

## THIS MONTH:

- MBSA: from one to one million
- SA drives company gears up for Africa
- The consumerisation of manufacturing IT
- Pre-CAD solutions for advanced topology optimisation

# MECHANICAL



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## Time to protect our steel industry?

Earlier this month, I was invited on a trip to the construction site of the Kusile Power Station as a guest of the Southern African Institute of Steel Construction (SAISC), which was followed by a tour of Genrec, Murray and Roberts' structural steel fabrication facility.

From the time we got onto the bus, it was immediately apparent that SAISC was deeply concerned about the immediate future of the local steel industry. Most of those invited were decision-makers from government departments: the Department of Trade and Industry (dti), National Treasury and SARS's Customs and Excise division. SAISC's appeal for their support began with a short presentation by Paolo Trincherio, SAISC's CEO.

South Africa, according to Trincherio, produces about 7,0-million tons of steel per year, of which about 5,0-million tons is locally consumed. "I think this year is going to be one of the worst in the steel industry's history with consumption at below 4,5-million tons," he began.

"China exported 100-million tons of steel last year and has the capacity to produce over 750-million tons," he revealed, adding that it was not uncommon for imported Chinese fabrications to land on our shores at a lower cost than that of the raw steel. He warned that there was a very real possibility that practices such as these could destroy the world steel industry.

Locally, he said, each unit of the Medupi and Kusile power stations required around 20 000 t of steel support structure. In comparison, one large shopping mall such as the Mall of Africa needed about 1 000 t of structural steel for its roof. "So when we stop building power stations, we have to build 20 large shopping centres to compensate for the lost work from each unit. This is currently a very real challenge!" Trincherio pointed out.

The structural steelwork for the first four units of Medupi and Kusile – eight units in total – was all fabricated in South Africa using locally sourced steel. The last four units, however, two from each power station, are being supplied from Germany, Saudi Arabia and Vietnam.

"It has been said that South African contractors were slowing things down but, in fact, all of the locally ordered structural steel is sitting in the 'veld' out there. Steel was never on the critical path for these power stations and, if we hadn't procured the last third of the work from overseas, we could have had our own fabricators working right now producing the steel for the last four boilers. Instead, most South African structural steel fabricators are having to retrench staff," Trincherio said.

"The current difficulties being faced by the South African steel industry cannot be over emphasised," he warned, reminding us of two key problems: the total lack of project work and the unrestricted access China has to South African markets.

Directly addressing the treasury representatives on the trip, Trincherio highlighted the need to shift from talking about the National Development Plan to implementing it. "Our industry is in real trouble! We urgently need some priority projects to be released to keep the steel merchants and steel fabricators going," he stressed.

Following a lightning tour of the Kusile site, we were bused back to Alrode for the Genrec visit. The extent of the current difficulties soon became apparent. "Our biggest challenge is order book," said a Genrec representative. "The company's capacity is 30 000 t per year and its current order book is 600 t," we were told. That is a scary statistic! One of South Africa's largest fabrication facilities is currently running at 2% capacity.

He added that the only opportunity left open to them was export. "There are no more big projects on the South African horizon and, the reality is, we will be retrenching a lot of workers unless we can secure overseas work."

The company sees opportunities in the coalfields of Oregon in the USA, which is "easier and cheaper to reach from South Africa than from China". And, in spite of last year's gruelling metalworkers strike, labour issues are not seen as a barrier to global competitiveness. This is clearly evident in Genrec's export record over the years, which includes the contract for the structural steelwork of the iconic Burj al Arab Hotel in Dubai.

Through BRICS, South Africa is developing preferred trade agreements with economically stronger partners: China and Russia in particular. But the playing field is not level. Chinese steel is cheap because of massive state subsidies.

It is surely in our interests to support and/or subsidise our own industries – and to use import duties or other disincentives to protect our markets from unfair competition from overseas. This has to be a better option than economic empowerment, black or otherwise, that is dependent on marking up imported goods.

*Peter Middleton*



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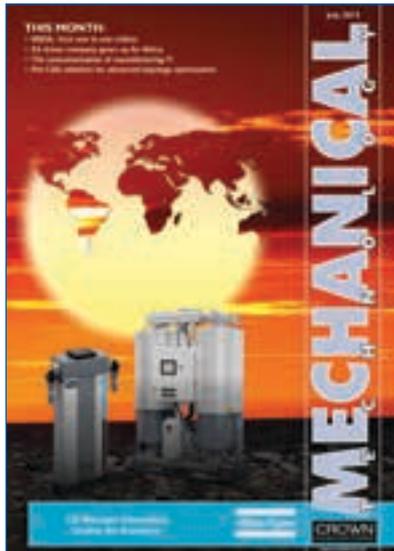
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## ON THE COVER



### Compressor Technique embraces new technology

Following Atlas Copco's global acquisition of vacuum products specialist, Edwards, Atlas Copco Compressor Technique in South Africa has access to a comprehensive vacuum products range. In addition, the company is introducing its patent pending UD+ cartridge filter solution, along with a re-engineered range of GA compressors. *MechTech* talks to Pieter van Wyk and Dean Adriaanse.

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# Compressor Technique embraces new

Following Atlas Copco's global acquisition of vacuum products specialist, Edwards, Atlas Copco Compressor Technique in South Africa has access to a comprehensive vacuum products range. In addition, the company is introducing its patent pending UD+ cartridge filter solution, along with a re-engineered range of GA compressors. *MechTech* talks to Pieter van Wyk and Dean Adriaanse.

In April 2015, Atlas Copco launched its pioneering GHS 350-900 VSD+ vacuum pump range; a range of new-generation, highly efficient, intelligent vacuum pumps with variable speed drives. "Based on the well-known and durable plug-and-play design principles of Atlas Copco compressors, a series of vacuum pumps have now been developed to deliver peak performance at operating pressures commonly found in industrial applications," says Dean Adriaanse, product manager of the company's Industrial Air division in South Africa.

Also new is the company's UD+ compressed air filter cartridge, which replaces the combination of a general-purpose (DD) filter in series with a high-efficiency (PD) filter, which is currently used in over 50% of oil-injected compressor applications. "One of our new UD+ filters replaces two previous-generation filters and, as a consequence of the new

Nautilus media technology, gives a 40% lower pressure drop compared to the two-filter solution," he adds.

"And it doesn't end there. We are also launching the re-engineered GA range of oil-injected rotary screw compressors, which, following intensive market research, have been tailored to better meet the real needs of customers. Efficiency and reliability have been further improved, and servicing has been simplified to reduce operating costs," Van Wyk tells *MechTech*.

## Atlas Copco's vacuum solutions

Drawing a vacuum, explains Adriaanse, involves creating suction pressures below atmospheric pressure. "There are two broad categories of vacuum, rough or fine, depending on the vacuum being drawn. We are currently focusing on rough vacuum pumps, which produce pressures from 1 000 down to 1.0 mbar.



Atlas Copco's single-stage oil-sealed rotary vane pumps (GVS series) offer flows of between 20 and 365 m<sup>3</sup>/h.

The Edwards range, however, gives us access to the fine vacuum products, which include three pressure ranges: medium (1.0 to 10<sup>-5</sup> mbar); high (10<sup>-5</sup> to 10<sup>-9</sup> mbar) and ultra-high vacuum, which involves pressures down to 10<sup>-12</sup> mbar," he says.

Edwards' fine vacuum pumps are designed for dealing with scientific, research and development, semiconductor manufacturing and thin film coating applications.

"Rough or coarse vacuum pumps, on the other hand, are much more widely used in industry. Common applications include: vacuum forming and packaging; vacuum cooling; brick extrusion; automotive handling, pneumatic conveying of powders such as cement; vacuum extraction of waste fluids; CNC loading and unloading systems; and a host of vacuum lifting and pick and place materials handling applications.

"Industries that make use of compressed air often also need vacuum pumps. So we have common customers. The compressor technology that we know so well, notably; screw, vane, scroll or claw compression principles, are also applicable to vacuum. So the vacuum pump technology, although a new offering from Atlas Copco, is an excellent fit with our current business," Adriaanse suggests. "The two offerings overlap significantly with respect to both customers and technology," he argues.

On the efficiency side, all of the applied technology in Atlas Copco compressors is used in vacuum pump systems: VSD technology; motor and drive train systems; and control systems. "All of our previous expertise developed for compressors is directly applicable to vacuum systems," assures Adriaanse.



The most advanced in Atlas Copco's vacuum pump range is the recently released GHS VSD series.

# technology

Six vacuum product ranges are now on offer, including both oil-injected and oil free vacuum options. “The majority of enquiries received at the moment are for single-stage oil-sealed rotary vane pumps (GVS series) but numerous other technologies are also available. We specialise in turnkey solutions that centralise the supply of vacuum, using larger machines linked to a reticulation system. Our GVS range offers flows of between 20 and 365 m<sup>3</sup>/h,” he continues.

The most advanced in the vacuum range is the recently released GHS VSD series of pumps, which offer flow rates from 400 m<sup>3</sup>/h (GHS 350 VSD) to 870 m<sup>3</sup>/h (GHS 900 VSD). “If reduced energy use and service requirements are taken into account, payback times on GHS vacuum pumps, based on a direct replacement of an existing oil-lubricated vacuum pump or dry vane installation, could be less than two years. And the lifecycle costs of installing a new modern Atlas Copco GHS VSD can be cut by half compared to traditional equivalents,” he estimates.

“From an efficiency perspective, the integration of IE3 motors and VSDs into our vacuum and compressor systems is something we do very well. Few can compete with us when it comes to energy efficiency.

“We prefer to assess a customer's plant needs and suggest holistic solutions. Rather than have 20 individual pumps at different places around a factory, it is more energy efficient to install one centralised system. This also results in less maintenance, which we can also take care of. Individual vacuum pumps are often not well maintained,” he adds.

On the replacement side, most of Atlas Copco's vacuum offering is compatible with installed vacuum pumps in industry. “In almost all cases, we can simply replace an existing unit with a more efficient and more modern equivalent and we are already achieving significant successes replacing application-specific units,” says Adriaanse.

## Nautilus shell technology and the UD filter

Compressed air from any compressor will generally contain raised concentra-

tions of contaminants, such as water, dust and, if generated by an oil-injected compressor, oil. Following cooling and drying to remove moisture, in-line filters are commonly used to decontaminate the compressed-air line for industrial applications.

Adriaanse explains: “In the past, a combination of a general-purpose filter in series with a high-efficiency filter was required to achieve suitable quality compressed air. Atlas Copco DD+ general-purpose coalescing filters remove liquid water and oil aerosols down to 0.1 mg/m<sup>3</sup> (0.1 ppm) and particles down to 1.0 µm. The air must then be passed through high efficiency PD+ coalescing filters to remove aerosols larger than 0.01 mg/m<sup>3</sup> (0.01 ppm) and particles down to 0.01 µm.

Filter design must combine maximum contaminant removal efficiency with minimum pressure drop, to minimise the energy loss associated with compressed air filtration. “Atlas Copco has now developed a combined technology that can remove contamination in compressed air down to 0.01 ppm from a single filter unit,” Adriaanse tells *MechTech*. “This has been achieved without increasing the size of filter housings and with a net pressure drop reduction of 40%.”

The new filter, called the UD+, relies on a filtration concept called nautilus shell technology. “We use the analogy of wind blowing through the trees in a forest. Traditional filter media are like densely packed forests that reduce the wind speed. They remove debris well, but the media clogs easily, particularly when removing wet contaminants.

“The new nautilus technology is based on spiral pathways for air through the ‘trees of the forest’. The filter media is wrapped around itself and, instead of having one or two layers of dense filter media, the filtration area is significantly larger while being less densely packed – due to the use of more open, glass fibre media.

“The filter, therefore, clogs more slowly, reducing the pressure drop while retaining filtration efficiency,” Adriaanse explains.

“Since almost 50% of all DD+ and PD+ filters are sold to be used together, their replacement using a single UD+ filter represents a huge marketing opportunity for us,” he believes. “At a cost 20% below that of the combination solution, along with a 40% lower pressure

drop, lower maintenance costs and the environmental advantage of halving the safe disposal requirements, our UD+ solution is the ideal universal filter for any reticulation line,” says Adriaanse.

## GA compressor range relaunched

The ‘bread and butter’ industrial range for Atlas Copco is its oil-injected rotary screw (GA) range of compressors. “What we have done is to re-engineer and relaunch the entire GA-range, which includes compressors from 90 kW to 315 kW. Based on extensive customer feedback and research, two different strategies have been adopted,” Van Wyk tells *MechTech*.

“For smaller GA compressors in the power range below 160 kW, the products have been simplified to make them more cost-effective, reliable and easier to service. The idea is to lower lifecycle costs, by maintaining high efficiency while maximising uptime. The new design allows complete maintenance access to the drive train from one side of the unit, for example,” he says, adding that some of the more complex features have actually been removed to make these machines simpler and more robust.

For the larger compressors, however, emphasis has been placed on energy efficiency. “For compressors of 160 kW and above, through the use of VSDs, Atlas Copco has again managed to improve the SER. Also though, while we could only previously offer the GA 160 and the GA 315 VSDs, 200 kW and 250 kW versions have been added to the VSD range. Without losing the advantage of variable speed and VSD control, these additions make it easier to right size a solution because a narrower operating range results in better long-term efficiency,” Van Wyk explains.

Associated with the GA relaunch is the company's Mk V Elektronikon® controller, which offers advanced control and monitoring features to further improve efficiency and reliability. The new controller also includes online, mobile network-based monitoring features that allow the condition of a compressor to be continuously tracked and alerts to be generated as soon as problems occur.

Going forward, Compressor Technique is targeting 50% of its GA sales to have VSDs and Elektronikon controllers. “We are currently already at 30%, but increasing electricity tariffs are sure to drive that higher in the future,” concludes Van Wyk. □

## Container library for Johannesburg primary school

As part of the company's CSI programme to provide disadvantaged communities with facilities that encourage and enhance learning, Hytec recently donated a container library to Crown Mines Primary School in Johannesburg. The library was



The ribbon is cut, marking the official opening of Crown Mines Primary School's new container library, which was supplied with over 1 000 books and magazines.

officially opened on February 13, 2015.

In addition to sponsoring the container structure, Hytec's R200 000 donation covered the installation of windows, doors, insulation, electricity and lighting connections, and the mounting of bookshelves. A heavy-duty protective resin was applied to the container's surface, inside and out, which will ensure it achieves a minimum lifespan of 10 years.

The library was delivered with over 1 000 books and magazines, for both students and teachers, courtesy of Qualibooks Maledi and Rotary International, and, as part of the ongoing Soul Buddyz programme, will have access to an ever-increasing volume of literature via the Rotary International book depot in Johannesburg.

In addition, the library will also carry

the new comic book from critically acclaimed 'The Urban Legend' series by Josef Yohannes, while the school's physical education and sports department received a batch of FIFA-approved soccer balls.

At the ribbon-cutting ceremony, Mike Harrison, Hytec general manager, spoke passionately about South Africa and its people, and Hytec's desire to be part of a greater solution through educating the youth.

The library was the company's third such donation in as many years, with the first being donated to Qoyintaba Primary School in Masameni, KwaZulu-Natal, in 2013 and the second to Mantshatlala Intermediate School in Namahadi Phuthaditjhaba, Free State, in 2014.

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

## Drives partnership consolidated

BMG and Danfoss Drives have consolidated a long standing partnership, with the official signing of a strategic alliance agreement that augers well for both companies, stakeholders and customers.

"This new development formalises and strengthens the original distribution agreement for Danfoss variable speed drives and the soft starter range, which has been in place since 2007," says David Dyce, division manager, BMG Electronics. "Through this firm alliance, BMG is set to increase awareness of the Danfoss brand; create a stabilised pricing structure and ensure efficient enquiry turnaround times and reliable support services for Danfoss systems.

"The Danfoss range of technically

advanced variable speed drives and soft starter systems, available from BMG's national branch network of over 140 outlets, enhances energy savings, food preservation, care for the environment and productivity.

BMG's R350-million expansion of the distribution and engineering facilities in Johannesburg includes new electronic workshops and a technical resources centre for the repair, maintenance and commissioning of the Danfoss product range. This 24-hour service is supported by mobile technicians who conduct onsite breakdown and routine maintenance when necessary. The centralised distribution network also delivers daily to all major centres around South Africa.

BMG currently has BEE Level 3 certification, with recognition as a 'value add



Danfoss Drives, VSDs and soft starters are available from BMG and supported from the company's new electronic workshops.

supplier' (VAS) which offers customers a source of Danfoss equipment from BMG that complies with the B-BBEE charter. This status represents a significant benefit to customers as BEE procurement recognition of 137,5% against all purchases from BMG can be claimed.

[www.bmgworld.net](http://www.bmgworld.net)

## Heavy-duty single-stage gear units

Following Hansen Industrial Transmissions' (HIT) success with single stage blower drives, the company has extended its single-stage solutions to the larger sizes. Based on the standard two-stage Hansen P4 housing (sizes G, H, J or K) a new single-stage gearbox range has been developed.

HIT sees a significant market potential for these single stage drives, particularly in the mining sector. They are suitable for driving centrifugal slurry pumps and for applications such as blowers, compressors and refiners as well as equipment for the chemical industry and the energy sector.

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

## Transmission OEM awards SKF Best Supplier Award

SKF has recently received the Best Supplier Award from SAGW, one of the leading automotive transmission system manufacturers in China. SKF was recognised for delivering outstanding performance of products and services in 2014.

Ulrich Selig, SKF's director of sales, Asia, says: "The Best Supplier Award is the highest award SAGW presents to its suppliers. This is great recognition of a successful co-operation that has been established in a very short time. Our strong dedication and attention to the needs of SAGW has truly been recognised

and we look forward to the continuation of a successful partnership."

Hong Gao, executive director, SAGW, says: "To maintain the industry's leading position and realise the strategic target for business development, every step in procurement and manufacturing must be the best. SKF's outstanding performance is helping us to reach this target."

SKF's supplies SAGW with transmission bearings and seals for several new gearbox models to equip car models from SGM, SGMW and Haima Motor.

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

## Aquaponics project award for high school students

Air Products South Africa has once again demonstrated its ongoing support for young agriculture students with the sponsorship of Inmed's Aquaponics unit at Carel de Wet High School in Vanderbijlpark, close to the company's flagship production facility.

Inmed, a global children's organisation, launched the unit in August 2013 in partnership with Air Products South Africa, in order to introduce students to aquaponics, an agricultural technique that combines aquaculture and soilless crop growing. The aquaponics project has generated much interest, particularly among students taking agriculture as a school subject.

The first group of students, Grade 10 and 11 learners at the school, who are studying agriculture as a subject, were recently honoured at an awards ceremony. Of the sixteen students who took part, 12 received graduation certificates while the remainder received participation certificates. Grade 10 pupil, Matshepo Maduna, got top honours with her impressive 95% mark.

"It has been an honour to be involved in this exciting initiative, which teaches young people an innovative and environmentally friendly method of farming to



*Matshepo Maduna got top honours with her impressive 95% mark.*

help combat hunger among communities in our country," says Josua le Roux, general manager, central support at Air Products South Africa.

The aquaponics training programme includes a combination of 'hands-on', practical experience at the school's farming facility, plus a theoretical component. Air Products South Africa's sponsorship has paid for the training and the development of course material. In addition, Air Products donated a gift voucher for each student who achieved a pass mark of 80% and above; and a prize for the top student.

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

## SEW-Eurodrive appoints new MD

After 12 years of service, SEW-Eurodrive South Africa's managing director, Ute Schoeman, has stepped down to pursue personal interests as a business consultant. Schoeman, who made a name for herself as one of the youngest and first female MDs in the local power transmission industry, has doubled the turnover of the South African business during her reign.

SEW-Eurodrive would like to thank Schoeman for her years of service to the company, and wish her the best of luck in her future endeavours. She will be replaced by general manager of operations, Raymond Obermeyer, who has more than 25 years of operational experience in the company.

Obermeyer, who officially took up his post from 1 July 2015, was instrumental in the upgrading of SEW's South African facilities, during which all factories were equipped to handle additional tonnage and fitted with load test benches, tooling upgrades and new assembly lines. He was also involved in the streamlining



*Raymond Obermeyer, the new managing director of SEW-Eurodrive, South Africa.*

of process flow in the factories, which has led to optimum productivity and reduced delivery times. Obermeyer hails from Nelspruit, where he was initially the branch manager before his promotion to operations and logistics general manager three years ago.

"I have every confidence in Raymond's ability to lead the company to new heights," concludes Schoeman.

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

## In brief

**Tectra Automation** has appointed Wayne Neethling as branch manager for its Cape Town office. Neethling has over 25 years' experience in pneumatic and hydraulic technology across the mining, packaging, dairy and automotive industries. As a branch manager, he has managed sales and services outlets in Welkom, Klerksdorp and Port Elizabeth.

**Schneider Electric**, the global specialist in energy management and automation, has announced that **Eplan** is to become its major E-CAD solutions provider for the design of global Energy division products. The Eplan platform enables Schneider Electric to optimise its workflow from design to production, structure and to centralise the components database and to facilitate knowledge management.

**Vale Canada** has chosen **Intergraph® SmartPlant®** Materials as its supply chain management software for the Long Harbour Nickel Processing Plant in Long Harbour, Newfoundland, Canada. After an extensive review of the software capabilities and the business needs of the project, Vale replaced its existing solution with SmartPlant Materials, a solution the company has successfully implemented in its Brazilian operations.

**seebaWIND Service** is the first enterprise to use the **Reference Designation System for Power Plants (RDS-PP®)** standard-based REGAS applications software app. The software will initially be used for its own technical operations management. In the next stage, seebaWIND's service technicians will use the app to log wind turbine data and to record results as standardised reports.

The **City of Joburg** and the **Ministry of Small Business Development** have demonstrated their support for SMMEs at Empowertec Africa, a small business opportunities showcase that formed part of the SA Industry and Technology Fair (INDUTECH). "We are determined to support the development of entrepreneurship, SMME businesses and employment opportunities in Gauteng and the City of Joburg," said Reginald Pholo, a director at the Department of Economic Development.

The **Technology Innovation Agency (TIA)** has announced the much-anticipated arrival of its new CEO, Barlow Manilal. Manilal is optimistic about his five-year plan for TIA but also acknowledges the challenges ahead.

**RITZ Pumps SA** in partnership with **Rockwell Automation** are engaging in a project to solve one of South Africa's high-profile national problems – acid mine drainage (AMD). The project, taking place at Gauteng's Central Basin, is being implemented by **TCTA (Trans-Caledon Tunnel Authority)** on behalf of the **Department of Water and Sanitation**.

# Mercedes-Benz: from one to one million

From the first W121 Mercedes-Benz 190 built at the Mercedes Benz South Africa's (MBSA's) East London plant on January 31, 1958, to the fourth generation W205 C-Class – 2015 World Car of the Year – South Africa's premium automotive manufacturer has now produced its millionth car. *MechTech* visits the multi-award winning manufacturing plant.



Mercedes-Benz South Africa CEO and executive director for manufacturing, Arno van der Merwe, poses alongside the millionth Mercedes Benz to be manufactured at the company's East London plant.

**O**n May 28, 2015 at its East London plant, having produced its one-millionth Mercedes-Benz passenger car, a white right-hand drive C200 Mercedes-Benz C-Class, MBSA added a milestone to its journey as an automotive manufacturer of premium brand vehicles. The millionth vehicle was produced following a complete overhaul of the manufacturing plant – a R5-billion investment between 2011 and 2015 mooted to be the largest single-project investment in the automotive industry in recent history – to accommodate mostly export demand for the new W205 C-Class.

The first Mercedes-Benz passenger car, a W121 Nap Vista Blue Mercedes-Benz 190, came off the line of the then Car Distributors Assembly (CDA) plant in East London more than 57 years ago. CDA, the company that would become Mercedes-Benz South Africa, opened

## MBSA's new paint shop for the W205

**P**ainting of completed car bodies manufactured in the body shop is a vital step in ensuring product quality for the finished vehicle. The quality of the applied coating is directly responsible for long-term corrosion protection and vehicle life. The paint shop is, therefore, a tightly controlled area that must remain dust free and under humidity control.

Following manufacture, the built bodies with mating doors are transported to the paint shop on conveyors. Each body has its own transponder with unique information about the finished car's specifications, including its future colour.

At the paint shop, bodies are transferred onto skids, which first guide them through the pre-treatment process.

**Pre-treatment:** Each vehicle body is washed to remove small particles, grit and obvious debris. Then the whole body is immersed and degreased in a chemical

solvent bath before being rinsed with de-ionised water. They then enter a chemical dip tank, where the entire body is submerged so that all crevices can receive chemical treatment.

The whole structure is then electro-coated. This is an electrolysis-based process, also called e-coating or electrophoretic lacquering, and provides a chemically-bonded primer layer onto the entire car body. The electro-coated car bodies then enter a baking oven to cure the e-primed layer. This completes the pre-treatment process.

**Sealing and masking:** Prior to painting, areas that will later have adhesives applied are masked off. The line of bodies is then conveyed down to the sealant deck, where all exposed seams have sealant applied to guard against water ingress and corrosion. The underside of the body is sealed using robot applicators, while at critical points, sealant is applied and spread manually



by operators. The paint line then passes through a sealer curing oven.

**Painting:** Each vehicle receives three coats of paint, starting with an inspection stage where any visible defects are removed. The bodies are moved through an automatic cleaning station to remove any small dust particles.

Primer paint is then applied to act as filling and smoothing agents. The interiors are manually spray-painted, while all exterior

its doors ten years earlier and was contracted in 1958 by Daimler-Benz to assemble Mercedes-Benz products. This first unit was dispatched to John Williams Motors in Bloemfontein. Since then, MBSA has entrenched its place in the South African history, having produced 24 different models with the number of units produced per model steadily climbing. The East London plant is on track to double production this year – the significant majority for the export market.

“MBSA continues to create jobs, developing the economy and transferring essential skills. Over the years we have always placed emphasis on superior quality in the products we deliver to our customers. For us excellence is the norm and should not simply be an expectation of something that can be achieved in the future. It is also fitting that the one-millionth Mercedes-Benz passenger car produced here today is the latest generation C-Class, which was deservedly announced as the 2015 World Car of the Year in April 2015,” says Mercedes-Benz South Africa CEO and executive director for manufacturing, Arno van der Merwe.

Markus Schäfer, member of the divisional board of Mercedes-Benz Cars, manufacturing and supply chain manage-



The assembly shop at Mercedes-Benz's East London plant, which has now produced its millionth vehicle.

ment adds: “South Africa is an important location in our global C-Class production network. One million Mercedes-Benz passenger cars made at the East London plant illustrates the remarkable development this location has seen over the years.”

### Models produced in East London

The model line-up from the plant over the years include, amongst others, models in the Ponton series from 1958 to 1962; the W110 and W111 Fintail from 1962

to 1968; the ‘new generation’ W114 and W115 from the late 1960s; the W116, the first true S-Class, from 1973; and the W124, the first E-Class, from 1986, winner the Car of the Year title in 1987 with the Mercedes-Benz 260E.

C-Class production started in 1994 with the production of the W202, the first official C-Class. The W205 C-Class currently being produced is the fourth generation C-Class to be manufactured in the East London plant and, as part of Daimler AG's flexible production network,



1. A vehicle enters a chemical dip tank during pre-treatment. The entire body is submerged so that all crevices can receive chemical treatment. 2. Protected robots seal the underside of the body before painting. 3. A pre-treated vehicle enters the painting line. Each vehicle receives three coats of paint, starting with an inspection stage where any visible defects are removed.

paint is applied using robots. Once primer is applied, the unit enters the primer curing oven, before being transported to the primer preparation deck, where it is again checked for defects and prepared for top coat spray-paint.

The second coat or base coat is robotically applied in the specified colour of each vehicle. This is a fully automated high qual-

ity process to ensure consistency. Following passage through the base coat curing oven, a clear coat layer is applied to give a gloss finish and scratch resistance.

The quality and finish are inspected at the polish line and in a final step, a wax coating is applied to critical areas of the under body to provide long lasting corrosion protection.

Stringent quality assurance is enforced by a dedicated quality team, which works to global quality standards. These standards and automated processes applied in MBSA's new paint shop have significantly reduced rework on car bodies, to the point where South Africa is very nearly matching the throughput statistics of its German manufacturing plant in Bremen. □



*The cutting-edge production technologies linked to the new C-Class include components and processes such as aluminium skin panels, complex laser welding, roll forming for complex structural profiles, advanced rear axle carriage assemblies, aluminium pre-treatment and natural fibre pressings.*

is being exported in left- and right-hand drive versions to countries on every continent of the world.

East London is one of four plants in the world producing the C-Class, the others being: Tuscaloosa in the USA, Bremen in Germany and Beijing in China.

“The story of the C-Class, since the

W202 came off the line 21 years ago, has become one of pride and success, not only for MBSA but also for the Buffalo City Metro Municipality and for the Eastern Cape. The first ever exports of C180s from South Africa were loaded for Australia on Sunday November 15, 1997, beginning MBSA's ‘Out of Africa,

for the World’ success story,” says Van der Merwe.

### Decades of technology advances

The C-Class production history at the East London plant is a story of steady technological advances, which today, with its new state-of-the-art W205 production line, place MBSA at the forefront of production technology, not only in South Africa, but also in the world.

For the W202 in 1994 a new semi-automated welding line made use of special turnover devices (STODS), to make the final welding process more operator-friendly. The technology on that line also included a Steifelmeyer measuring machine to check body accuracy.

With the arrival of the W203 C-Class in 2000, a new water-based paint shop with climate control was put in place as well as a new body shop with the latest computer-aided clamping, welding robots and laser in-line measuring stations.

For the W204 in 2007 specialised robots implemented new technologies such as laser welding and brazing, high-strength steel welding and structural gluing. The C-hanger system implemented



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The first Mercedes-Benz passenger car, a W121 Nap Vista Blue Mercedes-Benz 190, came off the line of the then Car Distributors Assembly (CDA) plant in East London more than 57 years ago.

with the W204 in the assembly line was made height-adjustable to suit the optimum working height of each individual workstation, making the mechanical operations much more ergonomic. New rolling road and wheel alignment equipment was also introduced.

Along with the announcement that the W205 C-Class would be manufactured in South Africa came the need to completely overhaul the manufacturing process in line with the new technologies that were required, hence the R5.00-billion investment. The new C-Class also saw MBSA employees being groomed to work with this advanced production technology and R68-million was channelled into training initiatives, resulting in over 1 400 training interventions. This included assignments to various international plants and, to date, 20% of our employees have spent significant amounts of time working in overseas plants," adds Van der Merwe.

"Producing the one-millionth Mercedes-Benz passenger car is a remarkable achievement for us. It is the result of the collective work effort that has been displayed by everyone involved with the company over a long period of time. Certainly, this would have not been possible without the dedication of our employees. The production of this unit is simply the start of a new, even brighter era for us. We will maintain our levels of excellence and even surpass the accomplishments of the past," he continues, referencing the various accolades that the East London plant has received. These include six consecutive JD Power Initial Quality Survey awards from the US-based global market research company, as well as being consistently recognised locally by Ipsos as the best passenger car plant in South Africa. "As far we are aware, we are the

only plant in the world to have been awarded six consecutive JD Power awards," Van der Merwe suggests.

The cutting-edge production technologies linked to the new C-Class include components and processes such as aluminium skin panels, complex laser welding, roll forming for complex structural profiles, advanced rear axle carriage assemblies, aluminium pre-treatment and natural fibre pressings. All these technologies have also empowered the local automotive supply industry.

Last year, the East London plant produced more than 45 000 vehicles in the eight-month ramp up period since the production launch of the new C-Class in May and, by the end of 2014, had employed more than 3 000 people.

### Passion to be the best

Van der Merwe touts the dedication and passion of the plant's employees and healthy labour relations as one of the key factors in the success story of the company. "Our attendance rate at the plant, sitting at close to 99% for the last five years, shows the dedication of the people who physically incorporate their own energy and commitment into every car that leaves our premises," he states.

"There is a myth in South Africa about an unproductive, uncommitted, difficult to manage workforce. This needs to be debunked," Van der Merwe says. "It is leadership's task to bring excellence and commitment to the workplace, so that employees are willing to go the extra mile because they share a vision and a stake in the company's success. We need to be implementing continuous improvement processes within our industries and to continue to push costs down – and there is absolutely nothing that stands in the way of this in the South African manufacturing environment!" he exclaims.

The strength of this culture was particularly evident in 2013, when one of the longest automotive industry wage strikes in 20 years hit the country. The solid foundation set over the years at MBSA saw workers return to the production lines with renewed vigour immediately after the strike ended, committed to realising a full catch-back of all volumes lost during the strike.

This healthy relationship also ensures that the Mercedes-Benz East London plant is on par in terms of quality, delivery and cost with the mother plant for C-Class production in Bremen, Germany.

"Mercedes-Benz South Africa prides itself in being a pioneer in the automotive sector and looks forward to producing another million units," Van der Merwe concludes. □

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# SA drives company gears up for Africa

Hansen Transmissions South Africa's market responsibilities have been extended beyond the southern African region to also incorporate west, east and central Africa. In preparation, the company has installed a "game-changing" modern regenerative load test bay for testing industrial gearboxes of up to 300 kNm.

**“W**e have been serving the southern African region for close on 35 years and this latest development is just one of a number of positive outcomes following the acquisition by Sumitomo of the global Hansen Industrial Transmissions group in 2013,” explains Hansen Transmissions South Africa's (HTSA) managing director, Fritz Fourie. He adds that the expansion of HTSA's African footprint also forms part of the group's global African strategy and, as the acknowledged centre of excellence for mining within the group, HTSA was tasked with the responsibility of implementing the strategy.

The acquisition also provides HTSA with access to new products including Sumitomo's Paramax (PX9) small and medium high torque range industrial drives as well as the Seisa range which has a torque capability of above 1 100 kNm, “a perfect fit,” says Fourie “to complement the medium to high torque Hansen I4 and P4 industrial gearboxes.”

“Subsequent to our first order outside South Africa for the supply 46 conveyor drives to a Zimbabwean Colliery in 1981, we have a large installed base of industrial gearboxes operating in diverse drive

applications including underground and surface conveyors, hoists, grinding and sugar mills to crushers, stackers, reclaimers, kilns, pumps mixers, aerators and wet cooling towers in a number of African countries,” says Peter Pallister, HTSA's key accounts manager – Africa.

According to Pallister, other African countries share similarities with South Africa. “Reliable, quality, equipment is fundamental to the sustainability of mines and plants given the remoteness of some locations and poor road infrastructure. But long distances can impede quick delivery so an inferior product is often preferred simply due to its rapid availability, which cancels out any benefits derived from quality products. So, in addition to the challenge of ensuring on time delivery, health risks (malaria and Ebola), political and economic instability, travel costs and commodity price fluctuations also need to be taken into account when doing business in Africa. Add to this the fact that each country presents its own unique set of laws and currency, the importance of establishing business partners in the regions with local service and repair facilities to take care of minor repairs quickly and affordably to keep customers' downtime to a minimum



*HTSA's market responsibilities on the African continent have been extended beyond the southern region to also incorporate the Economic Community of West African States (ECOWAS) as well as east and central Africa.*

becomes apparent.” While major repairs are currently sent to HTSA's Jet Park facility in Gauteng, Pallister says that, over time, training programmes will be undertaken to up-skill local technicians in the various countries.

“The establishment of business partners as our route to the African market in the different regions is fundamental to business sustainability and thus forms an integral part of our African strategy,” continues Pallister. “We select our partners carefully and look for companies that are already well-established in our focus areas and who share our commitment to world-class products and service.” HTSA partnership agreements are already in place in Zambia and DRC (SD Mining Equipment), Botswana (Seapro Ltd), Ghana (Mining Equipment International Ltd) and Namibia (Danste), with Mozambique imminent.

“We also only focus on countries with a stable economic, political and business environment. It follows that countries that tick all these boxes are also key growth areas such as Tanzania and Kenya, which are currently under consideration. While we will concentrate on previously supplied areas in Africa i.e.



*HTSA's new load test bay consists of two VSD-controlled 200 kW induction motors that can operate at speeds from 200 to 3 000 rpm, allowing a large range of operating speeds to be simulated on the test bay.*



mining, power plants, water treatment, cement mixing, ports and bulk materials handling, we will continue to build on our core competence i.e. industrial transmissions for the mining industry.”

Mozambique is a very significant market for HTSA. “In fact, we received our largest cross border order to date for the supply of over 20 conveyor drives from Mozambique,” continues Pallister, adding that HTSA is supplying spare industrial gearboxes, conveyor drives and spares to two ports and a colliery. HTSA also enjoys a large footprint in Zambia and the DRC where the company is conducting surveys on industrial Hansen Transmissions gearboxes operating at various copper mines. “We have installed 64 ACC gearboxes at a Power Station in Botswana and we have also supplied equipment to gold mines in Ghana and fan drives for an oil refinery in Nigeria.” Pallister also confirms the receipt of direct orders over the past six months from Namibian zinc and uranium mines.

Over the next three to five years he expects to see growth in Africa’s power generation and infrastructure sectors, which, he points out, will stimulate growth in the coal mining and cement

industries. “There is no doubt that the opportunities for growth in Africa abound and far outweigh the barriers. We have the experience, expertise and capabilities to surmount the challenges. We have a proven product in the African market, our equipment operates in every conceivable environment, from humid equatorial to dry desert conditions, and we recently streamlined our service offerings – with the added support of Sumitomo and our partners in the respective regions.”

“We make long term commitments to our customers, supporting our products with specialist advice, technical expertise, skilled maintenance, after-sales service, spares and repairs to extend equipment life cycles so that our customers reap the benefits of maximised plant availability and low costs of ownership. In short, HTSA is the complete drives solutions partner for mining and industry on the African continent,” Pallister says.

#### New gearbox load test bay

HTSA’s recently installed a “game-changing” modern regenerative load test bay with a capacity to conduct testing on a wide range of industrial gearboxes rated at up to 300 kNm.

According to Willem Sullivan, engineering manager at Hansen Transmissions South Africa (HTSA), there are two main driving forces behind the requirement for a load test bay at the company’s Jet Park facility east of Johannesburg. “On the one hand, there are customers who insist on load testing of their gearboxes before they accept delivery to ensure that the units will function correctly under at least a portion of the load that they will be exposed to on site. On the other hand, though, running load testing on various design features of the industrial gearboxes under real-life conditions instead of unloaded running conditions yields a great deal of knowledge about the operation of the machines at various loads.

“The installation of the load test bay is also in perfect alignment with HTSA’s strategy to extend its market responsibilities on the African continent. “Our scope of supply has been extended beyond the southern African region, which we have been supplying for close on 35 years, to now also encompass west, east and central Africa,” says HTSA’s sales and marketing manager, David Main. “Reducing the risk of equipment failure and resultant unexpected downtime is critical due to remote plant and mine locations, long

distances and poor road infrastructure typically found across the continent. Upfront testing of industrial gearboxes to ensure correct and reliable functioning will go a long way towards containing costs for customers. We aim to provide customers with up-front confidence for ultimate peace of mind,” says Main.

The load test bay consists of two 200 kW induction motors that can operate at speeds from 200 to 3 000 rpm, allowing a large range of operating speeds to be simulated on the test bay. “With the exception of hoist and sag mill units, which are dimensionally very large, we can test about 90% of our gearboxes,” affirms Sullivan. The test bay’s motors are adjustable in all three axes and allow the back-to-back testing of both right-angled and parallel gearboxes delivering up to 300 kNm of torque.

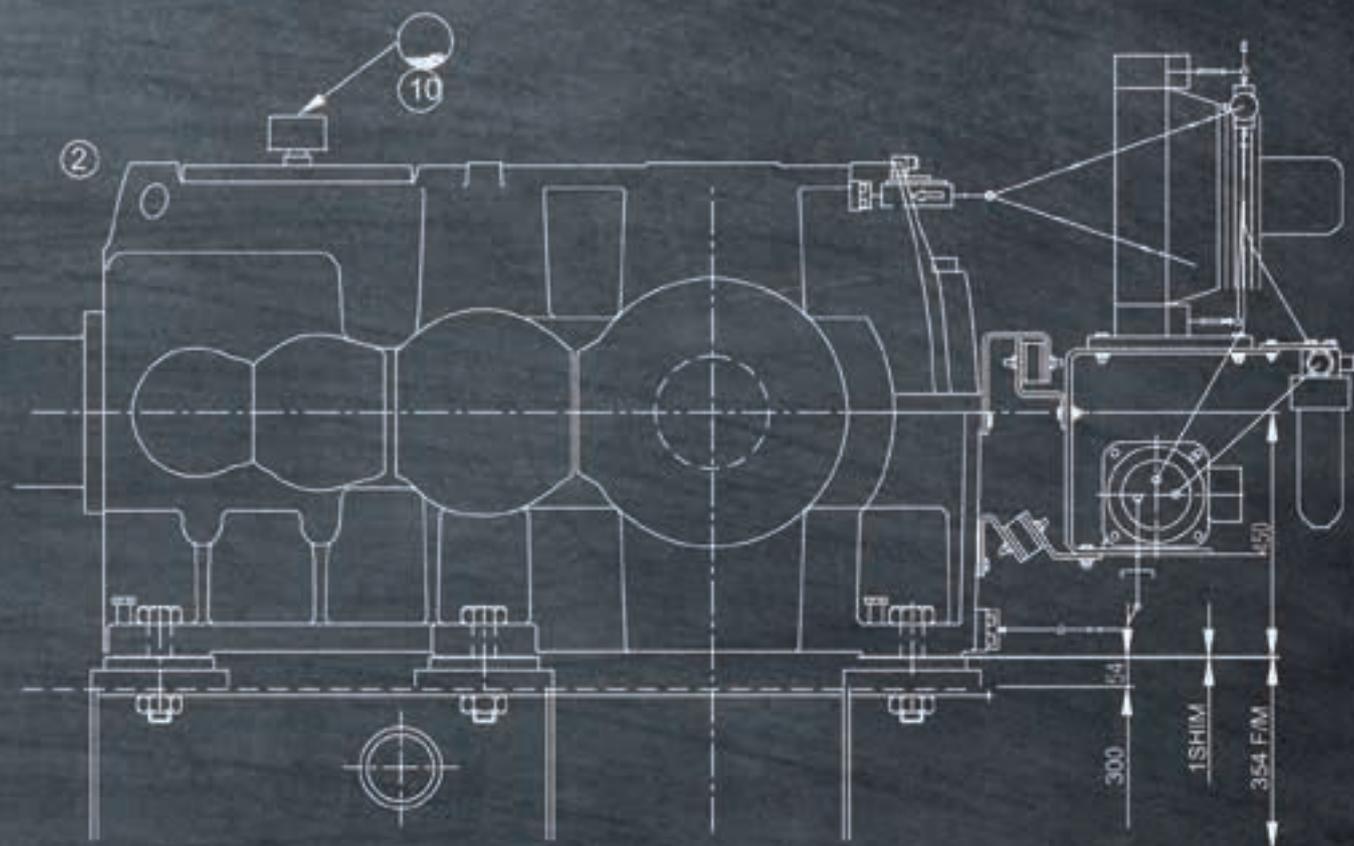
Sullivan explains that due to the advanced control system, the test bay can accommodate ratio variations of up to 10:1 in the gearboxes being tested, with precise control of the power and torque being transmitted. “The modularity of the bed also allows different gearbox sizes to be run back-to-back – even with different ratios – to allow us to test primary single-order gearboxes with a large variety of secondary gearboxes,” adds Sullivan. The test bay also monitors vibration levels, temperatures, speeds, torque, input power and load power during the duration of the test and results are displayed on a user-friendly touch screen graphical interface.

“Furthermore, the start-up of the test bay is also VSD controlled, giving both a smooth start and power variations when a test is in operation. Within the test bay’s performance envelope, the VSD system interface allows almost infinite adjustment to the power and speed settings at which the testing can be done.”

While there are other test facilities available, Sullivan points out that “the size and technology behind our system makes it one of the best available on the market. The regenerative capacity of the unit also reduces the running costs by an astounding 80-90% in some of the test cases. This makes the test itself a lot more economically viable to end users.”

With this industry leading test bay, Hansen Transmissions aims to provide an even better service to customers across Africa. “This is a game changer, not only for HTSA but also for our customers,” concludes Sullivan. □

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# New bearing rating life model launched

SKF has launched a pioneering new bearing rating life model that will help engineers to calculate a more realistic bearing life by considering more influencing factors than previously possible. Developed as part of the SKF EnCompass Field Performance Programme, the new SKF Generalised Bearing Life Model will enable original equipment designers and end users to more closely match bearings to actual application conditions.

**S**KF's new rating life model "is a major step forward for the industry, and will play a vital role in enabling OEMs and end users to match bearings to application conditions with even greater certainty, resulting in improved bearing life and reduced operating costs," says Alrik Danielson, SKF Group president and CEO.

SKF has developed the model and a corresponding technical paper, which, due to its significance to the wider industrial and engineering disciplines, has been submitted to the scientific community. The new model builds on the strengths of the current bearing life model, which was developed by SKF over 30 years ago, standardised in ISO 281:2007 and currently used worldwide.

The new SKF Generalised Bearing Life Model now successfully separates surface from sub-surface failure modes. Based on explicit tribological models, it factors in new performance parameters, including those for lubrication, contamination, surface strength and mild-wear resistance. By understanding and accounting for more potential failure modes, the model is able to more

realistically predict bearing behaviour and life under a wide range of operating conditions in the field.

Danielson says, "SKF is proud to be taking the lead once again in advancing the science of tribology and applying it to bearing optimisation in our customers' applications. This innovative new model will improve our ability to help customers select bearings to meet their specific application needs in terms of bearing life, speed, energy use and more."

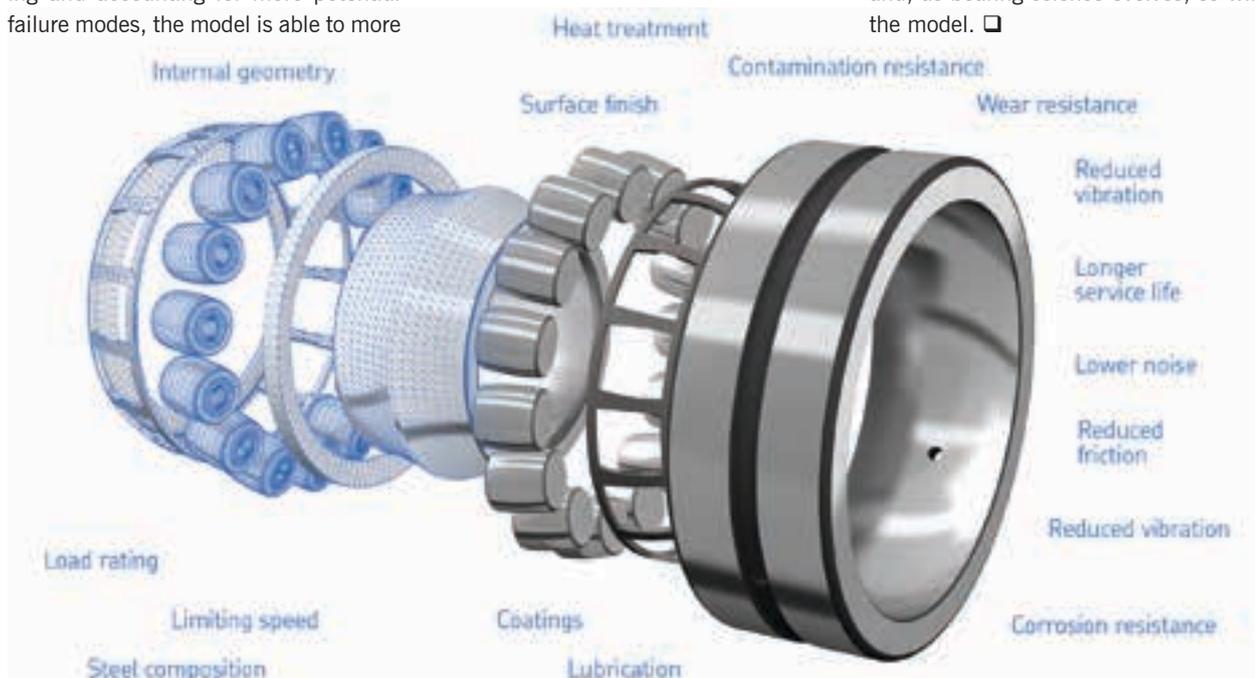
He explains that the current bearing rating life model is primarily based on sub-surface fatigue damage accumulation, which is transformed into a bearing survival probability by using the Weibull probability distribution model, modified with surface stress concentration models for poor lubrication and lubricant contamination. The model is used to determine a bearing's unique basic dynamic load rating, also known as C-value, which is the load for which the calculated rating life of a bearing population with 90% reliability is one million revolutions.

"However, today SKF high quality bearings rarely fail due to sub-surface

fatigue damage. Nowadays failure is typically the result of surface damage caused by factors such as contamination, inadequate lubrication, or other environmental conditions that lead to surface distress and wear," he says.

Bernd Stephan, senior vice-president, Group Technology Development, explains, "C-value is still a relevant performance parameter, but it tells only part of the story because it doesn't account for the bearing's rolling contact micro-geometry, material properties and other critical factors. New steel heat treatments or materials, better surface textures and contact profiles, high-performance coatings, hybrid bearings, better lubricants – these things cannot be reflected with increases of a single sub-surface fatigue performance parameter such as C-value. This is why new concepts in bearing life models are required that, combined with SKF's application knowledge, enable improved field performance."

Another benefit of the new model is that it is flexible enough to allow the integration of new knowledge in the tribology and materials sciences as they develop and, as bearing science evolves, so will the model. □



The development of an innovative, rolling bearing rating life model leads to a deeper insight into how to improve the field performance of bearing applications



SEW-Eurodrive Nelspruit area sales manager, Jonathan McKey.

# Mill gear unit powers chrome mine output

A chrome mine in Mpumalanga can now continue production of up to 110 000 tons of chrome per month after installing a technologically-advanced SEW-Eurodrive mill gear unit (MGU).

The latest SEW-Eurodrive installation was completed recently after the mining operation experienced technical difficulties with its two gearboxes, which had been running since the mine's inception in 1997.

Only one of the gearboxes could be repaired, and SEW-Eurodrive Nelspruit area sales manager, Jonathan McKey says this prompted the company to offer one of its latest M2 MGU series solutions to replace the defunct unit.

"The new unit, powered by a 250 kW motor, includes a pressure lubrication system, an oil/air cooler, a sight glass and radial labyrinth sealing to protect the unit from dust," he explains, adding that the unit was adapted according to the customer's specific needs. "Condition monitoring sensors were also mounted into the gearbox, and an overload coupling was fitted on the HS (high-speed) shafts."

Developed as an upgraded version of SEW-Eurodrive's successful M1 MGU series, the M2 MGU meets "the highest quality, reliability and performance requirements" McKey points out.

"Products in the series feature a hori-

zontally split housing, which is equipped with facilities for lifting, an oil inlet and outlet, an oil heater, a lubrication unit attachment and an oil sight glass, along with various other components," he continues.

M2 MGU products are sturdy and rugged, with the housings composed of various materials, ranging from fabricated steel to cast iron. All of the gears and pinions in the MGU range also meet ISO standards.

Additionally, the gear mesh properties have been specially selected in order to minimise noise and vibration levels, as well as to reduce the risk of surface wear to the unit.

The high-speed shafts are equipped with a three-bearing arrangement and the radial load component from the gear mesh is supported by two radial bearings.

An additional thrust bearing load is included to compensate for the axial load component. If necessary, thrust bearings can be spring loaded to avoid minimum load condition for non-loaded bearings.

"Thrust bearings on HS, IM and LS shafts are located on the same side of the housing. This causes a thrust load on the HS shaft and a counter thrust load on the IM/LS shafts to be compensated

close to each other, thereby minimising the housing deflections," explains McKey.

SEW-Eurodrive's relationship with the mine, according to McKey, began in 2008 when the company was commissioned to supply the mine with swing-based solutions for its strike and run of mine (rom) drives.

"The relationship has grown and today, we supply the operation with all of its geared and industrial gear solutions for operations above and beneath the mine's surface," he says.

SEW-Eurodrive also supplies the mine with IG MC lateral strike conveyors. These feed the mine's incline and rom belts, which transfer raw chrome ore to the surface.

McKey notes that SEW-Eurodrive geared motor and smaller IG MC products are also currently found on smaller conveyor belt networks throughout the plant where the chrome ore is readied for transport.

"We are fully-committed to providing more efficient and modern engineered solutions to our customers. Given the nature of our relationship with this chrome mine, we also offer a 24/7 service which provides customers with full peace of mind. SEW-Eurodrive prides itself on improving and reinventing products and drive solutions. We will continue to advise the mine on how we can better improve its solutions, reduce downtime and ultimately save money on running costs," he concludes. □

## SAIW turns up the heat



Dr. Andy Koursaris

Leading physical metallurgy expert, Dr. Andy Koursaris (BSc, PhD) is to present the **Heat Treatment, Microstructure, Properties and Applications for Engineering** course at the Southern African Institute of Welding (SAIW).

The Heat Treatment for Engineering course covers the processes used to manipulate the microstructure and properties of steel, which is the most used material owing to its versatility.

### Course Outline:

- The nature and basic properties of metals, alloying, metallurgical reactions and microstructures.
- Iron/carbon system and microstructures.
- Heat treatments processes and hardening of steel.
- Martensitic transformation and tempering of martensite.
- Isothermal transformation of steel, TTT and CCT diagrams.
- Quenching and hardenability of steel.

- Surface treatments, induction hardening, plasma and LASER treatments.
- Alloy and tool steels and their heat treatment.
- Cast iron heat treatments.
- Heat treatment of stainless steels.

**This five day course is intended for personnel who are involved in the engineering field and conduct, utilize or specify heat treatment processes for engineering components.**

**Date:** 7 to 11 September 2015

**Venue:** Southern African Institute of Welding

**Address:** 52 Western Boulevard, City West, Johannesburg

**Costs:** Corporate Members, R13 505. Non-members, R14 600

**For further information phone 011 298 2111 or email [dormehl@saiw.co.za](mailto:dormehl@saiw.co.za)**

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**Left:** Two of Europe's largest synchronous motors ever used in a reversing roughing mill have been commissioned by ABB at Tata Steel's Port Talbot hot strip mill in South Wales. **Right:** The upgrade aims to increase steel production significantly while improving final product quality.

## Europe's largest motors and drives power steel roughing mill

ABB has commissioned two of Europe's largest synchronous motors and medium voltage drives at the roughing mill at Tata Steel's hot strip mill in Port Talbot, South Wales.

Two of Europe's largest synchronous motors, along with the highest power-rated medium voltage (MV) drives ever used in a reversing roughing mill, have been commissioned by ABB at Tata Steel's Port Talbot hot strip mill in South Wales.

The replacement motors and drives were the focus of a major £25-million reversing roughing upgrade – a key part of the rolling process which transforms a 23 cm thick slab of red-hot steel into sheet, less than 3.5 cm thick, before further reducing it to produce hot rolled strip. The upgrade aims to significantly increase steel production while improving final product quality.

The reversing rougher is a heavy torque application and as such demands two ABB 12.5 MW salient pole synchronous motors, together with two ABB MV drives rated at 36 MVA at 3.1 kV, to power the slab between a set of rolls.

Previously, two 6.0 MW direct current (dc) motors, installed in 1985, were operated some 30% over their intended capacity. The overload regularly stressed the windings, making the motors difficult to maintain and subject to potential catastrophic failure. Although operating in overload the roughing mill was still the bottleneck process for 50% of the time, putting a hard limit on plant output.

The new synchronous motors give

the response demanded while the ACS6000 MV drives with their motor control platform that uses direct torque control (DTC), provide unrivalled speed and torque control. As the slab enters the reversing rougher there is no perceived speed drop, as happened with the dc motors. The new motors and drives control the slab precisely, with no over shoot in speed. This results in the slab being processed much faster and reduces unnecessary torque reversals in the mechanical drive train. The slow control of the dc motors caused severe torque swings in the drive train, resulting in fatigue cycling to the mechanical equipment. This no longer occurs, resulting in a much quieter and safer operating environment, with improved production capacity together with increased reliability.

"With the old system, the average cycle time was 95 seconds. Today, it is 80 seconds," says Steve Winkley, Tata Steel's project manager for the roughing mill project. "When we change direction of the bar, it's much faster than ever before. When we take advantage of the motors maximum top speed, this will result in an average production speed increase of 30 t per hour – that is a staggering 200 000 t per year. This significant increase in production is almost a side effect of having to replace the dc machine. We successfully turned what

was a potentially catastrophic situation with the overloaded dc motors into an unprecedented success, breaking a series of 'all time' production records."

For reversing roughing mills, reliability is paramount. ABB's extensive experience of mill applications together with proven design technology and manufacturing know-how combined with thorough quality control and comprehensive testing throughout the production cycle, combined to make Tata Steel's decision to use the company easier.

Tata Steel meticulously structured the shutdown of the existing facility; a process of design, planning and risk management that began back in 2011. This risk mitigation strategy led to some 90% of the installation being completed, commissioned and tested before the plant shutdown.

Over a four-week period, starting in August 2014, the plant completely closed for what was to be the most intense upgrade in 25 years. The old motors and spindles were removed and the foundation for the new equipment prepared. The pre-assembled new motors were then lifted into position at the same time that the new spindle system was being installed. The two motors were connected with the spindle system and all the pre-installed and commissioned services and control equipment was connected ready to run the new motors.

"It's fantastic to see the installation progress to schedule and really justifies the approach we took on this project with 90% of equipment pre-installed before shut down," says Winkley.

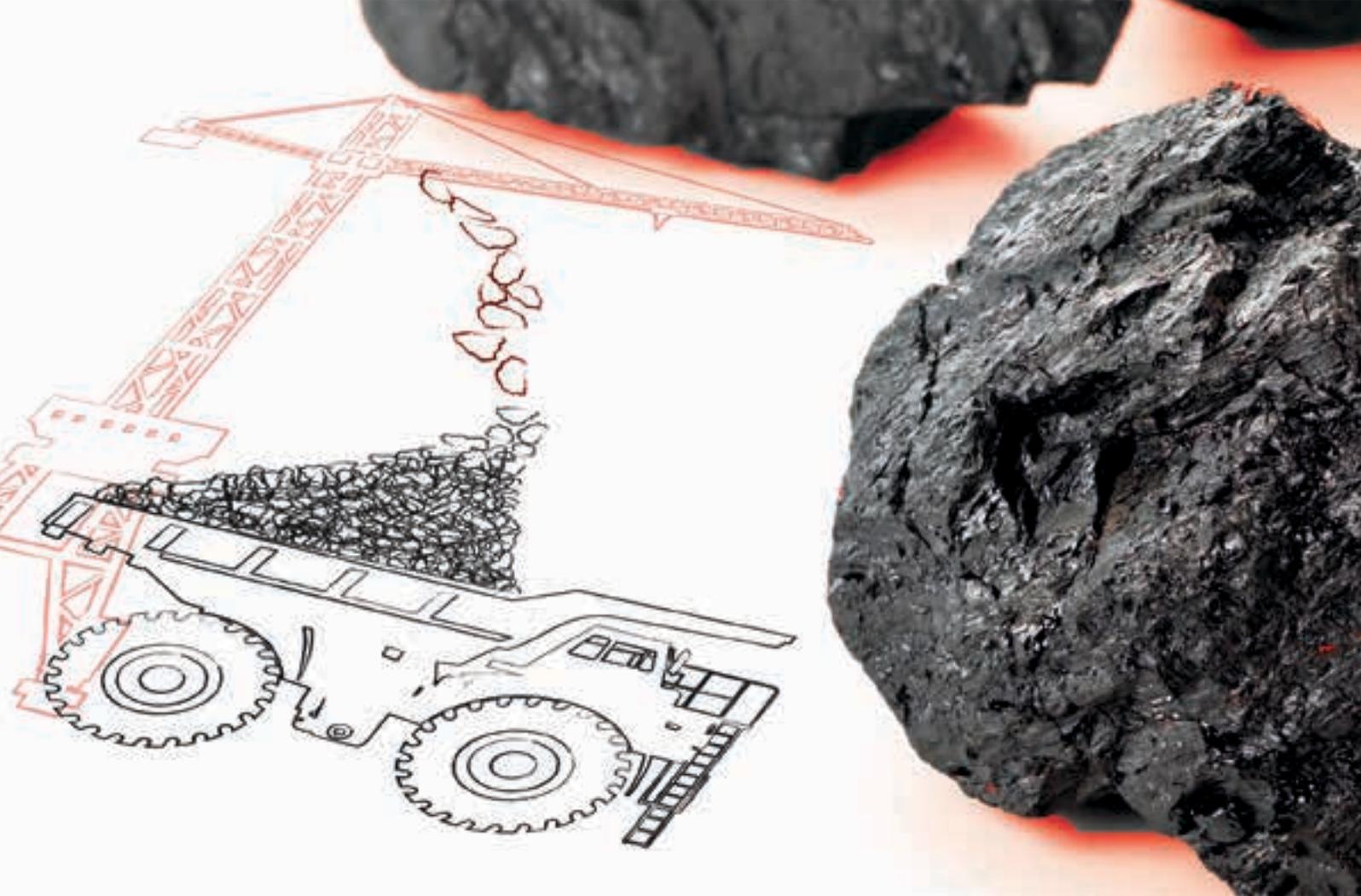
"We are really happy with ABB, in terms of the equipment and the company; both performed absolutely brilliantly," he concludes. □

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# Seeing the big picture

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# Split roller bearings enhance proactive maintenance

Maintenance is an essential requirement in a range of industries where machine availability is key – and rapid and cost-effective change-out of bearings is a critical requirement to prevent downtime and the subsequent loss of productivity.

Cooper split roller bearings are distributed locally by Bearings International. Cooper Bearings product manager for Southern Africa Matthew Tyler says there is “an industry-wide trend whereby companies are reducing their maintenance budgets and staff to cut costs”.

“The prevailing trend is simply to replace components as and when they break or malfunction, however, the skills shortage facing South African industries also means there is a need for products that are easy to install, with minimum training requirements. This is where Cooper split roller bearings add measurable value,” he explains.

Tom Black, director of sales for Europe and the Middle East, recently visited South Africa from principal supplier, Cooper Kaydon. “We continue to enhance our products through ongoing investment in new machine tools and modern manufacturing techniques. In addition, continuous advances in material science allow us to produce bearings with higher capacities in accordance with the changing requirements of the market.

“Our estimate of Cooper’s share of the global split roller bearing market is about 85%. Thus we are the world leader by a considerable margin, and certainly in Africa we have the largest installed base of split roller bearings of any other manufacturer.”

The main advantage of Cooper split roller bearings is that they can be split for easy fitment to the shaft. “The reason for this is to allow the bearing to be easily changed when the life of the bearing is reached; and with Cooper split bearings, this can be done more easily than a solid bearing,” Black says, “allowing the machinery in question to be back up and running much more quickly.”

Another advantage over solid bearings is that Cooper split roller bearings



Tom Black, Cooper Kaydon director of sales for Europe and the Middle East; Ross Trevelyan, business unit head – product and engineering; and Cooper Bearings product manager, Matthew Tyler.

can be removed without dismantling any ancillary equipment. “The bearing can be opened up, taken out and replaced to ensure that machinery is up-and-running quickly,” says Tyler.

The traditional solid-type bearing, on the other hand, typically requires that a gearbox be uncoupled and the coupling removed. Depending on the size of the bearing, such a change-out could take days, as opposed to a few hours for a Cooper split roller bearing.

“From a maintenance point of view, downtime is critical in a manufacturing environment. Major industries can lose millions of rands due to machine shut-downs. Cooper Bearings is an ideal solutions provider for such total maintenance requirements,” Tyler asserts.

Cooper split roller bearings can even be replaced onsite by a fitter with experience in an industrial environment. “We give our customers the assurance that when their plant goes down, they will recoup a significant quantity of that lost production in terms of reduced maintenance time. Industries ranging from cement to marine, food and beverage, mining, sugar, pulp and paper and materials handling can all benefit from the Cooper split roller bearings range,” Tyler continues, adding that every Cooper split roller bearing is supplied with a handy step-by-step installation guide for ease of use.

The bearings are made from carbon chrome steel for added robustness, with the outer housings and cartridges made from cast iron. Bearings International

carries local stock for shaft sizes of up to 300 mm to cater for the bulk of shaft applications, and the company can customise products for specific applications. Existing installations can also be converted to Cooper split roller bearings with minimal modifications.

The products are manufactured in the UK according to strict quality and manufacturing standards. A feature that makes Cooper split roller bearings suited for the harsh operating conditions in Africa is the sealing arrangement.

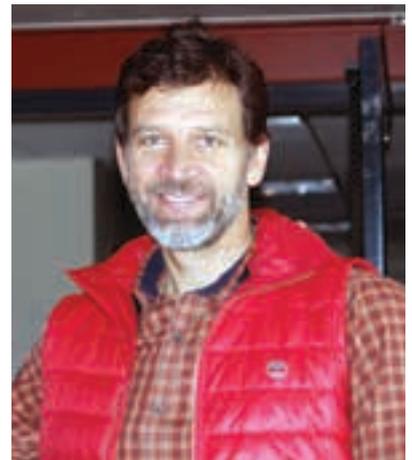
“The seal is contained in the outer swivel cartridge. This means that, in the event of any shaft misalignment, the seal remains concentric to the shaft itself,” adds Tyler.

In a traditional solid bearing, the seal is contained in a static housing, which causes a gap in the event of any shaft misalignment. This gap allows the ingress of contaminants such as dust, dirt or water, which is a major cause of bearing failure. The sealing arrangement and split nature of the roller bearing is what gives Cooper its extended lifespan, even under the harshest operating conditions.

“We usually design for a L10 life of 100 000 hours, which equates to 12 years’ continuous operation on a 24/7 basis. Cooper’s products are easy to maintain and inspect because the lubrication enters the bearing directly, as opposed to the cavity alongside the bearing. Cooper pioneered the split roller bearing in 1907 and has continued to advance the technology ever since,” he concludes. □

# Pre-CAD solutions for advanced topology optimisation

During June 2015, solidThinking announced the signing of channel partnership agreements with productONE, Rapid3D and Access CAD/CAM to introduce the South African market to solidThinking Inspire® software and offer support and workshops to customers in the region. *MechTech* visits the solidThinking stand at Indutech and talks to Gronum Smith (right) the Stellenbosch-based country manager for Altair South Africa.



Altair, the parent company of solidThinking, prides itself on engineering analysis, synthesis and simulation solutions. Its HyperWorks® offering is described as one of the most “comprehensive open architecture CAE simulation platforms in the industry”, offering “best in class” modelling, linear and non-linear analysis, structural optimisation, fluid and multi-body dynamics simulation, visualisation and data management solutions.

“Altair has pioneered pre-CAD engineering solutions, which involve getting the engineering analysis right before attempting to develop a complicated 3D CAD model,” says Smith, showing a video of a man weighing a beautifully crafted chair, only for it to collapse when he sits on it. “The overarching philosophy is, before developing a detailed CAD model, a product needs to be thoroughly engineered. There is no point spending hours on an aesthetically pleasing design that is structurally inadequate. Ideally, the physics should be in place first, and it should stay in place throughout the detailed design process,” he suggests.

Smith’s involvement with Altair began back in 1993 as a student at Stellenbosch University, where, with a colleague called Frans Meyer, he completed a PhD thesis on electromagnetic field analysis.

They started Electromagnetic Software & Systems (EMSS), a company consulting in electromagnetic field analysis and were later joined by Ulrich Jakobus, the pioneer of the EM field solver FEKO.

“EMSS grew into a local company employing 120 engineers, before being split into three entities, EMSS-Antennas, currently developing antennas for the SKA; EMSS-Consulting, working on a database for safety compliance for mobile networks; and EMSS-SA, for advancing FEKO functionality for electromagnetic modelling and simulation software for antenna and RF component design, antenna placement, electromagnetic

compatibility, EMC/EMI and scattering analysis. I stayed with FEKO working on solutions for local customers such as CSIR, Denel and Poynting, amongst others,” Smith tells *MechTech*.

FEKO software was picked up by European customers in the automotive industry, to model antennas on cars for receiving wireless sensor signals, such as those from tyre pressure monitors. It was used to design windscreen-embedded and traditional communication antennas for car roofs. “We became strong in the European automotive industry, while in the US, we focused on defence, modelling RADAR and antenna placement on aircraft, for example,” he adds.

“Our relationship with Altair spans back more than 15 years when Boeing was using FEKO as an EM field solver and HyperMesh as an advanced FEA pre-processor. FEKO was later one of the first products to be included in Altair’s Partner Alliance (APA),” Smith says.

The APA provides HyperWorks’ customers access to a broad spectrum of complementary software tools for many simulation disciplines. “Altair does a lot of things differently,” explains Smith. “Instead of supplying and licensing software for each separate application, customers with a leased HyperWorks license have direct access to the full suite of tools,” which consist of multi-physics analysis tools for almost every field of engineering analysis, including FEA (finite element analysis), CFD (computational fluid dynamics); NVH (noise vibration and harshness); impact, durability and fatigue; electromagnetic modelling; manufacturing and thermal analysis; multi-body dynamics; composite modelling and many more.

“EMSS South Africa and the subsidiaries in USA, Germany and China were acquired by Altair in June 2014, which saw the FEKO electromagnetic field solver being added to the HyperWorks suite. As a consequence, our Stellenbosch office became the latest Altair office, making

the full benefits of Altair’s business model and software tools available in the South African market,” Smith reveals.

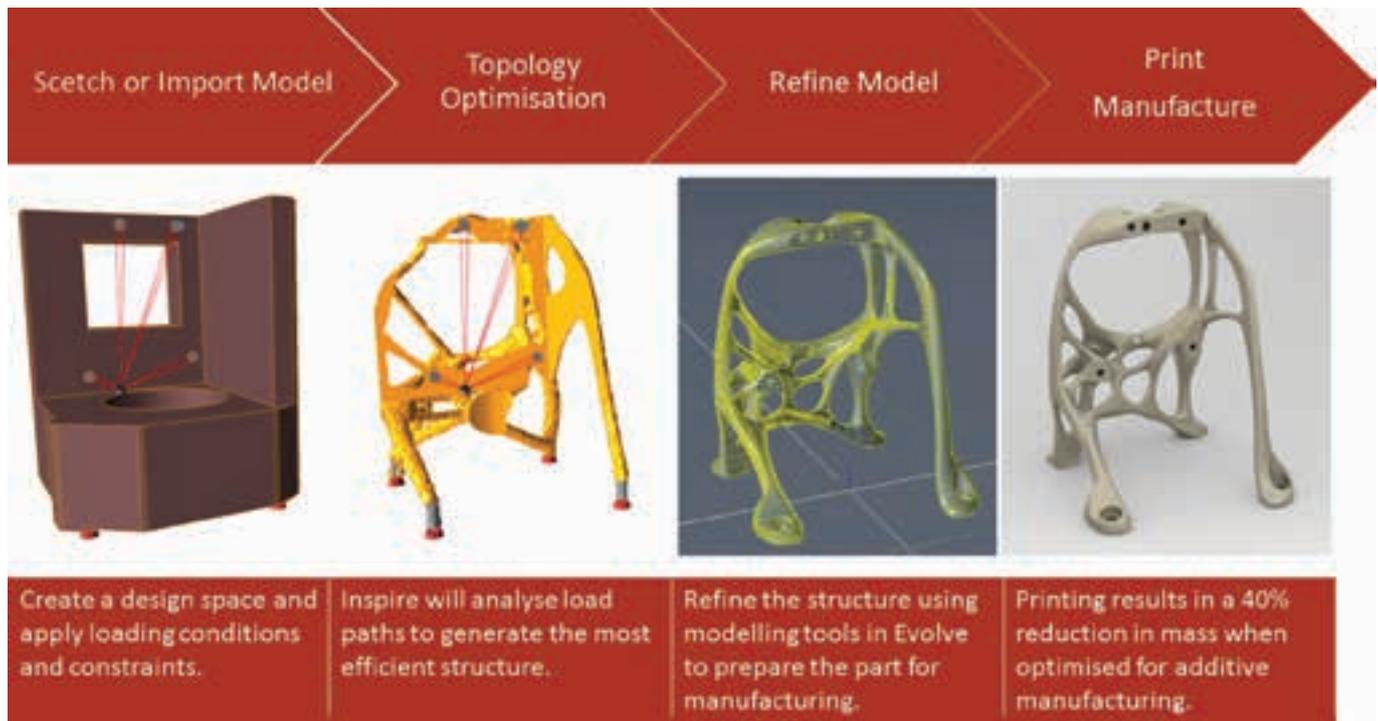
## solidThinking Inspire

The solidThinking set of tools is aimed at structural analysis and optimisation, as a precursor to full-scale CAD (pre-CAD). “Concern has been expressed that solidThinking competes with traditional CAD products, but the fact is that Inspire’s power is in early design exploration and, globally, it is sold by companies who also sell CAD packages such as PTC Creo, SolidWorks, Solid Edge and ZW3D.” Altair’s solidThinking puts high level analysis tools in the hands of designers so that CAD users can focus on the detailing without worrying quite so much about the structural or functional engineering side,” Smith assures. “Company’s such as productONE are ideal local partners and solidThinking products will complement their product and service offerings,” he adds.

Describing its typical use, Smith says: “Any company looking at lightweighting in product design has three basic options: using advanced materials; changing the topology/geometry; or redesigning the entire product,” he says.

Value can be added through the design for Additive Manufacturing (AM) by increasing performance, i.e. more complex shapes leverage the freedom of AM; lifecycle cost reduction; design cycle reduction; and lastly functional integration.

“Three fundamental question apply: How can a designer come up with the best possible shape? How can the engineer draw this best possible shape? And how can this shape be manufactured?



While developers will typically start with CAD, then go to engineering analysis based on the 3D CAD model and then onto manufacturing, we advise a process change involving these three questions being addressed in advance of CAD.

On the material side, composites, aluminium or titanium are typically used as substitute options in lightweighting exercises. Any change in material, however, must come with an associated change in the topology of the new component.

"The cornerstone of solidThinking Inspire involves automatic topology optimisation," Smith says, opening the software to display how solidThinking works. "At its starting point, a part is sketched using primitive solids (cubes, cylinders, etc.), or an existing part can be imported and de-featured to define the design space. Then the fasteners, joints and boundary contact points are defined, before the required materials and external structural loads are assigned."

Once the basic shape, engineering materials and specifications have been assigned, solidThinking begins to generate an ideal shape. "Embedded in the analysis tools are bio-mimicry philosophies. Bones grow stronger along load-paths where they need to. In the same way, the geometry of a part can have ribs, struts or thickening added where it is needed and removed where it is not needed. The topology of the part can, therefore be quickly and automatically established before doing any detailed design," he reiterates.

Once complete, the part performance is verified before the resulting geometry is smoothed using Evolve, the free-form design software from solidThinking, or the geometry can be exported into a CAD package for refinement and integration.

Evolve makes use of NURBS (non-uniform rational basis splines) – commonly used in computer graphics for generating and representing curves and surfaces. "NURBS allows for flexibility and are widely used in free-form design and clay modelling tools," he explains.

Underpinning solidThinking's optimisation capability is Altair's OptiStruct® structural optimisation technology which is available under HyperWorks licensing for more advanced simulation and analysis, if required.

On the manufacturing side, additional options allow part topology optimisation that suits the preferred manufacturing method. "We are particularly strong on 3D printing or additive manufacturing. Designs can be exported for pre-3D print processing to several packages developed by the major 3D printer manufacturers, for example 3-maticSTL from Materialise," Smith continues, adding, "3D part printing allows a high degree of complexity and flexibility in terms part geometry".

But manufacturing shape controls for processes such as casting, moulding or stamping are also embedded into the optimisation constraints. If being extruded, for example, solidThinking generates constant cross-section topologies based

on the extrusion direction.

In spite of the power of the solidThinking Inspire, "the software is very easy to learn" and it is compatible with existing CAD tools, such as Creo Parametric. "Typical training for a design engineer can be done in a single day," Smith assures.

Niche successes include: the supporting struts for satellites, a simple basic design that is then lightweighted to optimise dynamic performance; the hinges on aircraft doors, which resulted in a 64% weight saving; and advanced bicycle frames.

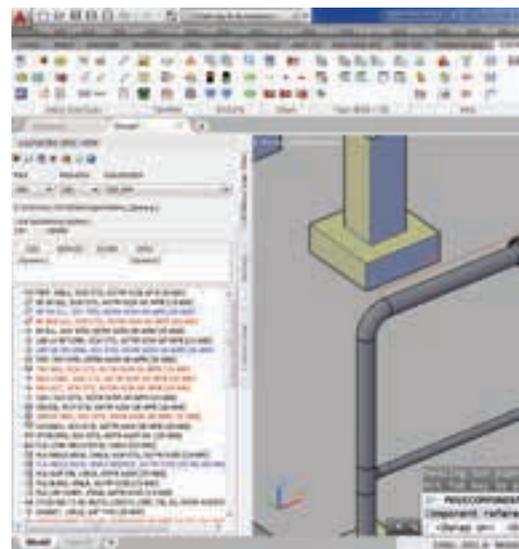
"Not only is Inspire successful in the aerospace industry, but also automotive manufacturers, such as Daimler AG, are officially certifying solidThinking Inspire for company wide use," Smith reports.

With the Daimler certification, all design engineers within the car and truck development departments of the company may now use solidThinking Inspire within their projects, giving them an opportunity to create efficient structures with minimum weight. This works for components, assemblies, and entire systems. Design engineers may also use solidThinking Inspire to apply a required stiffness on a component where needed, helping to avoid undesired vibrations and contributing to overall vehicle comfort and quality.

Standalone licences of solidThinking products are available through the local channel partners or as tools within Altair's HyperWorks suite of simulation software. □

# Automating plant and piping design processes

Founded in 1986 as a supplier of PC-based piping software to the chemical processing industry, today Chempute is a specialist supplier of software for plant and piping design, statistical process control, cost estimation and risk analysis for the chemical, mechanical, electrical and instrumentation engineering disciplines. *MechTech* talks to Werner Theron, the company's CAD applications manager.



**B**ack in the early 1980s, according to Theron, engineering design software was available, but only ran on big mainframe computer systems with each designer stationed at a separate graphics terminal. Then in 1982, this began to change as desktop applications became available for microcomputers or personal computers (PCs).

"Chempute was one of the first companies to offer engineering software solutions for smaller PCs, which were still being called home computers at that time," Theron relates.

The first software solution supplied by Chempute in 1986 was Caesar II, a pipe stress analysis program. "This was a code-based program that analysed pipework design according to the algorithms and requirements stipulated in the ASME B31.3 or 31.4 process piping guides. It was able to determine, from a plant piping design, where a pipe was overstressed, for example," he explains. "The original developer, a US company called COADE, was later purchased by Intergraph, which continues to develop and distribute Caesar software as an integral part of its analysis suite of software tools," Theron adds.

"We currently supply several Intergraph solutions, as well as FEA tools from the Paulin Research Group (PRG) and, also from the US, we offer a software solution called ChemCAD, which is not actually a CAD solution. It is a process flowsheet simulation package. To design a process to distil alcohol, for example, ChemCAD can simulate the chemical process using to establish whether the plant design would work or not," he tells *MechTech*.

## CADWorx Plant: the process piping solution

"As Chempute, our core speciality is on plant design. For green fields projects, we specialise in CADWorx Plant, which was developed in the mid 1990s and first released in 1996, originally as a piping add-on for AutoCAD. The package has since been expanded to include the structural side of plant piping, along with associated equipment, such as heat exchangers, pumps and vessels," Theron explains.

AutoCAD, he continues, "is an open platform, so many developers write additional tools for particular environments. CADWorx Plant is a tool for process plant design. Generally speaking, process plants vary in size and complexity. CADWorx on the AutoCAD platform is ideally suited for both small and large scale plant layout design projects," he says.

Opening the AutoCAD environment, Theron gives a quick demonstration of CADWorx's power. "Let me show you how easily we can assemble a model of a pipe connection between a pump and a tank," he says, opening a development window.

"As a starting point, we load the piping specifications," he explains, while choosing to use metric units and opening a library of piping options. "Specifications list the components available for use in the design," he says, selecting seamless ASTM A106 Grade B pipe

With a click Theron connects the pipe to a pre-drawn nozzle on one end of the drawing. "I am now changing the reducer to an eccentric reducer, and a flange is automatically added to the pipe end. I then choose a direction and the opposite end point of the pipe. The

software automatically determines a few pipe route options. By clicking on the preferred route, all of the bends required for the connections are automatically inserted.

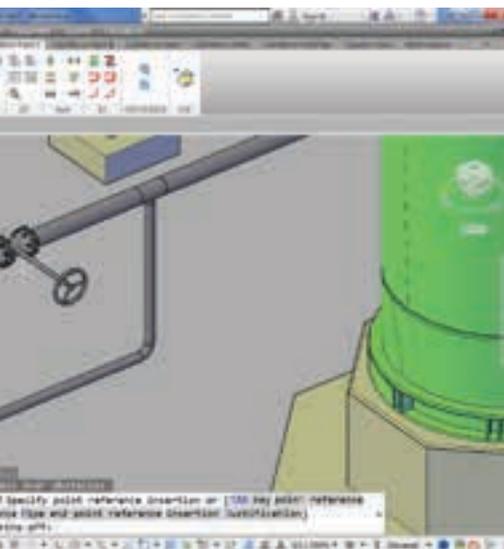
"Inline components, such as shut-off valves can then be selected and inserted in any position on the pipe. The valve is automatically inserted and if repositioned, the pipe will heal while the valve is reinserted into its new position.

"Once done, an isometric drawing for the pipe route systems is generated automatically. This is a typical industry deliverable. The associated bill of materials (BOM) is generated on the side and all the dimensions, relevant annotations and process flow arrows are inserted," Theron continues. "This used to have to be drawn manually in AutoCAD, but as well as simplifying the pipe connection design, CADWorx automates the isometric drawing process," he adds. "So as soon as a pipe connection has been modelled, the piping detail can be extracted for fabrication and procurement."

In summary, he says that CADWorx is an "intelligent plant design tool" that is easy to learn and use because it shares its environment with AutoCAD. "It's an extra tool, purely for plant layout, that runs on the well proven and stable AutoCAD platform. It is, therefore, widely used by contractors to South Africa's chemical, petrochemical, water purification and power plant operators. It is ideal for use on any plant involving piping, small or large," Theron says.

## CADWorx fieldPipe

While CADWorx Plant is ideally suited to greenfield plant design, "we also offer a



solution called CADWorx fieldPipe, which is specifically tailored to working with brownfield projects, for extensions and upgrades to existing plants.

"Before beginning such a project, someone has to go onto the site to establish what is already there. Forty years ago, this would have been done with a notepad, pencils and a tape measure. The position of each pipe, pump, valve, vessel or instrument would have been physically measured to determine how each part of the plant was interconnected. This took forever, was dangerous and inaccurate," he argues.

"Technology has progressed, though, and laser scanning is now more affordable. Today we can scan an entire plant within three to four days, and the process produces a series of point clouds that can be used to determine very accurate piping and component positions," Theron relates.

CADWorx fieldPipe software is able to recognise the presence of a pipe or valve by analysing point clouds. Simply by clicking on a point cloud in one area of a plant, models of the existing piping and connected components can be automatically overlaid to accurately recreate the details of an existing plant.

"For plant modifications or expansions, 3D modelling can be done directly onto the point cloud," Theron explains, opening the fieldPipe tools on his laptop. "FieldPipe interfaces with Leica Cloudworx Technology. Using clever algorithms, fieldPipe is able to automatically detect the exact positions and pipe sizes from a point cloud scan. By clicking onto a pipe represented only by points, the software automatically creates a 3D CAD model of the pipe



**Above:** CADWorx fieldPipe software is able to recognise the presence of pipes, valves and other plant components by analysing point clouds. **Left:** Theron demonstrates the power of CadWorx Plant Pro software. Given the end attachment types and positions, the software automatically determines pipe route options and the bends required, and selects and inserts end-connections.

over the point cloud," he explains.

On clicking, a 3D pipe is created that follows the exact path outlined by a point cloud on the screen. "The really impressive part is that this is a real pipe, on actual coordinates and is an accurate representation of what is typically found onsite. FieldPipe overcomes the big challenge with retrofitting pipework, where the pipes and pipe routes are significantly different from the original drawing," he adds.

For a new piping addition, the *in-situ* end positions can be accurately established from the point cloud, which can also be used to guide the routing path – and the new component can be confidently manufactured to its 'shoe-fit' shape.

Once the pipe is created and a valve is added, Theron hides the point cloud to reveal a 3D model that is almost identical to the one he created using CADWorx Plant. "Using a point cloud, we have created a fully intelligent pipeline model in minutes," he points out. "FieldPipe makes the process of adding new tie-ins and extension piping to an existing plant painless and very accurate," he assures.

New to Chempute's offering is the DotProduct DPI-8 handheld 3D Data Capture scanner, a small cost-effective handheld scanner that works on an Nvidia Shield Android tablet using software called Phi.3D 2.0. "Phi software turns an Nvidia Shield Android tablet into a fully mobile 3D-capture and processing solution. While this system is not suitable for scanning an entire plant – only because of the memory limitations of the tablet – for small repairs and replacement piping, it is perfectly adequate.

And it is 10 to 20 times cheaper than a full-specification plant scanning system," says Theron, adding "this makes real time data capturing truly mobile."

### Training and support

With offices in Durban and Johannesburg, training is a cornerstone of Chempute's offering. "We offer a number of different training courses, from the original Caesar 2 software and AMSE pressure vessel design courses through to FEA and AFT (applied flow technology), pipe stress analysis and the application of engineering theory using the different software solutions. We strive to overlay theory with the practical use of different software tools," Theron explains, adding that all Chempute courses are CPD accredited through ECSA or SAIMechE.

A second pillar of the offering is software support. "Our competitive difference is that we focus on direct user support, based on the specific and detailed use of the software for intended applications. All of our support staff are very knowledgeable of the design environment our users operate in, so support is more focused and direct than any of our competitors. Upgrades are available through online smart support services, and we are available to give service support via telephone or through remote connections to users' workstations.

"These days, it is not always possible or practical to send people into workplaces to resolve problems. It is easier, more cost effective and more immediate to use modern communication networks to put users in direct touch with specialists," Theron concludes. □

## Analytics a vital tool for competitiveness

Deloitte has released a detailed study *'Analytics in Manufacturing: Are South African manufacturers ready for MAnalytics?'* highlighting that integrating analytics into processes and decision-making were necessary in order to remain relevant and ahead of the competition.

**H**ow should a manufacturer respond to the Internet of Things, digital connectivity, big data, talent-driven innovation and technologies, such as robotics, additive manufacturing and artificial intelligence, all of which are contributing factors to manufacturing and Industry 4.0?

More than 40 South African manufacturing respondents to Deloitte's detailed study on analytics in manufacturing point to different reasons for not using analytics, or not using it to maximum advantage, and the challenges that exist to getting real value. "Half the surveyed South African manufacturers say that their

organisation does not have a clear vision on how to benefit from analytics, and half state that they lack clear advocacy or sponsorship for analytics," says Karthi Pillay, Deloitte Africa manufacturing industry leader.

Commenting on this observation, Werner Swanepoel, Deloitte Africa Leader: Data Analytics, says: "We see this as being an opportunity for manufacturers in South Africa to carve out a competitive advantage for themselves by becoming early adopters and drivers of a robust strategy, and by investing in the financial and leadership support necessary to see it through."

Clearly, there exists a challenge of leadership in coming to terms with the fact that global manufacturing is changing at an exponential rate and that, to be competitive locally and globally, manufacturers need to be in touch with changes in customer needs, the business environment and evolving manufacturing technologies. In fact, 95% of surveyed South African manufacturers see the greatest benefit of analytics in better decision-making. Other benefits of analytics that were highlighted include financial performance (75%) and risk awareness (70%).

The report found that South African manufacturers are getting ready for MAnalytics, with 21% of respondents already using analytics to a great extent, with a majority agreeing that analytics will grow in importance over the next three years and 50% believing this will yield a competitive edge for their business.

Swanepoel believes that analytics could play an even greater role in driving business strategies for a lot of South African manufacturers, by making available greater volumes of data and more particularly, better quality data. According to the report, "only one-third of respondents indicate that they already use more than 75% of their data to inform their decision-making".

Swanepoel says, "while volume is not the sole criterion for achieving improvement in decision making, quality is a more striking enrichment. 35% of respondents complain about data quality, while another 57% say they have inadequate technology infrastructures to support analytics."

In consequence, the report suggests that South African manufacturers need to address the backbones of a successful analytics capability: vision, sponsorship, quality, infrastructure, talent acquisition and skills development.

Pillay says that "manufacturing makes up 13.9% of South Africa's GDP, employs 1.7 million people and has a multiplier effect of 1.13, meaning that every R1 invested yields R1.13 of value. "The manufacturing sector has underpinned the success of most developed economies, and with some of the efficiency improvements highlighted in this report, I believe it can do the same for South Africa." □

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## Smart data validation tool released

Intergraph's next-generation data validation, transformation and migration platform is set to ensure high-quality data take-on for EPC companies, systems integrators and plant operators.

Intergraph has announced the release of Intergraph Smart Data Validator 2015, a comprehensive data validation, transformation and migration platform that enables companies to ensure the quality of information and significantly reduce the time and costs associated with data take-on. Smart Data Validator (SDV) supports the import, validation and export of data, providing consistency and traceability of the entire data migration process.

Monitoring and maintaining data quality is a significant challenge for engineering, procurement and construction (EPC) firms, system integrators and owner operators across all industries. It is even more difficult to manage when data is being moved from one source to another, such as during project handover, brownfield data take-on and data loads or migrations. Poor mapping or inadequate validation during these processes results in data that is not trustworthy and higher costs for the remainder of the facility's life. Data handover can easily account for 1-2% of the total capital expenditure (CAPEX) cost of a project and it often can take a year or more to complete.

Engineering data integrity begins by

carefully managing the quality, correctness and completeness of data at the time of data handover. Smart Data Validator, the successor to Intergraph Validation, Transformation and Loading (VTL), ensures the quality of data delivered from contractors, suppliers and vendors.

SDV allows users to have complete control of how data is imported, validated and loaded into one or more target systems. It enables EPCs and owner operators to:

- Check the quality of information being transferred.
- Keep records of which checks have been performed and results obtained.
- Load approved information into target systems.
- Route unapproved information back to responsible parties for remediation.

Key features include:

- A target system adaptor for SmartPlant Foundation 2014 R3 enables automatic generation of validation rules and export mapping.
- Manual rules can be added quickly using an intuitive user interface and an extensive library of validation rule templates.
- High-performance architecture allows

efficient processing of large data sets.

- A powerful export mechanism to load data into target systems.

"Shell and Intergraph have worked closely together during the last two years to improve the Smart Data Validator product. SDV is now faster, easier to use, more reliable and with a much better user interface," says Mario Stevens, senior delivery project manager – engineering excellence, Shell Global Solutions International B.V. "The end-user communities in Shell have expressed their appreciation for the renewed SDV product and are looking forward to start working with SDV globally."

Patrick Holcomb, Intergraph Process, Power & Marine's executive vice-president of global business development and marketing, says: "Managing the handover of data and documentation from projects to operations is a daunting task because the volumes are so high. Smart Data Validator has been designed to help our customers to significantly reduce the time and cost associated with the import and validation of data.

"However, the real value associated with quality data handover is in the operations phase. High-quality data is critical to the safe, reliable and effective operation of any manufacturing facility. SDV ensures that quality data is delivered from contractors, suppliers and vendors, creating a high-quality basis for operations." □



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# Compressor investments, long-term

Rising electricity costs and unreliable supply from the national grid are prompting industrial operations to seek more energy-efficient equipment. However, the major challenge in South Africa still lies in the market's reluctance to focus on long-term investment, by spending more on the initial purchase price to ensure future savings, according to Aerzen Airgas marketing co-ordinator Andreas Stubel (left).



“Aerzen Airgas offers highly-efficient equipment that can assist operations in considerably reducing energy bills,” begins Stubel, admitting, however, that the initial purchasing cost is a dominant factor in the decision making process.

“This makes the introduction of more expensive but efficient equipment challenging. Understandably, buying equipment at the lowest price makes financial sense, but the misconception lies in the fact that cost saving decisions are based primarily on short-term financial goals,” he says.

Stubel points out that purchasing

standard or cheaper equipment does not save money, and may in fact cost more in energy consumption and maintenance in the long run. “Bearing this in mind, Aerzen Airgas offers the local market the Aerzen Delta Hybrid rotary lobe compressor, an oil-free air conveying alternative to standard roots blowers,” he continues.

The Delta Hybrid is designed to be an optimised combination between a blower and screw compressor, and makes use of a patented twisted rotor profile. It is designed for a variety of applications where air and neutral gases must be conveyed oil-free. These include; wastewater treatment plants, the chemical industry, power plant technology and for

*The Delta Hybrid is designed to be an optimised combination between a blower and screw compressor, and makes use of a patented twisted rotor profile.*

the pneumatic transport of powder and granulate goods.

The Delta Hybrid is available in four models: L, S, H and E. The L model has been designed for pressure ranges of up to 800 mBar; the S model for 1 000 mBar and the H model for pressures of up to 1 500 mBar at sea level. The E model is a vacuum machine with a maximum negative pressure of -700 mBar. The Delta Hybrid is effectively an in-between solution, as it crosses the pressure range between roots blowers and low-pressure screw compressors.

“The Delta Hybrid is a compressor designed from the bottom up with energy-efficiency in mind. As a result, it is up to 15% more energy-efficient when compared to standard positive displacement blowers. It has an optimised fluidic design of inlet and discharge ports to provide for ideal flow conditions and reduced slippage,” Stubel explains.

The inlet air is sucked in on the cold side of the unit and a specially designed discharge silencer increases the compression efficiency. What's more, the belt-driven Delta Hybrid offers the significant advantage of exact sizing for customer requirements.

For demonstration purposes, an Aerzen Delta Hybrid D 24 S was tested alongside a standard positive displacement blower, both fitted with 37 kW IE2 motors. Both machines were configured to produce a system pressure of 900 mBar and an intake volume flow of 1 000 m<sup>3</sup>/h at sea level. The Delta Hybrid consumed 27,5 kW to produce these figures, while the blower consumes 32,3 kW for the same performance. “On average, therefore, the Aerzen Delta Hybrid is 14% more efficient than the

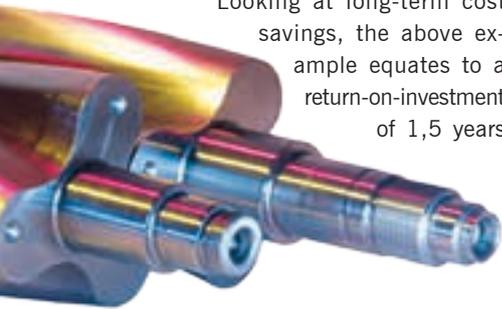


In conjunction with new machine sales, Aerzen Airgas offers numerous after sales services including field service, repairs and overhauls to the entire range of Aerzen blowers and compressors.

# efficiency and cost savings

blower," Stubel affirms, "which gives a tremendous increase in energy savings.

"Looking at long-term cost savings, the above example equates to a return-on-investment of 1,5 years



and an average annual energy cost saving of R25 000, when based on a 24 hour running schedule. With a minimal price difference of R36 000 between the D 24 S and an equivalent standard blower cost, the figures start to speak for themselves," he says.

## Advantages at a wastewater treatment plant

In addition to providing significant energy and cost savings, testing at a wastewater treatment plant in Huntingdon, USA showed that the Delta Hybrid holds its ground in fundamental areas such as

reliability and durability, maintenance costs, economy of space, ease of handling, and noise level. "Our current units require an oil change every 400-600 hours (4-6 weeks), while the Delta Hybrid requires a change every two years, reducing costs dramatically," says John Pavlik, the treatment plant's supervisor. "The town had been searching for a solution to the high energy costs of plant's current system and frequent mechanical failures that the manufacturer could not resolve, so we agreed to this comparison test," he explains

In addition, the belt-drive technology is "the simple beauty behind the design". The simple self-tensioning system is 97% to 98% efficient and it enables the driver speed to be optimised, regardless of whether the machine is connected to a variable speed drive (VSD) or not. The belt drive system provides versatility and adaptability for different applications.

The modular, compact design of the Delta Hybrid allows multiple units to sit side by side, saving space while offering ample access for maintenance.



One of Aerzen Airgas's Field Service vehicles ready for action.

Pavlik also found the unit to be relatively quiet compared to others. "When running with the acoustic enclosure open, although workers still had to use hearing protection, such as ear plugs, other units require use of double hearing protection, such as plugs and ear muffs," notes the treatment plants supervisor.

Aerzen Airgas, formerly Airgas Compressors, is the sub-Saharan subsidiary of German-based Aerzen 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. □

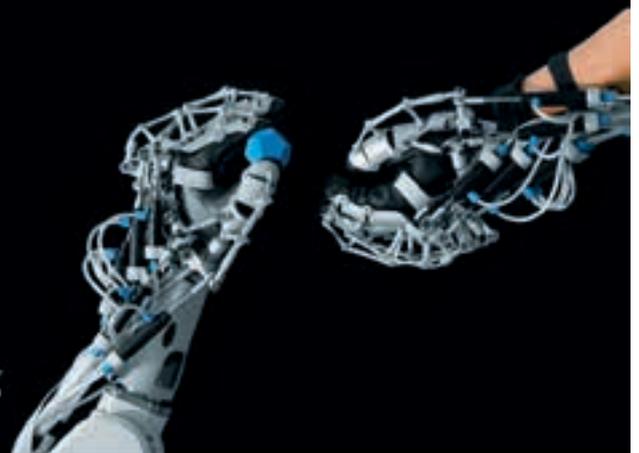
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## Cylinder castings quality improved

Following 10 months of negotiations, Hytec Engineering has appointed ACO Casting Services SA – the South African arm of Germany-based ACO Group, specialists in continuous castings – as its cylinder castings supplier, effective from mid-February 2015.

**H**ytec Engineering's decision to change casting suppliers was primarily taken to enable the company to raise the quality of its cylinder castings to international standards, a feat already attained overseas by ACO Eurobar®, the ACO Group brand.

The high quality castings from



*In addition to the high tightness with respect to liquids and gases, materials used for ACO Eurobar's continuous castings guarantee outstanding processing characteristics and excellent mechanical properties.*

Germany are supplied as unfinished, with all machining done in South Africa by ACO Casting Services SA, adhering strictly to Hytec Engineering specifications. ACO recently established its South African facility in Germiston, Ekurhuleni, where consignments are held and machining carried out. "The higher quality castings are available with immediate effect," says Pierre Goosen, general manager Hytec Engineering, "with ACO Casting Services SA holding consignment stock to agreed levels – some in raw casting format and the remainder pre-machined."

Negotiations for the supplier appointment focused around supply, delivery, price and stockholding, as the inherent quality in the ACO Group's casting products was already well established. "ACO Eurobar satisfies the highest quality specifications of the hydraulics industry," points out Goosen. He adds that the ACO Group and ACO Eurobar quality levels are acceptable to Bosch Rexroth in Germany,



*ACO Eurobar's continuous casting products are supplied as unfinished goods, semi-finished goods, or processed according to customer specifications for components such as manifold blocks.*

and one of the reasons the Group is their preferred supplier. "In fact, this proven technology was jointly developed with Bosch Rexroth."

Goosen says that the casting quality from their previous local supplier was inconsistent, but with ACO Casting Services SA a consistent supply of quality castings will enhance Hytec Engineering's cylinder production, a benefit that will be passed on to its clients.

Following close on the heels of ACO Casting Services SA's preferred supplier appointment, the Bosch Group re-awarded the grey and nodular cast iron Preferred Supplier status to ACO Eurobar GmbH on 23 April 2015. ACO Eurobar is the only concast iron supplier in Germany to have retained the Preferred Supplier status of Robert Bosch GmbH since 2010. □

## Expanding into sub Saharan Africa

**A**s part of the new joint venture into Africa, the Hytec Group has increased its distribution and support of the full range of Bosch Rexroth Oil Control cartridge valves throughout sub-Saharan Africa. This expanded support will enhance the Group's logistical, sales and support capabilities of the products, and includes a more competitive pricing structure for this series.

The valve range simplifies conventional compact hydraulic systems, and enhances hydraulic circuits where space and weight present fundamental application constraints. Bosch Rexroth cartridge valves are characterised by a very long service life: at an operating pressure of 350 bar, the cartridge solenoid valves are rated for a product life of 10 million cycles.

The unique design of the cartridge valves reduces the amount of interconnecting pipework required within the hydraulic circuit through a customised manifold. This reduces the overall weight and space requirements of the machine, resulting in decreased

power requirements – contributing to better all-round energy efficiency. Because the interconnections of piping within a conventional hydraulic system are a common source of fluid leakage, the compact design and reduced piping requirements of the cartridge valves also reduces inspection and maintenance requirements, facilitating



*A complete array of Bosch Rexroth Oil Control cartridge valves is available across Africa through the Hytec Group.*

a more efficient hydraulic operation.

The valves offer a typical working pressure of 350 bar, with some rated to 630 bar, and flow rates of up to 700 ℓ per minute, for fluids between -30 °C to 100 °C. The screw-in cartridge valve range includes pressure control valves, check valves, counterbalance valves, flow control valves, logic elements, directional valves and proportional valves.

These cartridge valves are used extensively in mobile applications, for instance in lifting platforms, agricultural machines, earthmoving and materials handling equipment and mobile cranes. The valves are also used in many industrial applications.

While mechanical and solenoid cartridge valves remain the most demanded solution, the demand for proportional valves is growing due to a recent increase in automation projects.

Oil Control cartridge valves will be stocked by HYSA, Hytec's central warehouse for all Bosch Rexroth hydraulic products, and distributed via the Hytec branch network. □

## Super flexible high-pressure spiral hose

Jorge De Lima, of Eaton's southern African Hydraulics business, explains the cost benefits of switching to Aeroquip X-FLEX very high-pressure spiral hose to help continuous mining machines to reduce downtime in South Africa.

South Africa is one of the ten largest coal producers and the fourth largest coal exporting country in the world. But the coal seams in South Africa are buried too deep beneath the ground for opencast mining, so they have to be mined using the underground room-and-pillar technique. The mine site is divided into a series of rooms that are cut into the coal bed using continuous miners. These machines extract the coal whilst digging a hole at the same time and can mine as much as five tons of coal a minute. Once the coal is removed, the ceiling is shored up with pillars to prevent it from collapsing.

Downtime on these continuous miners could cost the mine up to US\$10 000 per hour in lost production – a cost so high that some mines measure this downtime in minutes. There are many factors that can cause downtime, but the majority of cases are due to hydraulic hose assembly failure.

“Eaton's route to market for South Africa's mining industry is through a

distribution network for which we supply hydraulic assemblies, fittings and accessories,” explains De Lima. “Many of these companies are contracted by the mine to ensure that the continuous miners meet or exceed a certain rate per tonne of coal extracted, which is why avoiding downtime is of the utmost importance.”

The area on a continuous miner where most breakdowns occur is on shear cylinders that move the cutting bobbin. Upon daily servicing, these areas are cleared of coal debris and the assembly is checked for any cuts, signs of abrasion or visible leaks from threaded connectors. In disciplined sites, the preferred hose used on these machines is Eaton's GH506, which offers excellent performance when cleaned and serviced regularly. The hose-end fitting features a special wire trap design that requires the hose to be both externally and internally skived or scarfed to help ensure hose and fitting integrity under impulse conditions.

“At one particular mine site, the total

annual downtime caused by the failure of hydraulic hose assemblies was 9 000 minutes, which equates to approximately \$1.5-million in lost production,” recounts De Lima. To overcome this challenge, the supplier replaced the original GH506 hose assembly with Eaton's higher specification Aeroquip® X-FLEX hose.

X-FLEX features a rugged, abrasion resistant DURA-TUFF cover, which provides longer life in this abrasive environment compared with the original high-pressure hose. In addition, it provides a 46% reduction in force-to-bend ratio, which made it easier for the supplier to handle in the shop, and is less time consuming to fit on the equipment.

The X-FLEX hose assembly is also easier to build since skiving is not required. “On replacement of this original hose assembly with Eaton's Aeroquip X-FLEX very high pressure spiral hose, duty time increased considerably and downtime for the mine was reduced by 2 000 minutes,” he says.

“Squeezing lost production costs by \$333 000 by simply replacing a hose is a very attractive proposition for the mine and indeed the supplier. With supply and service of these mine sites in the region of \$50 000 per month, the mine recovers its investments very quickly,” he concludes. □



## SKF Sealing Solutions

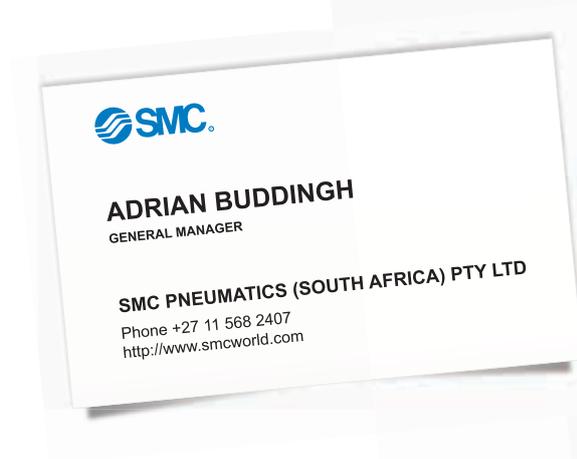
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# Successful pressure testing at Koeberg

Rand-Air equipment has again been used to successfully complete 4.0 bar pressure testing of the containment building at the Koeberg Power Station.

**R**ecognised as Eskom's most consistent and reliable power station, Koeberg is the only nuclear power station in Africa. Koeberg has a pressurised water reactor design. Featuring the largest turbine generators in the southern Hemisphere, Koeberg is also the most southerly-situated nuclear power station in the world. With international law stipulating that all containment buildings of all nuclear plants have to be pressure tested every ten years, Eskom contracted their preferred supplier, well-established compressor and generator hire company Rand-Air to facilitate the assignment.

Having previously supplied oil-free compressors for the containment integrated leak rate test in 2005, the decision to commission Rand-Air was a result of previous successful project partnerships with Eskom. "The purpose of the pressure testing of the containment building at Koeberg was to ensure that there was no leakage which could be harmful to the surrounding environment



*An overview of the pressure-testing project recently completed with Rand Air at the Koeberg Power Station. Inset: Ten PTS916 Rand-Air units running through desiccant dryers pumped dry oil-free air into the containment building.*

and public," says Andre Hopley, projects lead technician at Rand-Air.

"Using ten PTS916 Rand-Air units running through desiccant dryers, dry oil-free air was pumped into the containment building. Both the inner and the outer sector of the building were surveyed before, during and after the test. Water particles have a big influence on pressure testing and the end result. We were required to match an 18 °C air temperature of the air going into containment. We found that using heat exchangers and chillers reduce the pressure testing time by a few hours allowing us to control the air pressure distribution. The requirements for pressure testing are for a dew point of -20 °C

and we managed to achieve minus -40°," Hopley explains.

"The pressure test took between seven to eight hours. It took two-and-a-half hours to reach a pressure of one bar. The procedure stops for eight hours when it reaches one bar, this is key in ensuring that everything is stable enough to continue to four bar. The process requires the go ahead from two parties namely Électricité de France (EDF) and Eskom. It is critical to monitor the progression thoroughly as damage to the equipment inside the building is potentially dangerous.

"We are proud to report that the Rand-Air contribution to the pressure test at Koeberg was a great success," concludes Hopley. □

## Renting versus buying equipment

**T**he dilemma of buying versus renting machinery is a question that often arises amongst mining and construction companies, as working to meet tight deadlines means that project managers are constantly seeking ways to increase productivity.

Outsourcing equipment is beneficial as it allows companies to focus on their core business. Whether companies are looking at renting short-term or long-term, outsourcing machinery involves no major capital outlay and companies may not have to waste time applying for finance. Another benefit is maintenance, because the hiring company does it, and if any breakdowns arise these can be quickly attended to by replacing like-for-like hired units.

Buying machinery, on the other hand, has appeal, as it is a once off expense and could be considered a long-term investment. Owning the equipment also means

that the equipment forms part of the company's assets and the company can claim the depreciation costs. There are, however, many challenges involved when procuring an asset that requires continuous maintenance and high upkeep costs.

Henry Fourie the business development manager for Industrial Plant Rental at Rand-Air, a compressor and generator hire company, suggests that renting offers greater benefits in the long term. "Not only are customers guaranteed quality machines when renting from a reputable company, they also have peace of mind knowing that they are paying a fully inclusive rental price that comprises all maintenance expenses, including; parts, labour and travelling costs of the technician. In addition to this, the rental option offers back up machines in case of a breakdown to ensure that productivity isn't affected while the machine is being repaired. Rental also offers an

easy upgrade or downgrade path without additional capital outlay when compared to outright purchases," he argues.

Another significant factor to consider is hiring machinery from a company that offers 24-hour service. Industrial Plant Rental account manager at Rand-Air, Mpho Modjadji Ngamlane advises: "renting equipment from a company that does regular machine inspection and maintenance is important as this minimises the chances of breakdown, thus increasing productivity."

An important consideration when outsourcing rental needs is that the hiring of machinery is done through a company that has experience in the rental industry. "Rand-Air believes that exceeding customer expectation is a significant aspect in the service level agreement. Time is crucial and therefore it is essential to ensure that you are hiring from a company that makes it their business to understand your needs by offering the best advice and equipment," Fourie concludes. □

# Hygiene and safety

## with stainless steel handrailing

Andrew Mentis' marketing manager, Elaine van Rooyen, describes how two troublesome issues in industry, hygiene and safety, can be addressed by using stainless steel handrailing.

**S**afety of personnel and hygiene continue to plague a number of market sectors and cost companies thousands of Rands every year in downtime and lost profits.

Andrew Mentis' marketing manager, Elaine van Rooyen, says, "Stainless steel tube offers many advantages to the manufacturing, petrochemical/chemical, food, beverage and pharmaceutical industries. Exhibiting high levels of corrosion resistance, stainless steel can be used in rigorous environments, retaining strength at high temperatures. Furthermore, its non-porous properties offer a hygienic surface which, when coupled with its easy cleaning ability, makes stainless tube the primary choice for applications that require strict hygiene control, such as food and beverage processing plants."

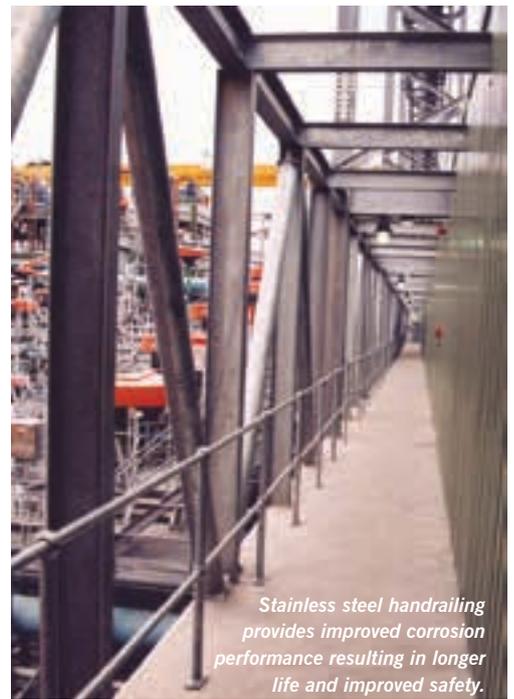
The aesthetic appearance of its polished surface is not only an added benefit, providing a modern and attractive appearance for most architectural metal applications, but stainless steel also increases ease of maintenance and provides improved corrosion performance.

This not only enhances the extended life cycle and long term value created by using stainless steel for its corrosion resistance, but since rusting handrailing can be a major factor in accidents, it also increases the safety factor.

Handrails are expected to meet both structural safety and aesthetic requirements.

Traditional carbon steel, cast iron, and aluminium handrails can deteriorate quickly in exterior or industrial installations with aggressive pollution and/or chloride exposure. Andrew Mentis provides a variety of handrails in three alternative grades: 3CR12, 304 and 316 stainless steels.

Stanchions on the Andrew Mentis stainless steel handrails are 45 mm in diameter with a 2.0 mm wall thickness and base plates are designed to allow moisture to drain from the stanchion itself, adding to the corrosion resistant benefits. The centre hole for the knee rail is drilled and then flared on both sides. The top is also flared and a half round



*Stainless steel handrailing provides improved corrosion performance resulting in longer life and improved safety.*

cap is welded into place. The base plate is 8.0 mm thick and welded to the tube.

Hand-, knee-rail and bends are manufactured from 31.8 mm diameter tube with a 1.5 mm wall thickness. Bends and closures have swaged ends, improving speed of installation and preventing moisture from penetrating into the joints.

"Typically, the more corrosion resistant Type 316 stainless steel handrails are the most cost effective choice in demanding environments. They require minimal maintenance, no paint or coating and provide safety and an attractive appearance. The service life of carbon steel and aluminium is typically limited by corrosion damage, which reduces structural integrity and appearance," says Van Rooyen.

In general applications, where corrosion is not a big factor, stainless steel handrailing can remain in situ with little or no maintenance, for many years. In more corrosive environments, for example close proximity to the sea or in locations with aggressive pollution and/or chloride exposure, 316 stainless steel provides major maintenance cost savings over other handrail types.

"Customised advice by our team of technical specialists ensures that the best handrail material is selected for the customer's specific application. Factors such as environmental conditions, amount of human traffic and aesthetics come into play and dictate the final product used. Solutions for even the most arduous conditions are available," Van Rooyen concludes. □



Stanchions on the Andrew Mentis stainless steel handrails are 45 mm in diameter with a 2.0 mm wall thickness and the 8.0 mm thick base plates are designed to allow moisture to drain from the stanchion. **Inset:** Stainless steel handrailing offers numerous benefits, including increased safety and hygiene.

## New generation steel roller introduced

Leading South Africa-based manufacturer and distributor of conveyor rollers, Megaroller has introduced a new generation steel roller to its hard-working rollers' range for the mining and materials handling industries.

**M**egaroller's new, patent-pending steel rollers are designed to ensure accurate bearing alignment to deliver easier rolling, enhanced efficiency and less noise pollution. Rolling easily, with less friction, the new steel roller is a long-lasting, environmentally friendly alternative to conventional steel rollers.

New generation steel Megaroller rollers have bearing housings that are mechanically fixed instead of welded. This ensures superior bearing alignment to deliver a more efficient, quieter and longer lasting roller.

Megaroller's steel conveyor roller features cushioned bearing carriers made from high quality nylon to provide vibration and shock protection at the most crucial part of the roller. This additional barrier, unique to Megaroller rollers, enhances impact resistance and guards the bearing against vibration, one of the main causes of roller failure. This is the first time that these benefits have been made available in

a steel roller for use in mines underground.

"Our new Megaroller is a revolutionary design concept for steel rollers. These rollers answer to the demand for a cost effective, more energy efficient and long-lasting steel roller that creates less noise pollution," says Adrian Evans, business development manager at Megaroller.

Megaroller, which was the first manufacturer to produce high-density polyethylene (HDPE) conveyor rollers in the early 1980s, has applied for a patent on the mechanically fixed steel housing arrangement.

"This is what differentiates our steel roller from conventional steel rollers available on the market. It is the welding-on of the bearing housings that causes them to warp, resulting in bearing misalignment and premature bearing failure.

"Our steel rollers have been tested at several customers' sites and feedback has been excellent. The rollers have proved to outlast other conventional steel rollers and our customers are impressed with their

quiet operation," adds Evans.

The rollers are produced in the company's ISO:9001-certified plant in Brits in the North West Province. This offers customers the assurance that the steel rollers adhere to the same high standards and quality principles for which the company has become renowned.

As with the Megaroller HDPE and hybrid rollers, the bearings in the Megaroller steel roller are lubricated at the factory and placed in a protective housing that is completely sealed. This eliminates the need to lubricate at user level, prevents the risk of over or under-lubrication, and mitigates the risk of bearing failure due to lack of lubrication. Customers are also offered the option to have their rollers manufactured using the bearing brand of their choice.

"The optimised efficiency and longer lifespan of the Megaroller steel roller, when compared to traditional steel rollers, mean that companies benefit from lower maintenance costs and improved total costs of ownership," says Sarel Koekemoer, general manager at Megaroller

"At a time when cost curtailment is a business priority, these benefits will be increasingly valued by mining and materials handling companies," he concludes. □

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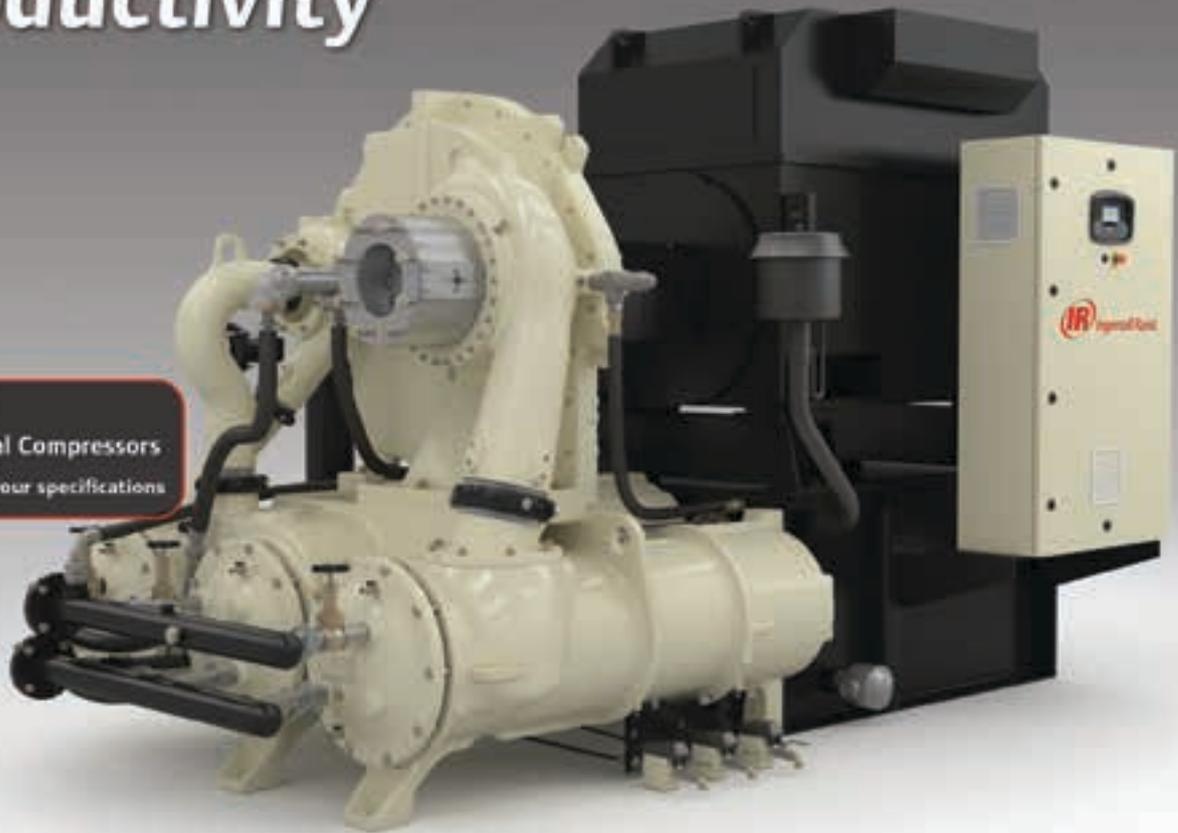
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# Material engineering in practice:

## Corrosion is everywhere

In this issue's Wits on Materials column, Josias van der Merwe of the School of Chemical and Metallurgical Engineering talks about corrosion and some of the research being undertaken to combat its effects.

Recently I asked my students to write about their experiences with corrosion, just in general life where they have come across problems caused by corrosion damage. The students are from a wide range of backgrounds with some growing up in more rural conditions. Some of the stories the students related impressed on me the extent of corrosion and how widely it influences our lives. The students from the more rural backgrounds related issues with vehicles and support structures that corroded.

The consequences varied from being just a hindrance to life threatening. One student described how a modified ox-wagon failed after a small modification did not take corrosion into consideration. Another student described how the family put up a small structure to hold a large water tank and they were quite surprised when the structure failed unexpectedly and almost fell on top of another family member. After closer examination they found that the structure failed as a result of excessive corrosion of one of the structural members. Another student reported on a water pipeline that burst. This was also in the news because it caused tremendous damage and loss of life. And several students reported on the effect of atmospheric corrosion on, especially, roofing.

This fits in well with research that we are involved with at the School of Chemical and Metallurgical Engineering. One of our students is investigating the extent of atmospheric corrosion in the greater Johannesburg Metropolitan. This is a much-needed study since a generalised corrosion map for South Africa was set up a number of years ago based on a limited number of sites. Therefore, one of our PhD students (Janse van Rensburg) has decided to focus on studying atmospheric corrosion after a number of years performing atmospheric corrosion testing as an Eskom consultant. The investigation considers close to 60 different sites

that are widely spread over the whole Johannesburg Metropolitan Area.

The initial results have been very interesting, describing the effect of industrial sites that contribute to most of the increased corrosion rates found, the effect of wind direction. High rainfall and seasonal changes were highlighted. What has been very clear is that atmospheric corrosion in a region cannot and should not be described by a single point measurement. These results will be presented as a corrosion map, a guide that can be used to compliment climate condition monitoring.

In the South African context it has been very important to consider and implement beneficiation of our mineral resources. Ruthenium is one of the metals forming part of the Platinum Group Metals (PGM) and is one of the least expensive metals in this group. It has been found that ruthenium provides excellent corrosion resistance to stainless steels (Myburg et al., 1998; Potgieter, 1991; Tomashov & Ustinskii, 1990), but is still too expensive and cannot be feasibly used as a bulk alloying element. For that reason we have been investigating the application of ruthenium rich layers to stainless steel, specifically for sulphuric acid service. The improvement found in corrosion resistance is considerable, with only small ruthenium additions. This is extremely beneficial as it makes the use of ruthenium a viable option for sulphuric acid service.

The corrosion resistant layers are applied by laser alloying and cladding and have also been used for both general corrosion to replace more expensive materials such as Hastelloys. In similar

work focused on more specific plant related corrosion problems, we are looking at the research of stress corrosion cracking as well as metal dusting.

Some of these forms of corrosion are not found everywhere but only in very specific industrial processes. When they occur, their presence can be extremely limiting and a huge stumbling block to processes such as those used in refineries and power generation plants.

Corrosion clearly affects all of our lives. □



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# The consumerisation of manufacturing IT

“Smart devices are a consumer success story. Their portability and power are also helping to ‘smartify’ the manufacturing industry – and this is just the start,” says Christoffer Malm, head of the Connectivity Room at SKF (right).



Smart devices such as iPhones and tablets have created a consumer revolution. No household, it seems, is without one. Smartphones double up as personal stereos and GPSs, while tablets are used as games consoles and portable movie screens. In business too, tablets are increasingly preferred to laptops, particularly for enhancing engagement during the sales process.

Now they are spreading to the manufacturing and engineering sector, including the factory floor itself. Manufacturers are harnessing the connectivity, portability and computing power of smart devices to ‘smartify’ the engineering world and create a revolution of their own.

SKF is at the forefront of this and has developed an infrastructure that will allow industry users – whether white or blue collar – to embed smart devices into their working practices. Whether for portable maintenance, personal instruction or simply banishing paper, smart devices are helping manufacturing companies boost their productivity.

The potential gains are enormous. For example, productivity gains of 12% have been achieved by engineering staff armed with tablets. Tablets allow people to do their job more efficiently, while accessing and making sense of more information.

Apple’s App Store already offers more than 30 apps developed by SKF. They have all been channelled through the company’s digital innovation catalyst team, known as Connectivity Room. Here, engineers distil their knowledge and expertise into apps that can help both SKF’s own employees and many customers.

All of these apps take SKF’s knowledge and translate it into software, with powerful analytics and IT algorithms processing the data. Smart devices are

the window to access this underlying knowledge.

SKF has, for example, one major US-based customer that repairs large industrial equipment, which often comprises many thousands of components. By law, each step of the process needs to be documented. To date, this has been done with pen and paper, to generate a paper trail in case of customer complaints. SKF has developed a data collection system accessed via a phone- or tablet-based app. A huge paper archive can now be replaced by a database, which the customer can instantly access and make sense of.

Using the new system, information on components is still entered manually because they are from different suppliers. Some components will have a unique ID, while many will not. But it’s early days for this kind of system. In future, for appropriate applications, parts might be barcoded or able to broadcast a unique signal – completely removing the need for manual entry. By registering a technician’s position on the shop floor, the nature of a particular maintenance procedure, and the time it is carried out, the smart device can automatically create a log history for each part.

SKF has also developed a number of apps that turn phones and tablets into measuring instruments. These are being trialled at one of its Gothenburg factories to help carry out maintenance as quickly as possible. With help from an internal positioning system (a factory floor GPS), the app pinpoints the position of maintenance staff on the factory floor. When a machine develops a fault, an alarm is sent to the nearest person, ensuring the fastest possible response.

Other apps guide maintenance staff through monitoring procedures. Sensors are often connected to smart devices,

turning them into measuring devices for vibration, temperature and other critical measurements. SKF’s engineers have taken this a step further, by adding an app that tells the operator where to place the sensor – in order to get the best reading, and better results.

In a similar fashion, a system called AliSensor ShaftLaser streamlines the process of alignment. Usually, when aligning an electric motor with a pump or fan, for example, a technician would traditionally have to carry a lot of heavy equipment. Now, thanks to smart devices and the minimisation of sensor technology, the equipment weighs much less. Through guided support, visualisation and instruction provided by the app, training is heavily reduced and the understanding of what to do and when is made much more clear.

AliSensor ShaftLaser was not developed by SKF, but by GLOi – a Swedish alignment technology specialist that was strategically acquired in September 2014. GLOi developed this integrated shaft alignment solution based on the iOS operating platform used by iPads and iPhones. The acquisition was part of SKF’s business strategy, and illustrates the commitment to this field – and to this type of technology.

SKF has spent more than a year developing a Mobile Operator Support Tool (MOST), which visualises the factory production line and connects machine data in real time. MOST will transform



the way that operators interact with machinery, by supplying them with the right information, at the right time and in the right place – via a customised mobile device such as a tablet or smartphone.

Delivering this wealth of information exactly when it is needed will bring multiple benefits. Operators will be empowered to improve manufacturing performance, and to diagnose and make decisions close to the problem. They will be instantly aware of real time manufacturing process data, such as energy consumption and product variability, allowing them to act quickly to overcome problems and improve performance.

The ultimate aim of MOST is to make it as easy as possible to do the right thing. As well as delivering process data directly to operators, it will include various instructions – how to re-set machines and equipment, preventative maintenance procedures, and much more. These will now be at the operator's fingertips, rather than in a manual somewhere.

But some information is always in another employee's head. So MOST includes a communications tool that allows operators and managers to text one another in order to solve problems. This feature has proved extremely effective during factory trials in Gothenburg.

From a pure business perspective, getting this connectivity through smartphones and tablets will save enormous amounts of time: SKF has already rolled out more than 3 500 tablets to employ-

ees and customers and each of these users has saved 12% on time as a result.

MOST can also identify the presence of humans in the factory. The heat treatment department of SKF's Gothenburg factory is 8 500 m<sup>2</sup>, which is covered by a handful of maintenance personnel. As well as pinpointing the closest operator to a particular machine to aid productivity, the smart device can act as a safety alarm. If a 'Where are you?' alert receives no reply, operators can quickly be tracked down – in case they have fainted, for example.

While there are obvious advantages to using smart devices in engineering, a note of caution should be sounded. As with any kind of new technology, there are hurdles to overcome before it becomes fully accepted.

High volumes of data flows between these devices, which rely on WiFi or 3G. But this extra connectivity raises huge concerns about security. Adding more cloud services outside the firewall introduces potential weakness and companies are keen to ensure their in-house data is not compromised.

These services will be accessed in a number of ways, such as http, https or through new standards. Password protection will be vital, but to make these services usable there needs to be a balance between tight security and ready access.

**Above:** SKF has developed a number of apps that turn phones and tablets into measuring instruments, for monitoring the hardening process of bearing races, for example. These are being trialled at its Gothenburg factories.

**Left:** SKF is at the forefront of developing apps and solutions that will allow industry users – whether white or blue collar – to embed smart devices into their working practices.

If you build a fortress, nobody will use it; protect it with a single password, and the data could be at risk. Careful balancing between these two extremes is important.

Regardless of the type of technology being introduced, technology itself cannot bring about changes in working practices. New technology must harmonise with people and processes to be successful. Smart devices, via the integration and visualisation of information, have an innovative role to play, but their use requires vision, thought, perseverance and drive.

The key to systems like MOST is making sense of data. Generating information is one thing; managing it is another. In order to take full advantage of this enormous new data set, it needs to be filtered and presented clearly. With top class hardware, smart devices, apps that gather and collect info, and dashboards. Much of the focus will be on maintaining and ensuring the quality of data and working out how to make sense of it.

Smart devices have already proven themselves in the demanding consumer market. If the manufacturing industry were to embrace the technology with the same enthusiasm, just think where we could be in terms of productivity. □

## Sustainable compressor productivity

Customer service and support are always first in mind at Atlas Copco Compressor Technique. "Purchasing a compressor is a significant investment so we make it our business to deliver complete air technology solutions and to establish long-term partnerships with our customers," says business line manager of Atlas Copco Compressor Technique's Service Division, Wayne Jacobs.

After-market service is a vital part of the overall solution because, no matter how exceptional the quality of a product, inferior service by untrained technicians



Atlas Copco Compressor Technique technicians: "know more about our products than anyone else, which equates to good value support and customer peace of mind," says Jacobs.

who may use the wrong tools, fit replacement parts incorrectly or even fit the wrong parts, all of which can result in premature failure. The resultant repairs, unplanned downtime and drop in production will, ultimately, have severe cost implications for customers and end-users.

"This can all be avoided by leaving service and repair in the capable hands of qualified Original Equipment Manufacturers (OEMs)," asserts Jacobs. "As an OEM, we offer the complete service package that encompasses regular maintenance by highly trained technicians who, in a nutshell, know the products and know what they are doing. Customers and end-users who opt for a good service ethic will reap all the benefits related to extended equipment lifespan and increased reliability which ultimately lead to maximised plant availability and sustainable productivity."

Quality training, notes Jacobs, "has a vital role to play". Regular training presented by qualified people not only keeps Atlas Copco technicians at the forefront when it comes to Atlas Copco original equipment but also address the very real and concerning problem of skills shortages.

"The fact that our technicians know more about our products than anyone else equates to good value support and customer peace of mind." Atlas Copco has established an in-house apprentice programme that offers training of the highest standards to develop qualified and skilled artisans.

Jacobs also draws attention to the importance of immediate response to a customer's service requirement as well as parts availability.

"These are fundamental to a good service ethic; we make every attempt to keep unplanned and costly downtime to an absolute minimum for our customers." Atlas Copco Compressor Technique's four service branches strategically located in Johannesburg, Durban, Cape Town and Port Elizabeth are supported by ten authorised distributors to take care of customers' requirements across the country. The service branches boast a 27-strong technician team with a significant back office support structure that can maintain and service any Atlas Copco product. "Irrespective of location, we can be on our customer's doorstep very quickly," Jacobs assures

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

## Gearbox spare parts packages introduced

The service department of Hansen Industrial Transmissions (HIT) has introduced 'All-in-One' spares kits that contain all of the spare parts and accessories necessary to replace critical components, such as shafts or gearwheels, in the company's gear units.

When the requirement arises to replace a faulty shaft or a damaged gearwheel, users can obviously attempt to order the original spare parts. However,

in addition to the shaft or the gearwheel, it is usually the case that other items such as bearings and seals also need to be replaced. Consequently, the user's purchasing department will, most likely, have to contact several vendors to secure all of the necessary parts.

The benefits of complete spares kits for gearbox users are countless. In particular, they will experience better control of the total cost of ownership of their in-

stalled drives and the total package price for their spare part(s) will be cheaper thanks to 'all-in-one' and 'one-stop-shop' principles. In addition, customers are guaranteed original, OEM-certified and correct parts.

This ensures extended life of the drives as well as making traceability straightforward – and spare packages are available for all of the HIT product ranges and covered by one-year HIT guarantee terms. This initiative is in line with the company's efforts at developing sustainable partnerships in which 'thinking together with the customer' is an underlying theme.

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



Hansen Industrial Transmissions has introduced 'All-In-One' spares packages for all of its gearbox range.

## Pinch valve product line at AICHEM 2015

Flowrox, a global leader in heavy-duty industrial valve manufacturing and services, exhibited its pinch valve and process flow product lines at AICHEM 2015, held in June in Frankfurt am Main, Germany.

For over three decades, Flowrox has been producing pinch valves designed to work in extreme conditions where corrosive or abrasive slurries or powders flow through industrial pipelines. At AICHEM 2015, Flowrox presented pinch valve designs including: PVE enclosed body pinch valves; PV open body pinch valves; PVG pinch valves; and PVEG pinch valves. Pinch valves are the most effective pipeline mechanism for

controlling fluids, allowing operators to seal a pipeline and block the flow for maintenance operations – particularly in conditions of high pressure where slurries or other coarse substances are transported.

"In designing our pinch valves, Flowrox has focused on ensuring reliability and performance by applying the highest standards in chemical and process engineering," says Simo Manninen, Corporate VP of sales and marketing at Flowrox. "We offer over 35 years of knowledge, experience and leadership in a highly-specialised product line of critical need to the industries we serve."

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

## Couplers for lower costs, weight and theft risk

ProAlloy couplers for electrical cables from specialist coupler, adaptor, plug and socket supplier, Proof Engineering, are 33% lighter than their brass counterparts and present a very low theft risk.

According to Proof Engineering director, Donovan Marks, the main problems experienced with couplers – traditionally manufactured from brass, leaded gun metal or stainless steel – is their extremely high weight-to-value ratio, which increases the risk of theft and often results in unplanned downtime and subsequent production losses.

“Following a three year research and development programme, we came up with a perfect solution for industry in the form of a coupler that is manufactured to specification from our patented ProAlloy material.”

Marks explains that this material is an alloy of zinc, copper and aluminium and holds a very low resale value. “The fact that the alloy is contaminated by the aluminium reduces its value from approximately R35/kg to R6/kg, so it is less likely to be sold for scrap. We further assist our customers by buying back the metal at R15/kg, effectively closing the loop.”

As an environmentally responsible company, Proof recycles the metal through re-melting to reduce the impact on the environment. A further benefit to end-users is that ProAlloy couplers are 33% lighter than brass equivalents.

Marks also points out that the zinc-based product has undergone stringent



*ProAlloy couplers from Proof Engineering are 33% lighter than their brass counterparts. Their low weight-to-value ratio reduces the risk of theft, which currently causes unplanned downtime and subsequent production losses.*

corrosion tests conducted by Mintek. Compared to brass equivalents, results showed no difference in corrosion rates when both materials were exposed to typical mine water.

“The ProAlloy couplers have been tried and field-tested by a number of blue chip mining houses with remarkable success,” continues Marks. He says this has led to the manufacture of ProAlloy plugs and sockets that provide end users with the same benefits as the ProAlloy couplers. The material may also have potential applications in components other than electrical couplers, such as switches, housings and flameproof glands.

Plugs, sockets and couplers are used to connect electrical cables to mobile mining equipment. “Using our patented non-theft ProAlloy materials to manufacture these components will, without any doubt, contribute to keeping end-users’ uptime to a maximum,” concludes Marks.

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

## New economical solenoid valves

Pneumax Southern Africa, leaders in the pneumatic and automation industry are pleased to announce a new cost-effective Italian made Eco 22 solenoid valve to its product offering.

Available in 1/8” and 1/4” ports in 3/2, 5/2 and 5/3 versions, this new series of valve comes with an aluminium valve body and spool/seal arrangement that optimises flow rate and valve switching time.

“We pride ourselves in offering innovative, versatile and reliable products designed to meet the needs of various industry sectors. Therefore we are pleased to add the Eco 22 series to our range,” says Deon Steenkamp, managing director of Pneumax.

This compact series is, on aver-

age, 40% cheaper than the traditional 488/484 Eco valve currently supplied by the company and the new valves can be supplied with or without a solenoid.

“Customers realise the quality and cost benefit of a European product being on offer at a fraction of the expected price,” continues Steenkamp, adding, “these valves have an average life of 15-million cycles depending on the application and air quality.”

Repair kits with seals and spools are available for overhauling the valves and manifolds are available for 2-10 valves. Monostable or bistable versions are available and these include an integrated techno-polymer solenoid operator with a 9.0 mm stem and built-in manual override.

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

## Bearings that take the heat

Extreme temperature bearings have to be high quality units that deliver numerous cost saving solutions to applications that require optimum bearing performance in hot, dry environments on slow rotating machinery.

SKF extreme temperature bearings are capable of operating at 350 °C without the need for re-lubrication. Grease lubricated bearings often fail at temperatures exceeding 250 °C because even special greases lose their ability to lubricate adequately above this temperature. In contrast, the SKF extreme temperature bearing is lubricated by a graphite cage, allowing for the bearings on any equipment to run at its optimum speed at higher temperatures.

Field experience shows that bearing service life in high temperature applications can be dramatically increased by using graphite lubricated extreme temperature bearings. For example, in a cooling bed for sheet metal manufacture, bearing service life was increased by a factor of three. In a typical application such as this, a single bearing of this kind can save up to 4,6 kg of CO<sub>2</sub>-equivalent and 1,5 kg of grease per year.

A cooling bed equipped with 5 000 bearings can save 7,5 t of grease and 23 t of CO<sub>2</sub>-equivalent per year. Based on both bearing and grease savings, this is equivalent to an 82% reduction in the climate impact compared to using grease-lubricated deep groove ball bearings.

In addition, the bearings are able to withstand the temperature extremes they are exposed to, bearing reliability is boosted and bearing service life is improved. This all leads to maximised plant availability and production and, ultimately, tremendous time and cost savings for the end user.

The extreme temperature bearing is included in the SKF BeyondZero portfolio.

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



*Pneumax SA's Eco 22 solenoid valves are available with manifolds for 2-10 valves.*

## World's first plastic rear axle transmission crossbeam

The world's first plastic transmission crossbeam for a rear axle subframe has been developed by ContiTech Vibration Control and BASF for the S-Class Mercedes-Benz.

The crossbeam is made from the engineering plastic Ultramid® A3WG10 CR, a specialty polyamide from BASF that is specially reinforced and optimised to withstand high mechanical loads. Compared to the previous beam made from die-cast aluminium, this highly durable component offers a weight saving of 25%, better acoustics as well as excellent mechanical properties – even at high temperatures – and it conforms to the latest crash-test requirements. The design expertise embedded in BASF's simulation tool Ultrasim® made a major contribution to realising these properties.

The plastic load-bearing structural component meets all the requirements for the static and dynamic loads that act on a transmission beam: As a central component of the rear axle, the beam counteracts torque transferred from the engine to the transmission and bears a constant share of the differential load.

For all of the reasons above, the Ultramid crossbeam is now used in vehicle designs from

Mercedes-Benz with all-wheel drive, with the exception of the AMG cars.

To replace aluminium in this demanding, crash-relevant application, the plastic has to meet high mechanical requirements. The Ultramid crash resistant plastic used, which is 50% glass fibre reinforced, shows optimum strength and rigidity and a low tendency to creep under constant loading. In addition, the material has to withstand high bending torques and exhibits good NVH (noise, vibration, harshness) performance.

"The new rear axle transmission crossbeam is a milestone in the use of polyamides in the chassis. It has the potential to set a new trend in the automotive industry," says Kai Fruehauf, head of the ContiTech Vibration Control business unit. "In order to replace metal with high-performance plastics, it is necessary to make optimum use of the material and adapt it to the particular load situations, as BASF has demonstrated in the development of Ultramid for the transmission crossbeam."

BASF used its Ultrasim simulation tool in the early phase of development of the new crossbeam in order to determine the size of the component, optimise the component geometry and predict how the component would behave during injection moulding and in operation. The simulation of ultimate loads, strengths under dynamic loading and crash safety was found to reflect the real component behaviour very well. ContiTech Vibration Control used Ultrasim's Integrative Simulation to model the entire manufacturing chain. Thus it was possible to define the component geometry at an early stage and reduce the number of prototypes.

able to define the component geometry at an early stage and reduce the number of prototypes.

BASF's Performance Materials division encompasses the entire materials' know-how of BASF regarding innovative, customised plastics under one roof. Globally active in four major industry sectors – transportation, construction, industrial applications and consumer goods – the division has a strong portfolio of products and services combined with a deep understanding of application-oriented system solutions. Strong capabilities in R&D provide the basis to develop innovative products and applications. □

[www.performance-materials.basf.com](http://www.performance-materials.basf.com)



The new ContiTech transmission crossbeam for the rear axle of the Mercedes-Benz S-Class is made from the lightweight engineering plastic Ultramid® A3WG10 CR, a polyamide from BASF.

### Industry diary

#### August 2015

##### BELTCON 18

05-06 Aug  
Birchwood Hotel and Conference Centre, Johannesburg, South Africa.  
Chris Townsend: IMHC organising committee  
+27 11 888 7163 or  
+27 11 782 3595  
ctr@beltcon.org.za  
www.beltcon.org.za

##### Bearings (2 Day)

17-18 Aug  
Secunda, Graceland Hotel  
Phindi Mbedzi: +27 11 325 0686  
phindi@2kg.co.za  
www.2kg.co.za

##### Gas Africa Conference & Expo

20-21 August, 2015  
Sandton Convention Centre, Sandton, Gauteng  
bettemc@mcaughtonevents.co.za

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## Certified Ultrasound Level 1 Training

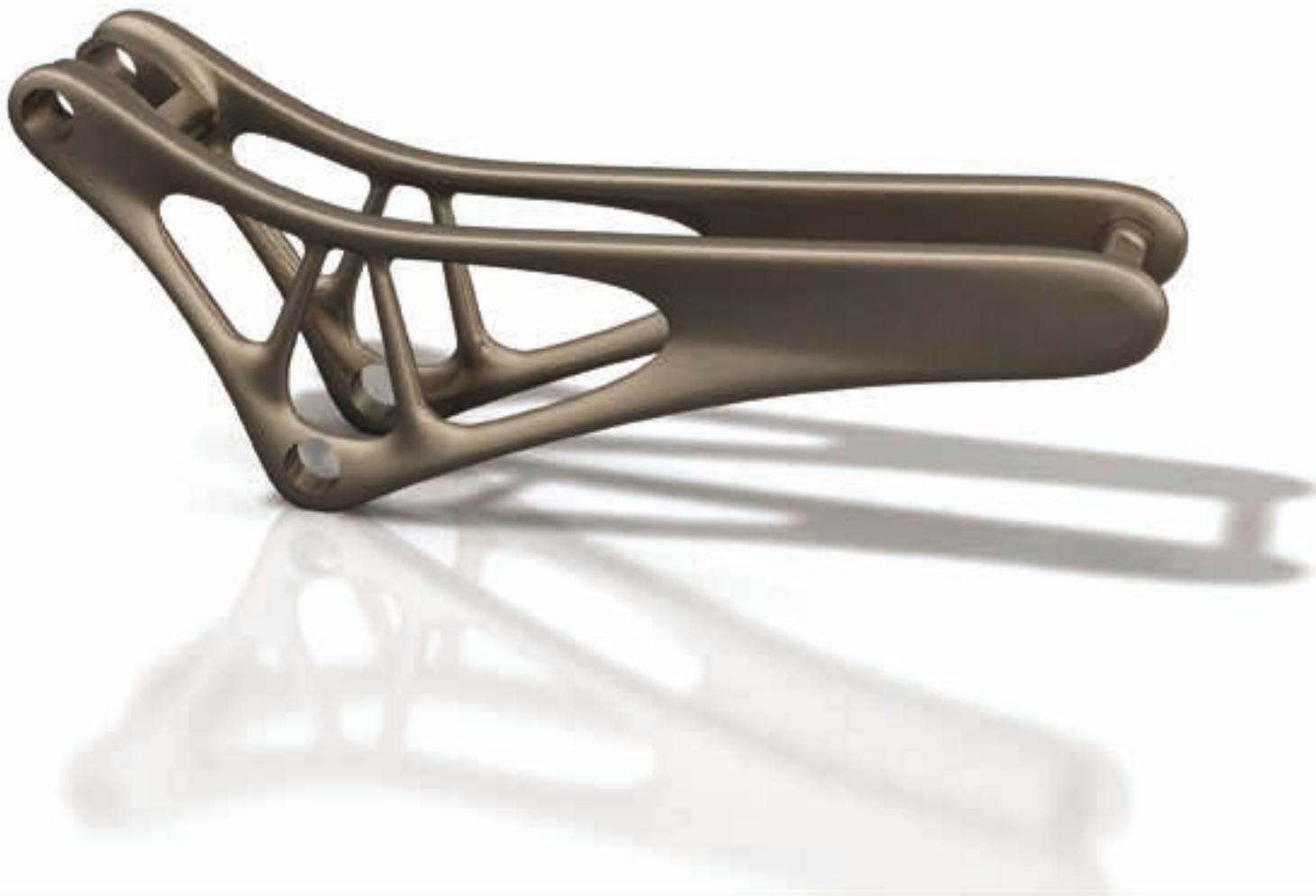
**Martec: Johannesburg, September 2-4, 2015**

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Key benefit include: Improved equipment reliability; the prevention of unplanned outages; reduced maintenance costs, extended equipment life, improved maintenance effectiveness and the maximisation of maintenance resources. In addition, ultrasound technology can help industrial users to save on energy, including electricity, and to improve their manufacturing efficiency.

For a registration form or more information contact Margie Roes: Fax: +27 86 502 0634 or email: [margie.roes@martec.co.za](mailto:margie.roes@martec.co.za)

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