ASTM-E487/78/110 steel and are fitted with specially designed handles for easy transportation. The back frame section, which provides stability to the unit, enhances portability and facilitates accurate alignment.

Becker Mining's range of hydraulic equipment also includes robust jacks, designed for safe and easy railcar and off-road equipment jacking applications. This hydraulic equipment, with spares and accessories, is available nationally from Becker Mining South Africa's extensive branch and distributor network. In addition, the company offers a full repair and maintenance service at its Alrode service workshops.

www.za.becker-mining.com



An Aerzen Delta Screw, oil-free screw compressor.

Convenient heatless desiccant dryers

Atlas Copco's CD2-5 range of small desiccant dryers offers an array advantages that make it particularly suitable for point of use and OEM applications.

The CD2-5 dryers, available from 2.0 l/s to 5.0 l/s offer high installation flexibility, have a very small footprint, utilise desiccant cartridges that include an integrated dust filter, and come equipped with an electronic controller with the connectivity for remote monitoring.

"Installation versatility is a key requirement for units of this size," explains Charl Ackerman, Atlas Copco South Africa business line manager, Industrial Air division. "The fact that the unit can be installed horizontally as well as vertically presents a significant benefit. In addition, the multi-port inlet, outlet and integrated after-filtration systems ensure that the package is a highly attractive proposition, especially when space is at a premium."

The unit is run via an electronic timer controller, which provides for remote monitoring and purge cycle pause (via a remote signal) as standard. "On top of this, all units are shipped with a series of interchangeable purge nozzles to optimise performance across a wide variety of operating conditions," adds Ackerman.

For reliable operation and performance, the high strength aluminium profiles are anodised to prevent corro-



Atlas Copco CD2-5 heatless, desiccant dryers offer high installation flexibility, have very small footprints and include integrated dust filters.

sion and the molecular sieve desiccant ensures a reliable pressure dew point down to -70°C .

The smaller CD2-5 dryers complement the larger range of Atlas Copco dryers, which comprises 17 different models. "Extending our offering to include elements of a compressed air system such as filters and dryers, backed by a global aftermarket support structure, ensures that Atlas Copco remains a first choice supplier," concludes Ackerman. www.atlascopco.com

Off-grid solar and backup power solutions for SA

Schneider Electric's Solar Business, a global leader in solutions for the solar power conversion chain, has released its off-grid solar and backup power inverter/charger, the Conext SW, in the southern African region.

The Conext SW represents a technological step forward for Schneider Electric's off-grid solar product offering by providing pure sine wave output inverter/chargers in power ranges of 4.0 kW and lower. Pure sine wave technology provides clean, uninterrupted power that can effec-



The Conext SW is ideal for off-grid solar, backup power and small community electrification applications.

tively run modern electrical appliances and equipment.

Every Conext SW is a 24 V dc system with selectable 50/60 Hz functionality. It is available in 230 V ac, and stackable up to 8.0 kW.

The Conext SW is ideal for off-grid solar, backup power and small community electrification applications. Breaker panels and accessories are available to build a complete system that communicates through simple network architecture.

Associated with the brand-new ComBox,

Aftermarket parts for diesels

A range of IPD aftermarket parts for Caterpillar® diesel engines are available from Metric Automotive Engineering. "This is part of IPD's concerted drive to introduce new products that help cut costs for owners of Caterpillar equipment – without jeopardising engine performance or life," says operations director, Andrew Yorke. The parts include overhaul gasket sets for 3512/3516, C9, C13 and C27 engines, overhaul kits for C9 engines and connecting rod bearings for C32 engines.

With the appearance of Cat® C-series engines in the aftermarket sector after more than a decade in full production, fleet owners and other users now have the option to install IPD quality engineered replacement parts, which enjoy the reputation of being unmatched by any rival aftermarket equivalents.

Russell Kneipp, president of IPD, was in South Africa recently to meet with local representative, Metric Automotive Engineering and said that Cat C-series engines are now in the stage of their lifecycle where "it makes sense to buy quality replacement parts that will yield the required hours at a price that delivers a good return on investment".

"IPD understands these engines, which have been used in the region for some time and need to be maintained properly if they are to continue to perform according to design specifications," Kneipp says. IPD is launching its replacement parts for C-Series engines up to C32 throughout the course of this year.

US-based IPD, represented by Metric Automotive Engineering in the local market, is a leading aftermarket provider of engine components for heavy-duty diesel and natural gas powered engines.

www.metricauto.co.za



A range of IPD replacement parts for Caterpillar® diesel engines are now available from Metric Automotive Engineering.

operators of the Conext SW systems can now monitor yield performance using devices of their choice, such as personal computers, tablet devices, or building management systems. Installers can also change the settings of Conext SW device during commissioning and remotely react to system alerts.

www.SESolar.com

SA's nanosatellite: one year on

TshepisoSAT, South Africa's first nanosatellite has survived one year in space, during which time it has travelled 250-million kilometres, taken hundreds of images, beaten 50% survival odds and inspired thousands of learners, resulting in a tripling of student applications for the CPUT space programme for 2015. The nanosatellite is still going strong, as it continues its six billion kilometre journey, after taking off from the Yasny Launch Base in Russia in December 2013.

The tiny 1,2 kg cube-shaped satellite measuring 10×10×10 cm is about 100 times smaller than Sputnik 1, the first satellite launched into space in 1957. It took 18 months, 30 000 hours of manpower and forty CPUT students to build and finish TshepisoSAT, which contains 4 000 electronic components and runs on the same amount of power as a 3.0 W lamp.

It was designed and built by CPUT postgraduate students participating in the Satellite Systems Engineering Programme at the French South African Institute of Technology (F'SATI), in

collaboration with the South African National Space Agency (SANSA) and funded by the Department of Science and Technology (dst) and the National Research Foundation (NRF).

Internationally, more than 50% of CubeSats fail early in their missions. TshepisoSAT has beaten the odds and survived the harsh radiation from the sun, extreme temperature fluctuations, a few strong solar storms and two close encounters with defunct Russian satellites.

Humbulani Mdau, chief director: Space Science and Technology at the Department of Science and Technology, says that TshepisoSAT (meaning 'promise') has put the country and the continent on the global map. Fifty students have graduated through the programme from a R21-million investment from the dst. "The nanosatellite is testament to the skills of South Africans and its development has been instrumental in creating opportunities for science advancement, as well as human capacity development," he says.

Says director of the CPUT space programme, Robert van Zyl: "TshepisoSAT truly embodies the hope and promise of the next generation of space engineers. The fact that our first satellite is still operational proves that know-how, infrastructure and ground operations have been established in support of the high-reliability space industry in South Africa."

He continues: "South Africa is establishing a broad-based indigenous capacity to develop advanced spacecraft for a range of applications that benefit soci-

ety, as well as the user community who can use the data from the satellites for the development of services," he adds.

It is a 24-hour job to monitor the satellite and decipher the data. One engineer is employed full time to operate the satellite and package the data and telemetry received. "We are currently concentrating efforts on deploying the nanosatellite's main antenna that is connected to the high-frequency beacon, for use to study the propagation of radio waves through the ionosphere, providing valuable space weather data to the South African National Space Agency (SANSA) and to enable improved space weather modelling and forecasts," Van Zyl says.

TshepisoSAT, which orbits Earth up to 15 times a day at an altitude of 600 km, has also received its official licence from the South African Council for Space Affairs (SACSA) and is now included in South Africa's national register of space assets.

The team at CPUT has also started development on ZACUBE-2, which will be three times larger than the first CubeSat. The new satellite will be ready for launch in 2016. □



TshepisoSAT, South Africa's first nanosatellite, is a tiny 1,2 kg cube satellite measuring 10×10×10 cm.

Africa, the new frontier for nuclear power

Africa is fast becoming the continent of choice for the development of nuclear power. Currently South Africa is leading the way in Africa having signed nuclear co-operation agreements with Russia, China, the USA, Korea and France during 2014, paving the way for establishing a nuclear procurement process.

According to the World Nuclear Association, countries actively considering nuclear power programmes include Ghana, Senegal, Namibia, Sudan, Uganda and Namibia, while countries already developing plants include Nigeria and Kenya.

The development of nuclear energy in Africa will be discussed at the upcoming Africa Energy Indaba taking place at the Sandton Convention Centre in February. A stellar panel has been assembled comprising nuclear industry experts: Des Muller, Group Five Nuclear Construction Services; Yves Guenon, MD of AREVA; Rob Adam, representing Aveng and NIASA; Dawid Serfontein, School of Mechanical and Nuclear Engineering, North-West University; Phumzile Tshelane, CEO NECSA; and Viktor Polikarpov of Rosatom Africa. www.africaenergyindaba.com

Industry diary

February 2015

Energy Indaba

17-18 February, 2015
Sandton Convention Centre,
Johannesburg.
Mbali Ndaba
+27 11 463 9184
mbali@siyenzaevents.co.za

API Storage Tanks: by Alex Fereidooni

16-20 February, 2015
Johannesburg, Cedar Park Hotel
Phindi Mbedzi: +27 11 325 0686
phindi@2kg.co.za
www.2kg.co.za

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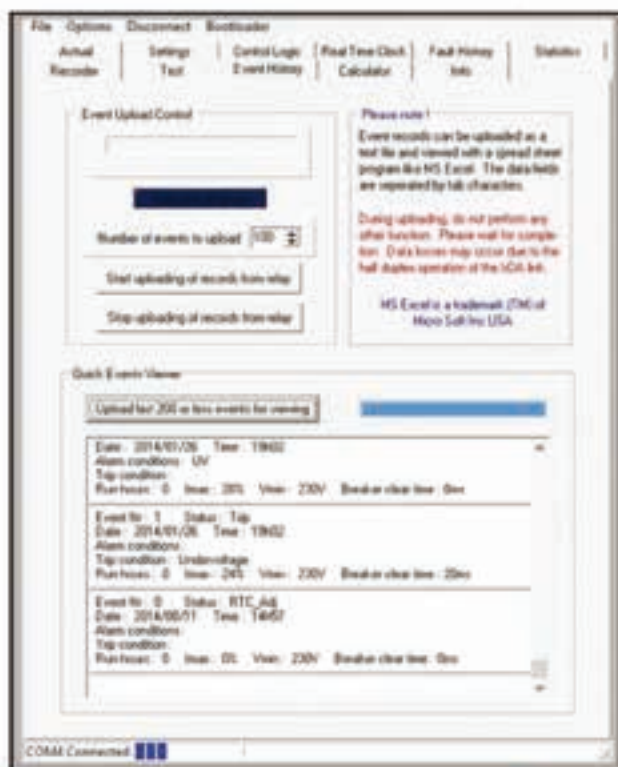
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Front End Events

Front end Screen showing all the events associated with the pump. Events such as warning, starts, stops, trips and settings changes are all recorded and stored inside the relay.



Protection and Management Features

- Thermal Overload Protection
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- Earth Leakage / Earth Fault Protection
- Short-circuit Protection
- Starts per Hour Limitation
- Over / Undervoltage / Phase Rotation
- Over / Under Frequency Protection
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- 2000 Event Recording
- 60 Last Fault Records
- 3-Phase Recorder
- On-Board Simulator

Johannesburg (Head Office)
P.O. Box 26389, East Rand 1462
Gauteng, South Africa
Tel: +27 11 966 9300
Fax: +27 11 552 8742

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