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Published monthly by
Crown Publications cc
Cnr Theunis and Sovereign Streets
Bedford Gardens 2007
PO Box 140, Bedfordview, 2008
Tel: +27 11 622 4770
e-mail: mechchemafrika@crownc.co.za
www.mechchemafrikamagazine.co.za

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Design: Darryl James
Publisher: Karen Grant
Deputy publisher: Wilhelm du Plessis
Circulation: Karen Smith
Reader enquiries: Radha Naidoo

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

CROWN
PUBLICATIONS



Transparency You Can See
Average circulation
July-September 2016: 3715

Printed by: Tandym Print, Cape Town

Cover story: BMG
3 Droste Crescent, Droste Park,
Jeppestown, South Africa.
+27 11 620 1500
www.bmgworld.net

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AFRICA and sustainable growth

Peter Middleton

COMMENT



Towards the end of 2016, a year universally acknowledged as 'awful', Cummins Southern Africa held an upbeat breakfast to introduce its new regional distribution MD, Thierry Pimi. "I am proud to be back in Africa," said Pimi, who was born, raised and educated in Cameroon. "There is nowhere in the world I would rather be. While the continent presents big challenges, it also offers huge opportunities," he said.

Cummins, through its engine, power, components and distribution businesses, "plays in the heart of what is needed in Africa today: infrastructure development, power generation and minerals extraction. We are a central player in all these arenas," Pimi suggested.

Commentators are seeing the consequences of Brexit and an inward-looking Trump-led USA as indicators of an "economically tumultuous" 2017. Yet, according to Lynsey Chutel writing for *Quartz Africa* recently: "Some African countries could see sustainable growth beyond the usual narrative of Africa alternatively 'rising' and 'reeling'".

Quoting former executive producer of the World Economic Forum (WEF) in Davos, Richard Attias, Chutel writes: "The countries that will be successful in 2017 – whatever happens in the global economy – are the countries that are diversifying their economies."

Attias believes that focusing on renewable energy, industrialisation and manufacturing will enable African countries to grow. He says that new energy sources allow countries to build new industries while stabilising their power grids and diversifying beyond fossil fuels.

And: "manufacturing gets countries to process raw materials domestically". He hopes 2017 will be the year of the African product label. "We would be proud to see 'Made in Africa,'" he says. "This would be the turning point, the really important turning point in making this continent sustainable, rich and looking forward to the future."

Chutel points out that neither South Africa nor Nigeria, responsible for half African GDP between them, are likely to return to sustainable growth. "This could be the time for Francophone Africa to step up," she suggests.

Her article cites five fastest growing African countries to watch in 2017: Cote d'Ivoire, with growth projected at 8.6% for 2017, Senegal at 6.4%, followed by Togo and Benin (5.5%) and Morocco (4.5%).

Cote d'Ivoire continues to be peaceful and its National Development Plan has been extended to 2020, with associated foreign investments of US\$15.4-billion. According to Attias, sustained growth will come from Cote d'Ivoire's renewable energy projects and its

ambitions to become a regional energy hub.

Senegal is launching a high-speed train link between the new Blaise Diagne International Airport and central Dakar. Launched in 2014, its 'Plan for an Emerging Senegal' covers projects ranging from infrastructure and transport, energy, water and sanitation developments.

Togo is modelling itself on Singapore and Dubai, developing the natural deep-water port of Lome to serve West and Central Africa. It has also cut the amount of time it takes to set up a business from 38 days in 2012 to 10 days. In addition, the country has set up an anti-corruption body, which is seeing its international transparency ratings improve.

In Benin, Attias believes the country's political stability in the last decade, a new economic plan and government commitments to reform the cotton industry and diversify its economy will bring the necessary growth. Investment plans include the country's ports, a stronger power grid, and development of the telecommunications industry.

Morocco is also turning its focus to renewable energy with the Tarfaya complex in the Sahara desert – 131 wind turbines and a total installed capacity of 301 MW – Africa's largest wind energy project. Next on King Mohammed VI's agenda is building the world's largest solar farm. And toward the end of 2016, Morocco signed a deal with Nigeria to jointly construct a gas pipeline to Europe.

In preparation for Davos 2017, the WEF has just published a document called the *'Renewable Infrastructure Investment Handbook: A Guide for Institutional Investors'*. The handbook cites two factors that were inhibiting renewable energy investments: scale and risk.

Scale, the guide argues, is no longer an issue since, to meet COP21 clean energy commitments, global investments in the region of US\$200-billion per year between now and 2030 will be required.

Also though: "by 2020, solar photovoltaic is projected to have a lower levelised cost of energy (LCOE) than coal or natural gas-fired generation throughout the world", and: "renewable infrastructure has moved much closer to utility-like investments and no longer presents frontier technology-like risks."

I think Thierry Pimi has good reasons for optimism. Africa is rich in renewable resources and poor in infrastructure, a combination that screams opportunity. With a little microgrid-type thinking, we could become a model continent for sustainability, both in terms of clean energy and economic growth.

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BMG's 'Simplify for Success' initiative



"Our advantage is that we can offer best-fit whole solutions based on a basket of different products and brands."

MechChem Africa's Peter Middleton talks to new BMG MD Gavin Pelser about his company history, the consolidation into the expanded BMG World premises in Johannesburg and his strategy for continued future growth.

Appointed on September 1, 2016, Gavin Pelser has been part of BMG since 2005 when his own business, Oscillating Systems Technology (OST), was acquired by BMG. "I did my Ts at Wits Technikon, now Johannesburg University, before joining GEC Electric Motors in Benoni," he tells *MechChem*.

After rising through the ranks to become general manager at GEC, Pelser decided to start his own electric motor business. "Soon after, though, I went into the OST business, which involves drives and suspensions for vibrating equipment. I started to spend a lot of my time at process plants, mines and materials handling sites. We developed vibrating screens and feeders, electromagnetic precision feeders and gearbox feeders for a host of applications – coal mines, the Koeberg nuclear power plant, coin feeder systems for the minters and chocolate sprinkling systems for the food industry," he says.

The heart of these patented systems is four 90 Shore round suspension rubbers, which have no memory loss and can be sized from small to massive. "While the rubbers are designed to be replaced from time to time, OST suspension systems are remarkably simple and highly effective," Pelser points out. Today, OST is wholly owned by the Invicta Group, BMG's parent. It is independently run with Pelser remaining chairman of its board.

Pelser joined the BMG board of directors in 2008



Building at the BMG World site in Johannesburg was completed in December 2016 and the Christmas break was used for moving. "The facility is now fully operational," Pelser assures.

when he first took charge of BMG Engineering, which includes the Technical Resources and Field Services divisions. "Both these areas have enjoyed substantial growth over the years. BMG now has over 100 field service technicians operating out of 168 outlets throughout Africa," Pelser notes.

Following the promotion of Charles Walters to CEO of Invicta Holdings, BMG's management structure was split into two, with Gavin Pelser and Paul McKinley taking joint responsibility for the separate divisions. "But during the last Exco, it was decided that one leader was preferable. Paul now looks after logistics, procurement, and distribution and I have taken on the MD role, while retaining responsibility for engineering. In principle, I take care of the value-adds and all components come under Paul," Pelser explains.

Centralisation and African expansion

The past year was "extremely tough" and, for BMG, characterised by the conclusion of the upgrade of BMG World along with the finalisation and integration of three strategic acquisitions: Hansen Transmissions South Africa; Hyflo, including Hyflo SA and Hyflo Namibia; and Sibuyile, a tools hardware and equipment supplier that was acquired through Man-Dirk.

"This is all part of our 'Simplify for Success' initiative," Pelser reveals. "We make acquisitions to strengthen the company; through the expertise and knowledge of the people that come with the acquisition, and the solutions and brands that we can add to our basket. We then look to see if we should fully integrate the new entity into BMG or to support independent operation. Hyflo, for example, like OST, will continue to operate independently, while Hansen Transmissions SA has been fully integrated into our Power Transmission offering," he explains.

Building at the BMG World site in Johannesburg was completed in December and the Christmas break was used for moving. "All of our financial staff has now relocated from Durban and the BMG World facility is fully operational," Pelser assures.

"By August, our new JDA warehouse management system will be installed and operational, consolidating our stock countrywide. Centralised warehouse management enables us to keep stock at branch level to a minimum, maximising our returns and minimising costs – without extending delivery times. The globally linked warehouse management system will enable us to respond to delivery requests faster than ever before, with branches able to function on the leanest possible 'just-in-time' basis.

"A conservative estimation puts the return on investment for the BMG World expansion and the new warehouse management system at no more than four years, through stock savings and efficiency. We have

also gone from 12 leased properties to a single property, internally owned by Invicta Properties,” Pelser tells *MechChem Africa*.

Citing the new customer service centre at BMG World, he says that BMG now offers 38 technical training courses. “This is a growing side of the business, and these courses are being approved and accredited as they get developed. Dave Russell, who used to head up Technical Resources before he retired last year, is now consulting for us, doing hands on technical training and systematically getting Merseta accreditation for our courses,” he says.

Turning attention to the company’s Africa expansion aspirations, Pelser says that 18% of turnover already comes out of Africa and, by 2020, BMG is targeting 35% of income generated to be from north of the South African border.

Outlining the African branch network, he says BMG has three fully fledged outlets in Mozambique and Namibia; two in Zambia; as well as single branches in Botswana, Swaziland, Tanzania and DRC. “We are also building a branch in Ghana at the moment, which will open towards the middle of 2017.

“On the service side, we are establishing regional service centres (RSCs): for East Africa in Tanzania; in Ghana to service West Africa; and in Zambia for the central African region. These will offer technical and product support, some assembly and customisation capability, and inbound stores to better support the regions,” he reveals.

Turning attention to South Africa, he says that while BMG’s Distribution division produced a resilient performance in the challenging market, “the Engineering division endured its most difficult year to date. There are currently no new or expansion project investments and we have to survive, almost exclusively, on maintenance and repair operations (MRO).

“Due to the closure of some key accounts, such as Highveld Steel, our traditional markets have shrunk, so we are having to find other customers in other industries. In 2008, mining comprised more than 50% of our business; it is now down at around 25%,” Pelser informs *MechChem Africa*.

In compensation, agriculture is growing fast. “Through our ‘Boer Slim’ (Farming Smart) campaign, we are finding ways to add value to farming operations, by installing smart VSD technology for water transport and irrigation pumping systems, for example. We are helping farmers to use new technology to save water and power through a range of complete solutions for farmers, which include higher efficiency pumps, motors, VSDs and gearboxes. Agriculture is now our second largest sector and is fast becoming a core pillar of our African growth strategy,” he says.

“The farming community is a close one and farmers talk to each other about their successes. This is creating demand for our solutions, reinforcing the value of implementing smarter technologies in this traditionally low-tech environment,” he suggests.

On the food and beverage side, he says that BMG is also experiencing significant success at bottling plants with its new water- and lubrication-free conveyor material. “This system is a direct replacement for slatted-top conveyor belting and is becoming the



BMG’s on-site service and support offering is now available throughout Africa. Services include the assembly of critical plant components as well as ongoing preventative maintenance assistance such as vibration analysis and oil sampling.



BMG’s ‘Boer Slim’ campaign seeks to add value to farming operations through innovations such as BMG Pivot Gear Motors for centre pivot irrigation systems. These, along with correctly sized pumps and VSDs, enable water to be efficiently and evenly distributed to crops.

solution of choice for the African beverage industry.

“We have a motto to help us through these tough times,” Pelser says. “The longer we can keep our customers in business, the longer we will be in business. So in everything we do, the drive is to save money for our clients by providing products that last longer, increase productivity or improve efficiency: products that contribute towards sustaining businesses for longer,” he argues.

“Our advantage is that we can offer best-fit whole solutions based on a basket of different products and brands. We have analysed the costs of getting three quotes and raising a purchase order, then receiving and getting the products into stores and managing the payment. That process will cost anything between R300 and R600 per purchase order.

“BMG is able to limit the number of purchase orders necessary, because a basket of product can be combined for payment on a single order. Based on a survey in 2005 and repeated 2014, we have confirmed that this is what customers want from us. These surveys led to the addition of tools and PPE to our range and an increase in the number of brands to cater for different quality and applications requirements.

“We believe we now offer the right product at the right place at the right price at the right time – and our product combinations make purchasing simpler than ever before,” he concludes. □

Experiences of a SAIChE president

In this first issue of *MechChem Africa*, we talk to Dawie van Vuuren, president of the South African Institution of Chemical Engineers (SAIChE), about his experience of the industry and his views of chemical engineering as a career choice.

“I started my career at CSIR and have worked here, although not continuously, for 35 years in total,” says Van Vuuren. “I received my chemical engineering degree from Pretoria University in 1976 and began my career here as part of my National Service,” he tells *MechChem Africa*.

Qualification wise, Van Vuuren also holds an MSc from Wits and a PhD from Pretoria University, awarded for a thesis entitled, ‘*In search of low cost titanium*’.

“Like many chemical engineers of my generation, I was initially involved in synthetic fuels and the Fischer Tropsch process – and many of my team members ended up joining Sasol. I worked on slurry-bed Fischer Tropsch synthesis and I played a role in the initial work of Sasol to develop this process,” Van Vuuren relates, adding that the slurry bed process is now in use on Sasol’s Qatar gas-to-liquids plant.

In principle, the Fischer Tropsch process

uses carbon monoxide (CO) and hydrogen (H₂) – which come from the gasification of coal or more directly from natural gas (CH₄) – to make *inter alia* longer-chain alkane-based liquid fuels such as diesel.

“Sasol 2 and 3 use fluidised bed reactors with all of the reaction products in gaseous phase. These are then condensed and distilled. By using lower temperatures heavier components, such as oily and diesel-like stock, can be produced in fixed or slurry bed reactors,” he explains.

A slurry-bed reactor uses molten wax in which the catalysts are suspended. Describing the reaction, Van Vuuren says: “basically CO and H₂ dissolve in the molten wax, which, via the catalysts, react to form more wax and other products.”

Related technologies in Van Vuuren’s experience include energy technologies. “The CSIR has a boiler called the National Fluidised Bed Combustor (NFBC) that can produce 10 t



of steam per hour. I was not directly involved in this research, but the team that reported to me for a time designed several commercial fluidised combustion units for a variety of different applications. I also got involved in coal briquetting, gasification, calcination and drying, along with some minerals reduction investigations,” he recalls.

In 1993 Van Vuuren joined AECL in Modderfontein, where he worked for five years. “AECL was a wonderful company to work for and I thoroughly enjoyed my time there. It was there that I began to learn about titanium, starting with titanium effluent treatment for a titanium dioxide pigment plant,” he continues. “I was also involved in phosphoric



The CSIR's Titanium Pilot Plant, which produces titanium directly from titanium tetrachloride (TiCl₄) feedstock. This is reacted with a strongly reducing metal such as magnesium, sodium, calcium or lithium to remove the chloride and to give titanium powder and a salt.

acid purification, also fascinating, and solid waste treatment of waste fly-ash.

"Unfortunately, AECl decided to close down its engineering department in Modderfontein, so I rejoined the CSIR and became involved in titanium dioxide (TiO₂) recovery from waste slag. On the road to Middelburg, is a 40-million ton slag dump that contains about 30% TiO₂ – and 30% of 40-million tons is a lot of TiO₂," Van Vuuren suggests.

CSIR, together with Highveld Steel and Anglo American were challenged with the task of developing a way of extracting this TiO₂ in an economically viable way. "The team developed a chemical to do it, but struggled to upscale the technology. I joined CSIR and was tasked with leading the upscaling. We developed a successful method that worked for relatively high volumes, which resulted in a 10 kg/h TiCl₄ plant for extracting titanium metal from the waste materials. After purification, TiCl₄ can be converted back into pigment grade TiO₂ via existing commercial processes.

"The risks became too high for Highveld and, since Anglo's main interest was associated with the Namakwa Sands operations, when that operation was sold, Anglo's interest in the project also waned.

"The dump is still there, though, as is the opportunity. There is also vanadium in there, comparable to the annual vanadium production from the now shut down Highveld operation. So if someone can develop a process to beneficiate TiO₂ and the vanadium, the economic equation might look attractive again," he points out.

"That is how I became involved in titanium metal research. My current job at the CSIR is to develop a competitive technology to produce titanium metal powder. We have developed some methods and have settled on a route. We are now piloting the titanium production process to service the envisaged titanium production and manufacturing industry in South Africa," Van Vuuren continues.

"Because titanium is so strong," he explains, "one cannot manufacture powder by directly grinding or milling larger pieces". To overcome this problem one must first react titanium metal with hydrogen to make a substance called titanium hydride, which is brittle and can be ground. After grinding, this is then heated and converted back to form titanium powder.

"But we make titanium directly from titanium tetrachloride (TiCl₄) feedstock. This has to be reacted with a strongly reducing metal such as magnesium, sodium, calcium or lithium to remove the chloride and to give titanium powder and a salt," Van Vuuren tells *MechChem Africa*.

"I also dabbled a little in the hydrogen economy and hydrogen fuel cells and I played

a role in promoting research into hydrogen," he adds.

"The thing about chemical engineering as a profession is the immense variety of applications of chemical engineering principles. This makes the profession incredible interesting. There are so many different opportunities and issues to resolve that it becomes one of the most interesting careers. As I say to young people, in my career I have often been frustrated but I have never been bored."

Chemical engineering in South Africa

"In South Africa, our minerals processing industry employs a large number of our professionals," Van Vuuren suggests. "There is a huge overlap between chemical and metallurgical engineering and, as I often say to my metallurgical colleagues, the metallurgical engineering discipline is really a branch of specialisation of chemical engineering." He argues that metals are simply different chemical compounds, so many chemical engineers end up in the key metallurgical industries such as chrome, platinum and gold – "because most minerals processing involves complex chemical processes".

"Then there is the petrochemical side, with Sasol being a big player, but one should not ignore Engen, PetroSA and rest of the refinery side of the petrochemical industry."

Chemical engineering also has an enormous role to play in cleaning up and protecting the environment. "The people who understand chemical processes and the consequences of contamination are those with the skills to put in place solutions to reduce negative impacts on the environment and to clean up affected areas," Van Vuuren believes.

The water industry is an example where removing contamination is of vital importance. "In Afrikaans, the word we use for chemistry is 'skeikunde', which actually means 'separation knowledge'. The underlying principles of separation technology are fundamental to the work of chemists and chemical engineers," he points out.

The water sector is split into two key areas: municipal water treatment for the supply of safe drinking water and the treatment of sewage; and industrial water treatment of waste process water streams.

"In South Africa civil engineers tend to dominate the municipal water treatment sector. The industrial side, however, is more the domain of the chemical engineer. Acid mine drainage (AMD), for example, is currently a big topic and significant strides are being made in establishing large-scale treatment plants for this dangerously contaminated water," he says.

Inorganic chemicals, the plastics industry, biochemistry, pharmaceuticals and the food industry all require chemical engineers to

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help them to develop and manage large scale reactions and processes. "Making food safely, efficiently and with economies of scale is also the work of an engineer, not of a chef," Van Vuuren says.

"The role of SAICHe in South Africa is not to regulate and control the profession. By law that is the role of ECSA. Our role is to promote chemical engineering as a profession and as a career choice for the younger generation.

"We strive to help with the development of chemical engineers and to assist members to perform and succeed in South Africa's chemical industries. Our members serve on university advisory boards to help align university programmes with industrial needs and our branches function well when they have strong university representation.

"SAICHe is about fostering and supporting the chemical engineering fraternity and community, via opportunities for professional development such as conferences, seminars and accredited training courses, with the shared involvement of universities and industries," Van Vuuren concludes. □

When bearings wear

It's a fact of life that all bearings, even the most highly engineered, will eventually wear and require either repair or replacement. This article explores the options for engineers working in the paper and pulp industry.

Bearings are critical components that are used heavily in both pulping and paper production machines. Buried deep in the heart of each machine, they ensure that rotating parts move smoothly, efficiently and with minimal friction.

In many instances, bearing designs are highly specialised to meet demanding conditions; for example, operation in areas such as suction rolls where there is constant exposure to moisture, or in dryer sections with high levels of humidity and heat. Installed and maintained correctly, and protected by appropriate lubrication systems, bearings should provide a long and trouble-free operating life.

Unfortunately, it is not always possible to maintain bearings under ideal conditions, as bearings expert and SKF business unit manager, Rudolf Groissmayr, explains: "Bearings can wear prematurely and fail unexpectedly for many different reasons, the most common causes including poor or incorrect lubrication, failed seals, misalignment of shafts, and changes in machine operating conditions. These often arise if attempts are made to increase line speeds or steam temperatures in dryers as a means of improving output; however, this can move the bearing performance envelope outside its original specification."

Although it is unusual for a bearing to fail unexpectedly – the latest condition monitoring and oil analysis systems should provide sufficient advance warning to prevent such an

occurrence – it is common to find bearings suffering from indentations and micro-fissures in rolling surfaces and raceways that, over time, affect the performance and efficiency of the bearings and thus of the shafts or cylinders that they support.

Ultimately, regardless of how carefully engineered, installed and maintained they are, bearings that are in constant use will eventually reach a point where they require either repair or replacement. Although there are arguments in favour of each approach, in the current economic climate, where mills face a combination of intense global competition and rising input prices, there is a strong impetus, wherever possible, to repair rather than replace bearings.

Groissmayr manages one of SKF's Industrial Service Centres, specialising in the remanufacture of bearings for the pulp and paper sector. He notes that "one of the biggest challenges for production or maintenance engineers is minimising machine downtime. The problem with bearing replacement is that it's often impossible to determine how damaged a bearing has become until it's dismantled and removed from the machine, by which time of course the line has stopped.

"If a new bearing is required then this can be costly and, as few suppliers keep such specialised or expensive components in stock, may require a special factory order, which can take weeks or in some cases months, to



fulfil. The alternative is to remanufacture the bearing.

"Remanufacture is possible in over 50% of applications and can normally be carried out within days and at a considerably lower cost than purchasing a new product. It is also possible to remanufacture a bearing – especially older bearings – to a higher standard of quality and performance than the original part."

Besides productivity gains, Groissmayr sees some real environmental benefits in remanufacturing bearings. "Not only are there real commercial and technical benefits for mill operators, there is also a powerful argument in favour of environmental sustainability, as remanufacturing uses up to 90% less energy than that required to produce a new component."

The purpose of remanufacturing, however, is not generally to produce a bearing better than the original, but to increase its service life.

It should be recognised that remanufacturing is an extremely demanding process that requires specialised knowledge and equipment to ensure that the bearing properties are maintained and guarantee continued reliability once the product is back in operation. "Working with a specialised supplier is essential," says Groissmayr. "Not only will they have the capabilities to carry out the work quickly to the highest standards, they will also be able to help a customer understand why the bearing was damaged in the first place and to assist with subsequent machine optimisation to minimise the risk of subsequent failures."

Not all bearings are suitable for remanufacture. Those with heavy damage or fractures are generally only fit for recycling. The remanufacturing process therefore begins



The latest condition monitoring and oil analysis systems provide sufficient advance warning to prevent bearings from failing prematurely.



Above: Bearing remanufacture is possible in over 50% of cases and can normally be carried out within days at considerably lower costs compared to a new replacement. **Left:** SKF bearing designs are highly specialised to meet demanding conditions. Shown here is a remanufactured bearing being assembled.

with an expert assessment of bearing condition, to determine both suitability for remanufacture and the type and extent of work required. An important aspect that is often overlooked is the assessment of bearing condition in the context of its application, taking into account the bearing load, lubrication conditions and time in operation; this enables the nature of the problem that has caused the damage to be fully understood.

A clear distinction has to be made between problems of subsurface-initiated fatigue and surface-initiated fatigue. The former describes the shear stresses that appear cyclically immediately below the load-carrying surface of the rings and rolling elements. These stresses cause microscopic fissures that gradually extend to the surface and, as the rolling elements pass over these fissures, fragments of the surface material spalls or breaks away. Bearing raceways with damage caused by subsurface-initiated fatigue are not normally suitable for remanufacture, while those suffering from surface-initiated fatigue can generally be restored by honing or grinding.

When a bearing arrives at an SKF remanufacturing centre, it is visually inspected and parameters such as residual magnetism and clearance are checked. The bearing is then disassembled and cleaned before the component parts are carefully inspected and their dimensions measured. This includes standard measurement of ring wall thickness and ovality, with the option of ultrasonic testing to detect subsurface micro-cracks. Additionally, measurement of hardness, roller diameter set variation and outer dimensions can be added, depending on the condition of the bearing and the criticality of the application.

This initial assessment phase is then followed by the submission of a customer report and a recommendation for further actions. The sub-

sequent remanufacturing process is undertaken in a dedicated production facility, combining advanced automation and control systems with the engineering knowledge of experienced technicians.

The remanufacturing process is effectively divided into four categories: Service Level 1 (SL1) covers inspection and analysis of failures; Service Level 2 (SL2) covers the process of restoring bearings that have not been used but may have degraded due to lengthy or incorrect storage; Service Level 3 (SL3) covers the remanufacture of bearings, primarily by polishing processes, with the reuse of existing components; Service Level 4 (SL4) is for the extensive remanufacture of bearings requiring the replacement of components and grinding of raceways. In each case, remanufactured bearings are reassembled, quality inspected and marked for traceability before being packed and returned to the customer.

Groissmayr believes that bearing remanufacture offers considerable advantages. "Our experience has shown that remanufacturing can help paper mills reduce their annual bearing replacement costs. This can vary, depending on the business model, but can typically be between ten and 12%. Just as importantly, the relatively short lead times mean that, with careful planning, bearings can be remanufactured during normal line shutdown, thereby minimising any loss of productivity. Finally, the potential energy savings also make remanufacturing an attractive option from an environmental perspective."

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New intelligent couplings for belt conveyor drives

Voith recently unveiled its new TurboBelt 500 TPXL fluid coupling at MINExpo in Las Vegas, USA. The fill-controlled coupling is the first in the new TPXL family to incorporate intelligent control technology.

The integrated controller incorporated into the new Voith TPXL fill-controlled coupling makes it possible to adapt the output torque of the coupling to the exact start-up requirements of the belt conveyor system. In addition, Voith's engineers have been able to considerably reduce the dimensions of the new coupling, so that the TurboBelt 500 TPXL only requires half the volume of conventional coupling types for the same transmission force. In addition to the operational advantages, the new series of couplings also offers attractive procurement and operating costs.

Operation of the TurboBelt 500 TPXL is simple and user-friendly. After the required torque for the belt and the basic start-up parameters have been transmitted, the coupling automatically calculates the optimum fill level in real time and fills or drains the working circuit accordingly. Equipped with a self-learning function, it simultaneously stores all relevant operational data in order to align the control behaviour optionally with the nominal value, depending on the respective load situation and previous empirical values.

This is enabled by the plug-and-play design of the TurboBelt 500 TPXL. An integrated controller, an integrated pump and a new oil supply unit are part of the coupling concept. Thus the components are optimally matched to one another and pave the way for predictive, requirement-oriented and cost-optimised maintenance of the coupling. The controller monitors the entire sensor system of the coupling and provides operationally relevant information, such as the condition of the oil filter, even by remote access, if desired.

As a self-contained system, the coupling can easily be put into operation without long interruptions of production. In order to allow for the integration into new as well as existing drive trains, Voith offers a version with bearings on both sides for standalone use, as well as a variant with bearings on the output side for direct motor connection.

Thanks to the hydrodynamic operating principle, power transmission via the TurboBelt 500 TPXL is wear-free and does not require a mechanical connection. New vanes with the XL profile double the power density of the coupling in comparison to conventional coupling types. This means that only half the

volume is required to transmit the same force.

The hydrodynamic circuit of the coupling limits the torque in the driveline to a fixed, predetermined value, which protects the belt and the drive components from damage due to overloading. This minimises maintenance costs and increases the lifetime of the system. Motors can be run up to speed under no-load conditions and staggered in time using the fill control system. This minimises the current peaks that always occur when motors are switched on and reduces the load placed on the power grid.

In parallel with the integrated controller unit, which controls the oil supply to the working circuit, amongst other things, the TurboBelt 500 TPXL is also equipped with a fieldbus unit.



The Voith TurboBelt 500 TPXL comes with an integrated controller and offers condition monitoring as well as remote access.

With this, Voith is laying the foundation for the mine of the future. Thanks to connected components over the entire extraction process, operators can profit from high conveyance performance and increased productivity as well as from increased work safety. □

Energy-efficient solution for Yanfolila Gold



Access to an OEM that can cover the full electrical scope of supply for mill applications is a major advantage and is what secured the Zest WEG Group the contract for the supply of an energy-efficient

solution to drive the mill at Yanfolila Gold Project in Mali.

The Yanfolila Gold Project in Mali is being developed by Hummingbird Resources as a low cost, high-grade open pit mining operation with its first gold production targeted for 2017. Following close collaboration with the mill OEM, Zest WEG Group provided an optimum solution, which will meet the performance parameters of the milling circuit whilst ensuring cost-efficient operation.

David Claassen (above), executive at Zest WEG Group, says that this is a good example of where the group is able to leverage not only its extensive expertise in electrical solutions for mill circuits, but its access to a comprehensive range of quality products.

Zest WEG Group is the South African subsidiary of leading Brazilian motor and controls manufacturer, WEG. The group's

product line-up includes low and high voltage electric motors, vibrator motors, variable speeds drives, soft-starters, power and distribution transformers, MCCs, containerised substations, mini-substations, diesel generator sets, switchgear and co-generation and energy solutions, as well as electrical and instrumentation construction and project execution services.

According to Claassen, this enables the Zest WEG Group to exercise total control over the packaged solution, which includes shortening lead times and offering customers the flexibility of meeting exact application requirements.

The electrical solution for Yanfolila Gold Mine includes a 2 000 kW, 6 pole, 6,6 kV squirrel cage WEG electric motor, a medium voltage WEG Variable Speed Drive (VSD) and a dry type phase shift transformer. The VSD and transformer will be housed in a custom-engineered and -manufactured sub-station. The sub-station will be manufactured and fully tested at Zest WEG Group's sub-station and panel facility in Johannesburg.

"An important advantage to customers of this 'plug-and-play solution' is that the fully completed electrical solution will be shipped to site from a single OEM," Claassen says. □

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Power transmission brands offer cost-savings and reduced downtime

"Bearings International represents a host of agencies, all offering top-quality products manufactured by international market leaders for niche markets," says Brian Tillie, the company's product manager for power transmission products.



BI power transmission products include ventilated turbo pulleys (VTPs) from Birn in Germany; taper bushes from RCO and V and wedge belts and pulleys from Opti and Continental.

Leading supplier Bearings International (BI) offers one of the most comprehensive power transmission drive product ranges available in the local market. "In terms of its extensive product offering for power transmission drives, BI represents a host of agencies," points out the company's power transmission product manager, Brian Tillie.

These include V and wedge belts from Opti and Continental, ventilated turbo pulleys (VTPs) from Birn Germany, taper bushes from RCO, industrial power tools from Makita, chain and anti-vibration units as well as specialised hosing from Contitech.

"While we target all market segments, we focus mainly on mining, heavy industrial, timber and food and beverage," Tillie highlights. He adds that the main benefits of the brands represented by BI are cost-savings and reduced downtime.

"These are all top-quality niche products manufactured by international market leaders. In terms of installation and aftermarket support, we are able to offer correct drive designs, training, technical bulletin back-ups and even laser alignment of drives," Tillie explains.

BI, part of the Hudaco Group, has consolidated its position as a leading distributor of bearings and power transmission products in southern Africa by launching a new brand identity at the end of last year.

"Our aim is to become a proactive company providing excellent service to our customers to ensure we are the preferred supplier. We strongly believe we should rather compete on value, providing advanced, industry-specific solutions and services, and thus safeguard industry sustainability," Burtie Roberts, CEO of BI, elaborates.

"As a member of the Hudaco Group with a customer-focused approach, we are committed to delivering value to all our stakeholders, while offering quality solutions that make a real difference to optimising plant availability and turnaround times. With over 58 years in the bearings industry, BI puts its experience to good use by going to great lengths to ensure that our product range and services meet the

changing needs of clients, industry and businesses," Tillie concludes.

Backed by an elite technical team, BI covers the full spectrum of customer requirements, and is able to ensure immediate availability of products through a nationwide network of branches. □



BI also has the agency for Makita Industrial power tools.

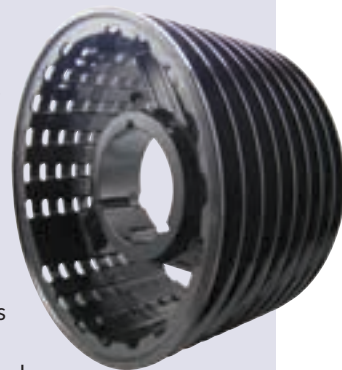
Ventilated turbo pulleys

Birn VTP pulleys are a V-belt pulley with a new design for optimised performance. One of the most notable improvements is the casting, which has resulted in a weight reduction of up to 50% compared to conventional V-belt pulleys. Furthermore, due to the tilted spokes, the internal tensions of the V-belt pulley are reduced considerably.

High quality GGG 60 iron allows the circumferential speed to be increased to up to 100 m/s and the wear of the V-belts is considerably slower than those made from grey iron.

VTP belt systems operate at lower working temperatures, by up to 17 °C lower, compared to standard V-belt pulleys. This also improves belt lifetimes.

ACC-surface treatment (autophoretic coating chemicals) is a new and more efficient surface treatment of castings. Among the other advantages, the ACC process adds a higher chemical resistance to oil, petrol, brake fluid and lubricants and exceptional physical properties to the cured film (6H-pencil hardness). Priming and finishing paint can be also be applied directly onto the ACC surface. □



Plans to increase local drive assembly capability

SEW-Eurodrive's global president and MD, Jürgen Blicke (right), visits South Africa and talks about the company's expansion plans.

SEW-Eurodrive's commitment to South Africa and the continent is underscored by the fact that the bulk of its regional turnover is still generated by the mining and minerals-processing industry. This is because the OEM remains a leading innovator and solutions provider in bulk materials handling and conveying technology.

Paying a visit to the South African head office in Johannesburg recently, SEW-Eurodrive president and global MD, Jürgen Blicke comments that, while the mining industry is in a slump, "we are still very strong in mining". Blicke reveals that the OEM plans to ramp up its local assembly operations, with an expanded assembly facility on the cards.

Another key focus for future growth is boosting the aftermarket sector, which has seen the South African subsidiary establish a new Field Service Department and Repair Centre. "We want to increase the service

business, including servicing brands other than our own. This is an international trend, whereby we find customers approaching us for this particular service," Blicke says.

However, Blicke adds that the main focus is still offering complete replacement units wherever possible. "As so many of our products are largely identical and interchangeable, we will simply offer a replacement unit as opposed to repairing an old one."

SEW-Eurodrive's success on the continent is highlighted by the South African company's celebration of its 30th anniversary last year. Blicke explains that the OEM's manufacturing base is distributed among 15 facilities globally, in addition to 75 assembly facilities, including Johannesburg. "Hence we are a truly global entity. The fact that we continue to invest significantly in South Africa is an indication of our commitment to the country and its economy."



A distinct advantage of the OEM's global footprint is an international pool of project and application experience. This not only encompasses manufacturing capability, but also an excellent grasp of local conditions and specific requirements. "What gives us the edge is not only how we manufacture our products, using the latest methodologies and technologies, but our in-depth knowledge of highly-technical sectors such as mining, food and beverage and automotive," Blicke elaborates.

In South Africa, the Johannesburg assem-

Latest-technology geared-motor assembly cells



SEW-Eurodrive Cape Town has invested in new assembly cells for geared motors to speed up production, increase quality and reduce wastage. As part of its ongoing development, the branch also plans a new assembly cell for electronics in the near future.

"We have definitely started to do more business on the electronics side, especially in terms of servo motors and mechatronic

units, which combine electronics with mechanical gearing," comments branch manager Byron Griffiths.

He explains that the assembly-cell development embarked upon by the Cape Town branch will increase its flexibility and capability for delivering total solutions to clients. It will also assist in reducing stockholding, as a lot of components are interchangeable, as opposed to having to keep one item in stock in every available size and configuration.

Cape Town is a significant production hub for SEW-Eurodrive, as it assembles units for other branches, including Nelspruit, Durban, Johannesburg and Port Elizabeth. In addition, specific sizes and ranges are only assembled in Cape Town, and distributed to other branches when needed. "For example, a smaller location such as Port Elizabeth will rely on us for its production, from servo motors to geared motors," Griffiths points out.

He adds that the Western Cape market in particular is showing

growth in terms of both volume and turnover. "The market is definitely on the up compared to last year. We are doing surprisingly well, despite the prevailing tough market conditions."

Griffiths reveals that the food and beverage industry is very stable in the Western Cape, where the large percentage of exports means that OEMs favour energy-efficient equipment such as SEW-Eurodrive's IE3-compliant DRN series of asynchronous motors. "One of the main reasons these new motors were launched was to cater specifically for increased export volumes into the US and Europe, where the standard regulations require IE3 compliance," he says. □



SEW-Eurodrive Cape Town has invested in new assembly cells for geared motors to speed up production.



Left: According to Blickle, the bulk of SEW-Eurodrive's regional turnover is still generated by the mining and minerals-processing industry. Shown here are the company's X series helical and bevel helical gear units at the Johannesburg assembly facility. **Right:** A cement plant in Zambia supplied by SEW-Eurodrive with geared motor solutions.

bly facility has invested significantly in installing the latest assembly islands to streamline production and reduce waste, an upgrade that will be carried through to the local branches in Nelspruit, Durban, Port Elizabeth, and Cape Town.

Elsewhere on the continent, the OEM has just established an assembly facility in Morocco, with representation in a range of countries including Tanzania and Dubai in the Middle East. It also has various partnerships

on the continent, including Tunisia and Egypt, whereby the OEM undertakes to service and support all of its products sold.

Blickle says that the ongoing success of SEW-Eurodrive is largely due to the fact that, although it is a multinational company, "we tend to do business like a family, and we feel like a family. I think that is unique, with not many other companies able to lay claim to a similar ethos underpinning their global organisation".

This means that regional hubs, such as the Johannesburg head office, continue to play an integral role in the OEM's growth and expansion and focus on innovation. "Each country and its facilities are equally important to us, especially as these mirror the spirit of SEW-Eurodrive. This also means that our regional experience and knowledge of local conditions and specific customer issues gives us a leading edge internationally," Blickle concludes. □



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Engineering capability fosters

During the last months of 2015, Southern Africa's hydraulics stalwart, Hyflo, was acquired by Invicta Holdings' major subsidiary, BMG Group. *MechChem Africa's* Peter Middleton talks to Hyflo's new MD, Emil Berning about the company's focus on engineering expertise and its customised hydraulics, pneumatics and mechatronics capability.

Appointed as managing director from November 1, 2016, Berning says that Hyflo now falls under the Engineering Services Group (ESG) of Invicta Holdings. Invicta has three arms: the Capital Equipment Group (CEG), an agricultural equipment and earthmoving specialist; the Building Supply Group (BSG), with MacNeil and Tiletoria supplying sanitary- and brassware, plumbing and flooring; and Engineering Services Group, BMG, being the segment's largest business.

Alongside BMG, the Engineering Services Group has several sister companies that operate as independent entities: Mandirk, a maintenance, repair and operating (MRO) equipment supplier; OST for vibrating equipment; OMSA, the lubrication systems specialist; Autobax for aftermarket automotive spares; and, most recently, Hyflo.

Application specific project engineering

"Unlike BMG Hydraulics, which has been fully absorbed into BMG with all its business going through the BMG branch network, Hyflo's business is independent and involves adding value to solutions, often through projects. We focus more on higher-level engineering design, manufacture and customisation projects, hence the decision to keep Hyflo as an independent entity," says Berning.

"We are very strong in the offshore and marine fields, for example," he says citing a recent success story about a 40 t active heave winch. "Hyflo was contracted by Denith Engineering to design and build an electro-hydraulic system to provide high speed accurate control for an active heave compensated (AHC) winch. This included the design and fabrication of 11 hydraulic cylinders to complete the system.

"The system is part of a launch and recovery system designed to deploy and recover a crawler, which is responsible for trenching underwater cables. The power cables are predominately used for offshore wind farms and are laid up to 600 m deep," Berning explains.

The winch is driven by ten Poclairn 5 000 cc motors and powered by a 1.5 MW power pack. The control is taken care of by two of Moog's latest NG32 digital axis control valves, which are synced together using a CAN network to control the 3 000 l/min of flow required. The valves are mounted on two manifold blocks weighing 1.1 t each, which, along with a third distribution block, were designed and machined in-house by Hyflo.

The AHC winch is designed to keep the payload at a constant height relative to a vessel in a swell of up to 2.5 m. This is accomplished using the Moog valves,



which receive three important reference signals: from a MRU (motion reference unit), along with position feedback and a tension signals, which are received from an encoder and load cell respectively. "The system's high-speed control is directly programmed onto the valves and enables a loop time of less than 1.0 ms," Berning tells *MechChem Africa*.

"We are increasingly supplying services to the international market and are particularly strong in the oil and gas industry in the Middle East," he continues. "We also have a proven track record for work on oil rigs, to do repairs and new installations on offshore rigs and vessels," he adds.

Looking at other markets, he says that Hyflo has the engineering capability to service the design or servicing needs of equipment OEMs and end users for the wide variety of specialised mobile agricultural, mining and materials handling equipment: harvesters and planters, for example, and for equipment such as mobile crushers or ship loaders.

"We have some niche agencies to support this offering, too," he continues. "For steering systems, for example, Eaton Char-Lynn is a global leader in heavy and off-road mobile equipment with millions of units installed worldwide. In Africa, we have the agency and the competence to incorporate systems such as these into custom-designed machinery," Berning notes.

Other key hydraulic component brands available to Hyflo include: Benteler for steel tubing; the full range of Bosch Rexroth and Eaton hydraulic pumps, valves and motors; Moog radial piston pumps and servo valves; VOSS Steel tube fittings; Stauff hydraulic clamps; Parker components; and Hydraforce cartridge valves.

"As well as our exceptionally strong engineering team, which includes over 15 graduate engineers, our manufacturing capacity for manifold blocks is one of the more advanced in the industry. Manifold blocks with cartridge valves are the hydraulic equivalents of integrated circuits in electronics. They are the modern way of designing hydraulic control systems to best match the user's application," Berning explains.

"Once a hydraulic circuit is designed, we select



Berning completed his mechanical engineering degree at UCT in 1984 and added a Senior Management Programme qualification from UP in 2003. Apart from a two-year 'sabbatical' from 2014 to 2016 as the director of energy storage specialist, Enersys, Berning has spent most of his career leading local hydraulics companies, including Hytec, Eaton and currently, Hyflo.

hydraulic company success



the most appropriate cartridge valves required and then design a manifold block to implement the full functionality of the circuit. This is a very important part of our business.

"We have several high-tech CNC-machines capable of making manifold blocks," he says. "Our big Mazak CNC machine is used when batch volumes of a block are needed, while we have several smaller CNCs for customisations or trial manifolds. From a manufacturing perspective, though, the Mazak gives us the edge. It can machine to very fine tolerance with excellent repeatability and we are currently running the machine on a two-shift/six day basis," Berning informs MechChem.

"Some 50% of our manifold manufacturing goes to other hydraulic companies and we can manufacture up to 1 000 or more blocks per month, depending on their complexity – and batch sizes of between five and 100 blocks are typical. Manufacturing, before populating the blocks with cartridge valves, contributes as much as 5.0 to 10% of our income," Berning reveals.

Adding to its hydraulic applications and engineering capability, mechatronics, pneumatics, automation and systems integration are growing aspect of Hyflo's business. "We offer pneumatic components and several other good quality automation component brands and were recently appointed as a primary Festo distribution partner.

"We employ qualified mechatronics engineers to enable us to implement PLC-controlled hydraulic, pneumatic or electrical automation solutions," he says, emphasising that, "Hyflo is not just an agent for hydraulic and pneumatic components; we are an automation service provider with full mechatronic and systems integration capabilities."

High-level skills development

In support of its technical and engineering skills base, Hyflo operates its own advanced education programme to build capability and succession. "We have two key succession routes, the apprenticeship programme for artisans and service technicians and, on

the engineering side, we operate an induction scheme for students and graduates from technical colleges and universities.

"On the Apprentice Programme, we bring people into our Johannesburg and Cape Town operations every year, who go through a proper apprentice training programme with us. These people are the country's future hydraulic, pneumatic and mechatronic artisans and 30 to 40% of them are currently being retained by Hyflo," says Berning.

"We draw our engineering expertise from the universities and technikons/universities of technology around Stellenbosch and Cape Town. While university graduates come with engineering degrees, the Technikon students have to do work-integrated learning (P1 and P2) for which they spend time with us. As a result, we often offer these students permanent employment if they fit in well," he adds.

"These two education programmes are well established and give us a succession strategy to retain our significant engineering strengths," Berning notes.

From a component sales perspective, Hyflo stocks and distributes over 16 000 hydraulic, pneumatic, hose and fitting components sourced from leading international manufacturers. "For servicing the installed base, standard components are often all that is needed. But we generally tend to add value to components. For accumulators, for example we might paint, charge, test and certify them. Component sales are also used to add value to the project engineering that we do.

"Mostly though, we are very good at systems and projects. We try to understand our customers, their needs and issues, so that we can engineer and deliver optimised solutions based on well thought out system and circuit designs, best-fit modern components and high-quality manufacturing – with the ultimate aim of providing improved production and cost efficiencies.

"This is how we distinguish ourselves from traditional component distributors," Berning concludes. □

Left: The AHC winch is designed to keep the payload at a constant height relative to a vessel in a swell of up to 2.5 m. This is accomplished using Moog valves responding to motion, position and tension signals.

Centre: For the agricultural sector, Hyflo was commissioned by Theebo Tech to engineer the electrical and hydraulic systems for the Equalizer Maximus® wide span planter.

Right: A Hyflo-designed and built engine test bench and oil and fuel supply system is being used by China North Rail to test its V20, 3 300 kW diesel railway engines. The system uses Festo pneumatic process control valves and a 16 station Festo CPX Profi-Net valve terminal block to direct the flow of the fuel and oil.

"We are increasingly supplying services to the international market and are particularly strong in the oil and gas industry."

New industrial air division launched

Probe Industrial Technologies, South Africa's largest importer of premium, maintenance-free, fit-and-forget batteries as well as rotating electrics has started a new Air Power Technologies division, focused on providing quality air, power and safety solutions to industrial clients.

As part of Probe's expansion strategy and commitment to providing complete industrial solutions, the company sought to partner with a suitable manufacturer of high-quality air compressors. The innovative German-based ISO 9001:2008 company, Tolpec SCC, which produces the SCC air compressor, was the perfect fit.

Trevor Volker, who heads up Probe's Industrial Technologies division, says that Tolpec SCC's combination of best-in-class practices and total in-house capabilities made the company an ideal partner for Probe. "The partnership is a win-win for both companies. We were looking for a premium class air compressor to distribute at a competitive market price. Tolpec SCC had recently embarked on a global expansion strategy that included establishing a German-managed manufacturing facility in China. It was looking at the potential

African market and required a local partner. Probe's 50-year experience in local and African markets attracted them to the company," he says.

"The air compressor market is dominated by overpriced OEM brands and numerous companies offering a cheaper product with no aftermarket or spares support," Volker adds. "We believe that it is an opportune time for new entrants to come into the market and provide a quality premium air compressor brand at competitive prices." Additionally, some of the more familiar brands are without distributors at present. "Our aim is to provide the customer with a product that gives optimal performance, along with energy saving potential, at the right price," says Volker.

He highlights that a crucial aspect to Probe's product offering is strong aftermarket services and support, which include service technicians and the availability of spares at all times. In addition, the specialist Probe Air Power Technologies team is able to conduct air audits and customer air compressor assessments to ensure that the best-suited products are selected for the specific application.

Probe Industrial Technologies has been able to hit the ground running by leveraging Probe Corporation's critical mass and reach. "With a high quality product such as the SCC compressor, and local markets ripe for a new



Probe's SCC Smart range offers simple, efficient and high quality compressed air. Easy to install with a very low noise level, service friendly with low maintenance costs and with a small footprint, these compressors are ideal for general industrial use.

offering in quality air compressors supported by solid aftermarket service, they are confident they will be able to meet, and exceed, customer expectations," Volker concludes.

Probe Industrial Technologies' sub division, Air Power Technologies, now offers:

1. Reciprocating compressors from 1.5 kW up to and including 15 kW tank-mounted compressors.
2. An electric rotary screw compressor range that starts at 5.5 kW and goes up to a 250 kW model in three pressure variants.
3. An oil-free range of compressors in a water-cooled version from 90 kW up to 415 kW.
4. Auxiliary quality air products including refrigerant air dryers, filters and drains. □

More about Probe

Probe was established in 1963 by Francesco Rovelli. The business started as an auto-electrical company and grew into an importer, wholesaler and distributor of top international brands. Probe is now a leader in its field and South Africa's largest importer of automotive batteries, with over 50 years of experience in distributing and providing aftermarket support for many international brands. The acquisitions of MED, Aristo Brands and Dynamax Auto Components have made the company a leader in rotating electrics in South Africa.

Probe serves the heavy and light duty automotive, mining and construction equipment industries through a national dealer network with a comprehensive range of services including sales and distribution of alternators, starters and associated spares and fully equipped workshop facilities for comprehensive electrical repairs.

The company's policy is to supply original equipment, spare parts and complete units, factory-approved remanufactured or replacement starters and alternators strictly to manufacturer specifications. □



A cornerstone of Probe's product offering is strong aftermarket services and support, which include service technicians and the availability of spares at all times.

Simple, rugged and easily serviced compressor brand

Specialist submersible and vacuum pump supplier, Integrated Pump Technology, has recently acquired the exclusive agency and distribution rights for ELGi Equipments Ltd, India's largest manufacturer of air compressors and associated equipment. Graham Russell, CEO of Boksburg-based, Integrated Pump Technology (right) introduces the range.



Based in Coimbatore, ELGi was founded in 1960 and is listed on the National Stock Exchange of India. ELGi's offering includes a complete range of compressed air solutions from oil-lubricated and oil-free rotary screw and reciprocating compressors, centrifugal compressors, diesel-driven high pressure and portable compressors as well as refrigerated air dryers, filters and other downstream accessories.

Highly vertically integrated, ELGi has taken the step to in-source all key manufacturing processes and, in line with this, has just commissioned its own foundry and opened a new state-of-the-art production facility in Coimbatore.

This extensive offering is supported by a rapidly expanding global footprint that now spans 73 countries, 20 offices and over 300 distributors. Manufacturing facilities are located in India, China, France and Italy. This world-class product, global reach and local service underpins ELGi's mission to offer customers "total compressed air management solutions", says Graham Russell, CEO of Boksburg-based, Integrated Pump Technology.

Having been present in South Africa as well as sub-Saharan markets since 1992, ELGI is already a firmly established brand with hundreds of compressors in daily service providing customers with reliable air in applications that range from specialised diesel-driven water, post and blast hole drill rigs, through to industrial plant requirements. Key markets for ELGi include mining, exploration, construction, railways and general industry.

Market-proven over almost 25 years in Africa's harsh operating environment, ELGi compressors are renowned for their simple operating system, rugged construction, local serviceability and low total cost of ownership.

"Apart from stocking popular models, Integrated Pump Technology will provide a full range of spare parts for both current and older models. Trained service technicians are available to undertake start-up commissioning as well as scheduled services according to OEM standards, always using genuine spare

parts in order to meet the ELGi brand promise of ensuring the highest levels of uptime," says Bert Stewart, the newly appointed general manager for Integrated Pumps Technology's compressed air division.

Within its 1 200 m² facility, the local company has the internal capability and experience to undertake service, overhauls and repairs to the air-end of almost any make of compressor.

Russell points out the business fit of ELGi within Integrated Pump Technology, from having synergies ranging from common customer bases, to the obvious benefits of being in a position to offer customers both compressed air as well as vacuum solutions. "We are very excited to be building on the solid reputation and strong market position of ELGi," concludes Russell. □



The ELGi EG 75 kW energy-efficient electric screw compressor is manufactured in compliance with CE, ASME, UL and other international quality standards. These new generation compressors significantly reduce operating costs and provide cost savings with fast return on investment.



The newly released ELGi PG 1500S Combo 400 twin stage diesel compressor, which can deliver 42.5 m³/min (1 500 cfm) at 28 bar. This compressor meets the critical requirements of high-speed, reliable performance and economy in drilling operations, ensuring faster drilling with higher productivity at lower drilling costs.

SA's niche hydraulic systems engineering company

MechChem Africa visits the Jet Park facilities of hydraulics specialist RB Engineering Services and talks to the company's MD, Richard Bartholomew.

First registered in South Africa in 1981, RB Engineering Services (RBES) began as a designer and manufacturer of high-pressure water-based solutions for the mining industry, such as control and safety valves, jetting guns and couplings. "We

did a lot of work on dust suppression systems, for example, to remove the dust and fume after a blast," begins Bartholomew.

Growing quickly, a dedicated factory was built in Kya Sands in 1990, where the company developed pure water-based high-pressure



For the Trump Ocean Club Hotel and Casino in Panama City RBES designed and manufactured the hydraulic shutter-lifting systems for the lift shafts, mast and the hotel's arcs (inset), which were required to position the shuttering to form the parabolic shape.

equipment for the New Hydropower mining system, including the then revolutionary Combi Valve.

Today, RBES has become a hydraulic engineering specialist with niche expertise in shutter-lifting systems for the construction industry; freight handling systems for companies such as Schenker, SA Airlink, Swissport, African Flight Services and Mega freight; and for general industry, custom-designed hydraulic presses, specialised machines, hydraulic cylinders, hand crimping tools, hydraulic cable guillotines, buzz bar twisting machines, scissor lifts and hydraulic turnover tables.

Hydraulic shutter lifting systems

The most notable success for RBES has been its hydraulic climbing systems for the construction industry. "We have developed systems with up to ten cylinders under independent control, capable of lifting up to 200 t of platform, formwork and/or safety screening," Bartholomew tells *MechChem Africa*.

"These are whole systems that are ratcheted up a building as it is constructed. The shuttering platforms, which include access ladders and safety railing, enable rebar to be set in place and concrete to be poured to suit the specific design of the building under construction," he says.

RBES' most recent export success is the Trump Ocean Club Hotel and Casino in Panama City. "We designed and manufactured the shutter-lifting systems for the entire building's lift shafts and mast, which were vertical lift systems, along with the more complex system for the hotel's arcs, which were required to lift the shuttering upwards and sideways before re-positioning it in order to form the parabolic shape with varying curvatures," Bartholomew reveals.

At 284 m, this 70-storey, 5-star hotel is now the tallest building in Panama and by using these three unique RBES-designed and built climbing systems, construction was completed in less than one year, "without a hitch".

"We have also developed a wall climber

that can lift shuttering or safety screening up the outside of a structure,” continues Bartholomew. “And although these systems are typically purpose-built to suit the architecture of a particular building, our design team can either adapt standard equipment to suit specific needs or design a unique system,” he adds.

A unique pup-coil press for Hualamin

Expertise gleaned from its sophisticated hydraulic climbing systems, in particular the parallel positional control of multiple cylinders required for precise vertical lifting, has also been adopted to manufacture special purpose presses.

“Hualamin Aluminium had a requirement at its smelter for a pup-coil press,” Bartholomew explains. “Foil and sheet products are rolled onto coils on the production line, but there is always some end-of-coil material that requires recycling back into the smelter to reduce waste and improve profit margins.”

This material, according to Bartholomew, needs to be compacted for two reasons: first, to make it fit back into the smelter more easily and, second, to increase its density so that it will sink below the slag floating on the surface of the melt.

Following research, Hualamin decided that the best way to recycle the pup coil was to crush it. “There are inherent dangers in other processes. If you get water into the aluminium, for example, then it explodes when dropped into the furnace. By crushing, inside spaces are removed and any surface water can easily be seen and removed before adding the material to the smelter,” he says.

The reel of each pup coil is taken out before crushing the aluminium, which could be of various foil thicknesses and roll diameters: typically up to 3.0 mm sheet thickness on a 1 000 mm roll. “A forklift is used to lift two pup coils at a time, one on each of its forks for loading into the custom-built hydraulic press we have developed,” Bartholomew says.

“Due to the extreme variation in coil diameter, thickness and length of each coil, the press platen would normally have skewed if using traditional press designs.

In its innovative design, RB Engineering has overcome this problem by adopting some clever hydraulic thinking. “We have developed a control strategy for a four-cylinder hydraulic press, so that, whatever is happening with respect to the load positioning, the press will always remain parallel.”

How? “It’s all managed via oil flow,” Bartholomew explains. “Instead of simply energising the four cylinders from one pump, which causes more flow to be directed to the cylinder experiencing the lowest load, we ensure equal flow to each of the four cylin-



The pup-coil press built for Hualamin Aluminium uses a control strategy for a four-cylinder hydraulic press that always ensures the press remains parallel.



Under test at RBES' Jet Park premises is a custom built hydraulic press for manufacturing railway couplings.

ders. For uneven load situations, this system inherently balances the press and directs the pressing forces to where needed, regardless of the load positions,” he explains.

The system also adopts regeneration to accelerate the action of the press under no load conditions. “There might be as much as a metre of daylight to close the gap to the load before pressing. To speed up the process, as well as pumping oil into the cylinders, we direct the oil from the annulus side of the cylinder to the crown. Then, as soon as the system detects a pressure build-up from the load, we shut off regeneration to focus on pressing the pup coil.

“The full pressure differential is then im-

mediately available to press down the load,” he says, adding, “each of the four cylinders is powered by its own power pack, with the system flow under PLC-control to ensure parallel operation at all times.

“We believe that our biggest strength comes from design innovation: thinking out of the box. We don’t simply design hydraulic circuits. We like to look at a whole process and to understand exactly what is required and what the pitfalls are.

“Then we can come up with well-engineered, custom-designed hydraulic solutions that help customers to achieve the outcomes they want,” Bartholomew concludes. □

Digital innovation shaping the world



At an 'Innovate the Future' event hosted by Dassault Systèmes South Africa in partnership with Innocentrix during December 2016, Olivier Leteurtre, the Eurowest MD of Dassault Systèmes, presented his views about the ways that digital and virtual technologies are changing the world we live in. *Peter Middleton* attends and reports.

Dassault Systèmes was created in 1981 by a team of engineers from Dassault Aviation, who had a vision to develop a high-end 3D design software suite. CATIA, the company's flagship brand, was launched in that same year.

"Having been involved in high-end innovations for over 30 years, I am here today to discuss how we view innovation and to share some trends I have seen in the countries I visit," Leteurtre begins.

Showing a slide full of superficially unrelated images, Leteurtre points to a virtual 3D image of a concept car branded AKKA Technologies, a design company with considerably know-how in automotive embedded systems associated with telematics and ADAS (advanced driver assistance systems). "Anything one can see and feel in a real car can now be simulated and tested in the virtual

world," he says, including the built-in intelligence and the market response.

Drawing attention to a medical image, he points out that, via additive manufacturing, it is now possible to manufacture body parts such as blood vessels, heart valves, skin, liver cells and even fully functioning bionic ears. "3D printing or additive manufacturing overcomes the need to go through the rigorous process of prototyping," he says.

"Also, the world is moving towards digital certification, especially in the aerospace industry. By using digital models for certification, months can be saved on a development project and testing can commence without the need to invest heavily in manufacturing. Many industries are moving in this direction.

"Is this innovation? Yes, but innovation is no longer about R&D and the creation of IP. Why? Because we don't buy products anymore, we buy a way of living or an experience. Look at how people use mobile phones. Everyone has their own unique device to suit their preferences and needs. So to innovate for the new generation, companies have to know their customers, even if they do not supply product directly to them," he argues.

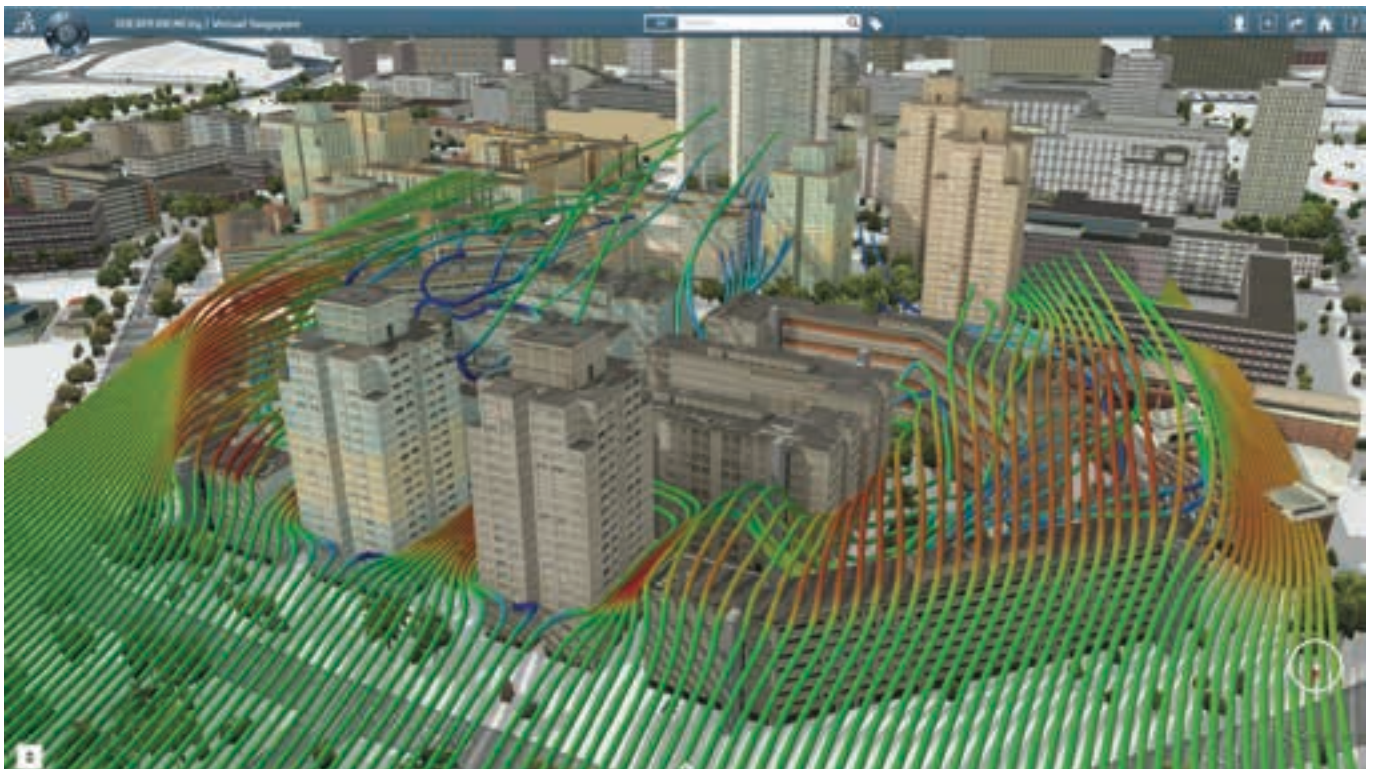
Citing a fitness equipment manufacturer in Italy, he relates that this market highly competitive. "The machines are not that complicated and the financial barriers to entry are low. So competition is fierce," he says.

This company decided to create a downloadable app for use by fitness centre members to enable exercisers to enter personal data such as age, weight, medical and physical details and problems. Then, by incorporating compatible intelligence into its machines, when a member goes to the gym the machines can offer personalised set-ups and routines to suit individual profiles.

This company now knows exactly how its end-users are using the machines. By collecting the data, designers are better able to develop the range to directly match the preferences of fitness equipment users. "They have also moved from being a hardware company to developing software 'experience' solutions," Leteurtre notes.

Five ways that the virtual world is improving the real world

Cities for people: In partnership with Dassault Systèmes, the City of Singapore is striving to



A wind simulation model of Singapore, an aspect of the Smart City campaign being undertaken by the city in partnership with Dassault Systèmes.

meet the modern challenges of large city life by implementing smart city technology on a large scale. Voted the world's best smart city for 2016 by Juniper Research, Singapore's minister for foreign affairs, Vivian Balakrishnan, said: "This drive is more than a need to be a world leader. What you see in Singapore is an exercise of desperate imagination. It's not about innovation because it's sexy, but because it's survival."

Says Leteurtre: "The Smart City of Singapore project is about looking five years ahead and asking questions like: 'If we move the airport, what will that mean for mobility and transport? What energy systems and utilities do we need to put in place? What does that mean for security?'"

"People in silos have been making these decisions in the past. Smart city technology strives to define models that everyone can access and examine so that everyone knows about a change as soon as a decision is taken and all impacted departments can react to that change. At its core is the principle of collaboration," he notes.

Resources and energy: From a raw material perspective, Leteurtre suggests that additive manufacturing is having a disruptive influence. Additive processes use powders, potentially at micro, nano or even atomic levels. They offer massive potential weight savings on designs, above 70% in some cases. But to realise these savings the design approach has to be completely different. The way of working also needs to change to accommodate the different knowledge sets that are involved.

Turning attention back to cities, he says that large cities are all facing increasing problems with respect to pollution, waste, energy supply, traffic congestion and transportation. "When 10% of the people are consuming 85% of the energy, it is not fair. Tomorrow 50% will want more energy but we don't have it and if we try to deliver, we will simply be burning the planet down."

The solution is to implement citywide energy efficiency management systems and to adopt renewable and sustainable energy generation.

Global and personalised health: "Today's medicines and pharmaceuticals are based on chemicals. Their development involves drugs that are statistically tested to suit the majority of patients. One consequence of this is that different people experience different side effects," Leteurtre says.

Today, through biotechnology, people are working on ways of personalising medication to better suit the physiology of individuals. This means that side effects can be minimised and dosages tailored to suit individuals – "to best match the individual's DNA".

Overall, this offers much better medica-



The XYT modular utility vehicle enables suppliers to develop different parts and modules and to price these accordingly. It is then up to the customer to decide whether the innovation is worth the price.

tion and treatment efficiency with far fewer unpleasant treatment related problems.

Supply globally, producing locally: "Additive manufacturing, for example, changes logistics completely. Traditional manufacturers move parts. A wing might come from a plant in UK, a fuselage might be made in France and engine parts in Hamburg in Germany. All of these then get sent to Toulouse where the plane is assembled. Imagine the transport costs?"

"Additive manufacturing is not yet able to make complete aircraft, but powder is much easier to transport, so production can be organised in a new way. It is even possible to envisage spare parts for a ship to be additively manufactured onboard while sailing.

Inspirational education and research: In the past, education was dependent on teachers. "A 'grumpy expert' teaching about mechanics or electrics passes his or her knowledge onto students." Now, before coming to the class, students have free access to that knowledge. The teacher is no longer the keeper of the knowledge. Online courses are available directly from global service providers at much lower costs than those that involve site-based classes.

"So education is no longer about knowledge, it's about project experience. What modern students need is opportunities to use knowledge, working in group projects, for example, to solve real problems and implement solutions," suggests Leteurtre.

"And graduates coming for interviews are no longer interested in the stability, history and past successes of a company. All they care about is the pay, the project he or she will be working on, with whom and for how long. Everything is short-term, so they have no interest in the mission and future vision of the company.

"These kids have seen divorce, unemployment, poverty and all kinds of instability. They know that life is uncertain. When offered a job for life, nobody believes in it anymore. They have much more short-term goals and very flexible approaches to their futures.

"And this trend is not related to one company or one country. Because of the digital nature of our society, there are no longer boundaries isolating different parts of the world," he points out.

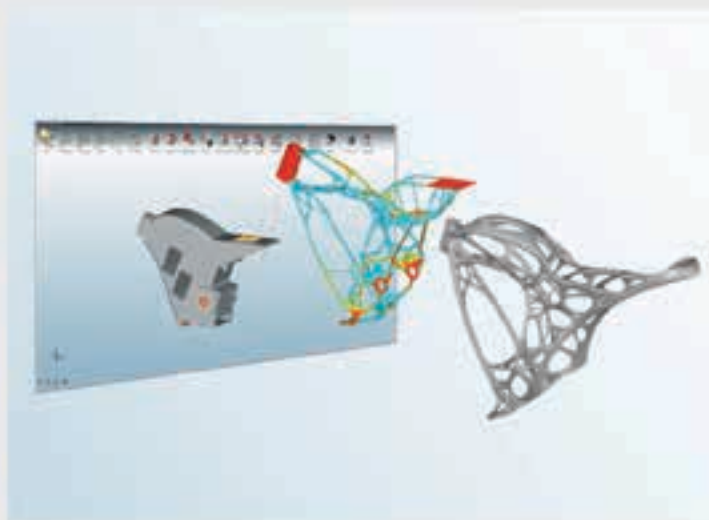
Leteurtre cites a start-up called XYT that epitomises the modern digital trend. This company, "the third car maker in France", has only two people and it is building the electric utility vehicle of the future, based on a modular platform with 600 different parts.

Fully upgradeable, the cost of a Pixel XYT by Francecraft starts at US\$11 000 and has a range of just over 200 km. "Through a network of suppliers and garages, customers are able to define the configuration that they want in a number of ways. A small construction start-up might define the tools area, a ladder rack and the branding, upfront. The number of seats, doors and the length of vehicle are also choices available to the customer.

"In terms of manufacturing, instead of suppliers, XYT has co-makers. Usually the carmaker defines the car, the market and the price. They then put pressure on suppliers to reduce costs while maintaining quality.

XYT allows suppliers to develop different parts and modules and to price these accordingly. It is then the customer that decides whether the innovation is worth the price. In this way, XYT is not standing in the way of innovation; the user decides. So the co-partners are encouraged to freely explore new innovations to bring to the platform – agility being the critical component of success," Leteurtre concludes. □

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Handheld 3D point-cloud scanner for easy plant modification



MechChem Africa talks to Werner Theron of Chempute about the new DPI-8 handheld 3D point-cloud scanner from DotProduct, which is ideal for use in conjunction with Intergraph's CADWorx Fieldpipe and CADWorx Structure.



The DPI-8 3D is an Android tablet-based affordable professional system that offers live feedback with respect to scanning accuracy and data quality.

Also, though, existing piping or structures are never the same as the design drawings – long pipes always sag, for example. Using a system such as the DPI-8 makes replacements and tie-ins much more accurate in reality, much easier to install and with significantly less onsite rework.

"The scanners are ideal for architectural records, failure analysis investigations, forensic crime scene or accident records and any application where photography and measurements need to come together for use or analysis at a future date," Theron tells MechChem Africa. □

The new DPI-8 handheld 3D scanner is designed for capturing point-cloud data for use by plant design professionals involved in plant upgrades, refurbishments or modifications. Along with the associated Phi.3d 3D imaging app, the scanner captures 3D special data via an 8-inch Android-based tablet, enabling advanced laser scanning and photogrammetry to be simplified, augmented or even replaced with this mobile DotProduct solution.

"The point-cloud data collected onsite can be imported into a CAD system such as CADWorx Fieldpipe or CADWorx Structure for quick and maintenance-based redesign and replacement of pipework or structural members or for adding tie-ins and extensions to existing systems," says Theron.

He demonstrates how a piping point cloud can be easily imported into programmes such as CADWorks fieldPIPE, from which replacement piping can be specified in minutes using the embedded automatic modelling features. "Directly from the imported point cloud, fieldPIPE can determine the pipe size and centreline. Once connection notes and options are selected, a 3D-CAD model of a new pipe connection is automatically created and inserted. Should an additional splice, valve or secondary piping system be required, easily accessible tools enable these to be added simply and quickly," he adds.

Referring to the new release of CADWorx Structure, he says that, while the automatic tools for specifying structural detail from point-cloud information is still under development, measurement and tracing options also enable structural steel detailing to be simplified to better match operations plants needing upgrades.

"The DPI-8 3D scanning system is an affordable professional system. Many of the lower cost systems do not have live feedback. By incorporating an Android tablet, however,

with a gaming specification, these scanners give operators the assurance that, when they leave a site the data collected is accurate and usable," he says.

Scanning the room using the system, he shows how objects within the scanner's ideal operating range (0.6 to 3.3 m) reflect as green points on the tablet's display. "Points that are a little difficult to collect, scan as yellow points, while if the scanner loses continuity – due to range discontinuity or a scanning speed that is too fast – it will immediately stop collecting data. On a restart, it is then usually possible to append the new scan to the data already successfully collected, without the need for additional targets or controls," Theron explains.

From a business perspective, he says that using the system makes a lot of sense for several reasons. First, Intergraph CADWorx fieldPIPE and CADWorx Structure are both AutoCAD-based, so most users do not have to learn new software to access this capability.

Easy and quick 3D steel structure design tools

Intergraph® Process, Power & Marine (PP&M) recently announced the release of Intergraph CADWorx® Structure 2017, an AutoCAD®-based fit-for-purpose tool.

CADWorx Structure 2017 is used for creating concrete- and steel-structure designs and is ideal for engineers who model plant buildings, pipe racks, offshore topsides and industrial structures that are part of the process, power, and manufacturing plant world.

This solution has been developed with end users in mind at every decision point and includes the targeted tools needed to create revenue-driven plant structure models very easily and quickly. Just as CADWorx Plant Professional provides an easy-to-use solution for piping designers, CADWorx Structure is focused on excelling in structural modelling and design. While other structural software packages are

overrun with options and add-ons, which a structural designer may never use, CADWorx Structure has been purpose-built to deliver structural designs with virtually no technical and administrative overheads.

"We are very happy to include CADWorx Structure into the Plant Design Suite, and we are certain it fills industry's need for a purpose-built, structural design solution," says Intergraph CADWorx & Analysis Solutions president, Rick Allen. "CADWorx delivers effective and easy-to-use solutions to customer's problems and we will continue to expand into other 3D modelling markets in the coming years," he adds.

Intergraph CADWorx & Analysis Solutions' offerings allow design and engineering personnel to share relevant information seamlessly, thereby maintaining accuracy and improving efficiency. □

Three levels of CIP for efficient cleaning

Clean-in-place (CIP) is a core process that keeps food and beverage plants working efficiently within the standards of quality and food safety. This article introduces three segmented approaches from Endress+Hauser to improve the CIP process using suitable instrumentation.

CIP system requirements vary based on the size of the plant and the investment amount. In a basic system, a flow switch, temperature sensor and conductivity sensor supply the information necessary to execute the cleaning process. This is independent of the number of tanks used and ensures the desired temperature, flow rate and concentration are delivered throughout the system.

Limit switches in tanks or in front of the CIP supply pump ensure that the system is always filled. A simple recorder combines the reporting of quality relevant data with visualisation. The flowphant works based on the thermal principle and shows there is flow in the system. The TMR135 temperature sensors – one after the heat exchanger and one in the backflow pipe – feed the system with media of a certain temperature and ensure that this temperature is maintained throughout the system.

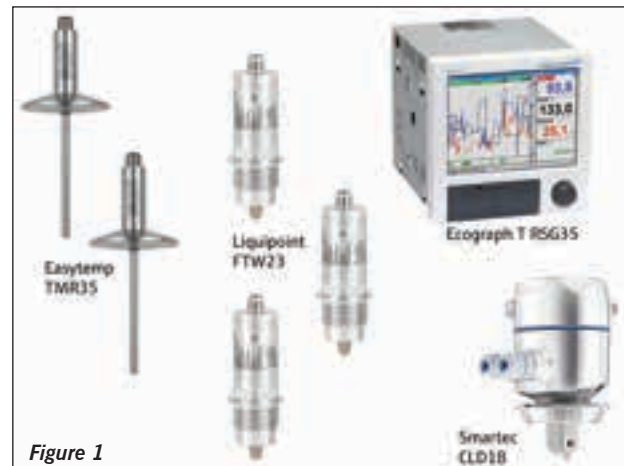


Figure 1

The CLD18 conductivity sensor displays the phase shift between media. The conductivity reading is used to calculate the concentration of cleaning agents. Liquipoint FTW23 capacitance limit switches help avoid pump damage by preventing dry-running. One switch in front of the supply pump, one in the caustic, and one in the acid tank help to avoid system damage. The RSG35 data recorder displays and records the main information, temperatures, velocity and concentration. With a relay output, it can even stop the supply pump, on receipt of a limit switch signal.

The starter package shown in Figure 1 allows the CIP process to run automatically. Some sensors will be added into the tanks, while others will be added into the pipe to speed up the entire process and improve concentration and temperature levels. The temperature sensors remain the same because they are already equipped with 'Sensor-on-Tip' technology, considered

Endress+Hauser and Rockwell Automation open European test centre

Endress+Hauser's new European Competence centre for level and pressure measurement and Inventory Management Solutions is now open. Core elements of the test plant at Endress+Hauser's site in Maulburg, Germany are three massive tanks, each containing between 2 000 and 26 000 l of oil. On the tanks, more than 20 instruments from Endress+Hauser with different measuring methods are installed, all of them communicating with Rockwell Automation's Plant PAx control system. In this way, all personnel at the test centre obtained specific information and diagnostics relating to the tank contents at a glance.

With an investment of several hundred thousand Euros, the first joint test centre for Europe in Maulburg takes the original concept a few steps further and establishes new

standards. Research and development take centre stage to align new products to customer requirements at an early phase under real application and environmental conditions. "All of our products must pass testing at the validation centre and prove that they

create sustainable added value for customers. They are exposed to extreme endurance tests," says Gerd Gritsch, division manager quality management with Endress+Hauser, Maulburg.

Increasing customer benefit was the trigger for a strategic alliance between Rockwell Automation and Endress+Hauser more than ten years ago. In Maulburg this includes, as well as research and development, training employees and customers at the validation centre and offering hands-on learning for students. □



Frank Kulaszewicz, senior vice president of architecture and software at Rockwell Automation, and Michael Ziesemer, vice president of Endress+Hauser's supervisory board, open the new test facility in Maulburg, Germany.



Figure 2



Figure 3

by E+H to be the fastest reacting sensors in the market.

The sensors come with a welded hygienic process connection. In the standard package (Figure 2) they are installed in three tanks – water, caustic and acid – after the heat exchanger and in the backflow. The temperature control within the process gains speed because the tanks can be heated up internally before the CIP process is started. It is the same for the concentration of caustic and acid. Including a CLS54D conductivity sensor in each of the tanks will determine the concentration, even when the CIP plant is not in operation, so the media are always properly prepared.

The conductivity sensor is equipped with an internal temperature sensor to compensate for the influence of changing temperatures. Connected to a central CM44x transmitter, the signals of both can be converted into a concentration value. The transmitter (also available for DIN rail installation) can host up to eight sensors. This allows the phase shift meter in the backflow to be either a compact CLD18 or a CLS54D.

Instead of a flow switch, the electromagnetic Promag 10H flow meter is used. This hygienic sensor supplies the information more accurately than the flowphant by using the flow rate signal. The Liquiphant limit switches are replaced by liquiphant vibration point level switches. They are installed in the three tanks and positioned in front of the supply pump and the return pump. Liquiphant level switches are easier to commission and work with all liquid media, even if not conductive and are the standard sensors in this application. The RSG35 still has the capacity to show and report all relevant data.

There are sensor options to choose from that improve the CIP control system. They supply information more accurately and faster, helping to save water, energy, cleaning agents and time. The higher investment costs often be recouped in a very short time thanks to reduced operational costs. Hygienic design adds some cost to a project, but the savings in every phase shift, during production or cleaning support short return on investment periods.

In the advanced system (Figure 3), velocity is measured with a Promag H 100. Based on the same hygienic sensor, this unit is equipped with a more sophisticated transmitter than the Promag 10H. After each cleaning, the Heartbeat™ Verification tool verifies the sensor is working within its specification. The Promag H 100 features empty pipe detection that

recognises when the return pipe is completely filled, even when installed horizontally. Flow can still be measured when the pipe is not full, however, an alarm signal is then given to suggest the system may not be cleaned completely.

Two Smartec CLD134 compact devices are installed in the two agent tanks when a local display is needed. Two CLS54D sensors connected to the CM44P transmitter can be used to measure conductivity and directly calculate concentration. The same contact device is used in the return line. It detects variation in the concentration of the returning cleaning liquid as fast as possible.

The TM401 QuickSens is used to measure temperature and control the make-up in the tanks. The TM411 QuickNeck is installed in the backflow, after the heat exchanger. These temperature measurements are important to maintain consistent quality, and frequent sensor calibration provides the required level of safety. The QuickNeck is installed with a specific fixed bayonet thermo-well so the entire loop can be calibrated without opening the process or cable connection. The spring-loaded Pt 100 element is still in close contact with the process and therefore has a fast T90 response time. The limit switches are replaced with a hygienic sensor that uses a combination of capacitance and conductivity technologies.

Supplying the same easy, flexible operation as the Liquiphant, the Liquiphant FTW33 can be installed flush-mounted. This is the next step in hygienic design. The Liquiphant's function can be easily tested with a service magnet, without opening the process. The central unit is changed to a RSG35 data recording and displaying system in order to properly display this complex system and record more values.

The differentiator in this high end system is the OUSAF11 absorption sensor. This sensor, connected to the same CM44P as the conductivity sensors, quickly detects when the majority of the product remains are flushed out of the system, enabling demand-driven (instead of time-controlled) flushing. This saves water and protects the caustic from being loaded more often than necessary. Nevertheless, the first caustic pumped through the system takes the majority of impurities with it. It makes sense to drain this caustic rather than to recycle it into the buffer tank, where it contaminates the other caustic. This results in a better use of caustics, which leads to lower costs. □

Figure 1: The CIP starter package for Endress+Hauser enables simple automation of CIP processes.

Figure 2: CIP standard package includes options that supply information more accurately and faster, helping to save water, energy, cleaning agents and time.

Figure 3: In the advanced automation package, velocity is measured with a Promag H 100, which is equipped with a more sophisticated transmitter.

ES05 valves for clever, economic and user-friendly automation

Tetra Automation, part of the Hytec Group of companies, has brought the Aventics ES05 Essential Valve System series to South African shores. The ES05 series now offers a clever, economic and user-friendly solution for applications with standard requirements in industrial automation.

The ES05 series was developed by Aventics in response to customers' requests for a simple, flexible and efficient standard valve with reduced components – tailored to their application. "The new series, therefore, focuses on ease of handling for distributors, machine manufacturers and system integrators," explains Malan Bosman, Pneumatic product manager, Tetra Automation. "They can configure their customised solution online from a set number of readily available components. Assembling a valve system has never been faster or easier."

The ES05 is a modular system and, as all components are unique and only one tool is required for the job, incorrect installation is virtually impossible. All fittings are of the same type and tightened with the same torque, which further simplifies assembly and prevents errors. The portfolio includes the Essential Test Box, which enables testing

for the correct function and valve leak-tightness before installing the valve systems – something particularly useful for volume users. Orders are supplied as complete assembly kits.

The valves come in a robust housing made of high-performance polymers and are especially stable and compact. Users connect the end and base plates, and can extend the system in pairs up to 12 single or double solenoid valves. The valves are controlled via single wiring with a type CI plug according to ISO 15217, a D-Sub connection with 25 pins with Aventics AES valve electronics from Tetra Automation, or an integrated IO-Link interface.

AES supports all common fieldbus and Ethernet protocols. If necessary, the pilot coils can also be turned at a later stage to realise



The new Aventics ES05 Essential Valve System series from Tetra Automation is suitable for general applications in industrial automation, logistics, and machine construction.

mixed connection configurations. With a switching time of less than 35 ms for all valve functions, highly dynamic action is guaranteed for short cycles. With single wiring, the ES05 complies with protection class IP65, so the valve system can also be installed in decentralised locations, even in environments exposed to splash water. All other connection types comply with protection class IP50. □

Packaging efficiency raised by Schmalz vacuum lifters

Tetra Automation has recently supplied three Schmalz vacuum lifters to mining supplier RSC Ekusasa Mining's packaging lines at its resin manufacturing facility in Wadeville, Johannesburg.

Used to palletise boxes of the company's RocLoc® resin capsules at the end of three production lines, these Schmalz lifters replace more manual, labour-intensive item



The end of a production line, where the JumboFlex vacuum tube lifter is used for palletising boxes of the RocLoc® resin capsules.

handling, allowing the facility to increase overall packing efficiency and safety.

Used in roof bolting applications in underground mining, RSC Ekusasa Mining manufactures a range of different capsules in various lengths and diameters as well as various formulae that offer different setting times, from 15 s to 5-10 min. The company currently produces up to 45 000 boxes of resin capsules per month, with between 45 and 60 boxes per pallet.

"We began building this facility in 2013, and, with a central focus on a lean, efficient production process, the Schmalz vacuum lifters were part of the design from the start," explains Alfredo Piroddi, general manager – resin, RSC Ekusasa Mining. "It brings the handling operation in line with international standards, and enhances the productivity and safety of workers loading the boxes onto pallets."

The three handlers – the Schmalz JumboFlex vacuum tube lifter range

– are an ergonomic handling solution with intuitive load lifting, lowering and releasing. "They are designed for handling lighter items up to 50 kg, and so were the ideal solution for these boxes, which weigh around 20 kg on average," explains Malan Bosman, products manager – pneumatics, Tetra Automation.

"The lifters don't just speed up the operation; they take the fatigue and physical strain away from the pallet loading process," Piroddi continues. "Issues around worker health and higher levels of absenteeism associated with manual lifting and loading are eliminated by the enhanced ergonomic operation of the vacuum handling process."

With health and safety of labour becoming more of an issue in South Africa, these considerations are becoming increasingly important. "The use of vacuum handling technology is definitely growing," Bosman explains. "With manual labour being both less efficient and less safe, more and more line managers are implementing it into their operations." □

New Leuze contrast sensor available

A new contrast sensor that combines product usability with high performance has been added to the Leuze sensing solution product line-up. Ideally suited to packaging processes, the innovative sensor will provide reliable detection in foil bag packaging machines as well as for label detection in filling systems. In addition, the need to precisely detect small parts and accurately position these has increased in demand of late as many products become ever smaller in size.

Available from Countapulse Controls, the new Leuze KRT 18B contrast sensor is a flexible multi-colour device that uses the three LED colours of red, green and blue to automatically determine the colour that produces the maximum contrast with the detected mark.

A significant feature is that reliable detection is possible even on glossy surfaces or when marks are faded. This is due to the automatic sensitivity readjustment. Equipped with a high switching frequency of up to 22 kHz, shortened response times are possible when using the Leuze KRT 18B. An alignment aid on the 13mm focal point means the sensor can be easily aligned and rapidly put into operation.

Different models of the sensor are available for simple switching point adjustment and each incorporates a self-adjusting bar graph for optimal display of the signal quality. One variant of the Leuze KRT 18B has two teach buttons for calibration on background and mark, while another has a potentiometer and a colour selection button.

These features make reliable functionality possible with just a single setting, even where there is a high contrast on the mark. Changes to the foil format on packaging machines, for example, can be quickly and easily adapted using the integral IO-Link interface of the sensor. The device is housed in an ECOLAB tested housing that is rated to IP 67 and IP 69.

Countapulse Controls, the official Leuze distributor for southern Africa, is able to assess any sensing application and provide a fit-for-purpose solution that will meet the specific needs of an operation. The company also offers a 24/7 hotline to assist end users with technical challenges that may be experienced due to lack of knowledge or experience.

Precise detection with laser sensors

Countapulse Controls also offers a range of laser sensors that are capable of reliably identifying small objects, accurately measuring dimensions and positioning these where required. Use of Leuze laser sensors that incorporate highly directional light beams facilitates optimum reliability for the end user.

Alignment is simplified using a small light

spot and these sensors are engineered to ensure an exact switching point. In addition, Leuze laser sensors can facilitate the detection of narrow openings, adding to the flexibility of these devices.

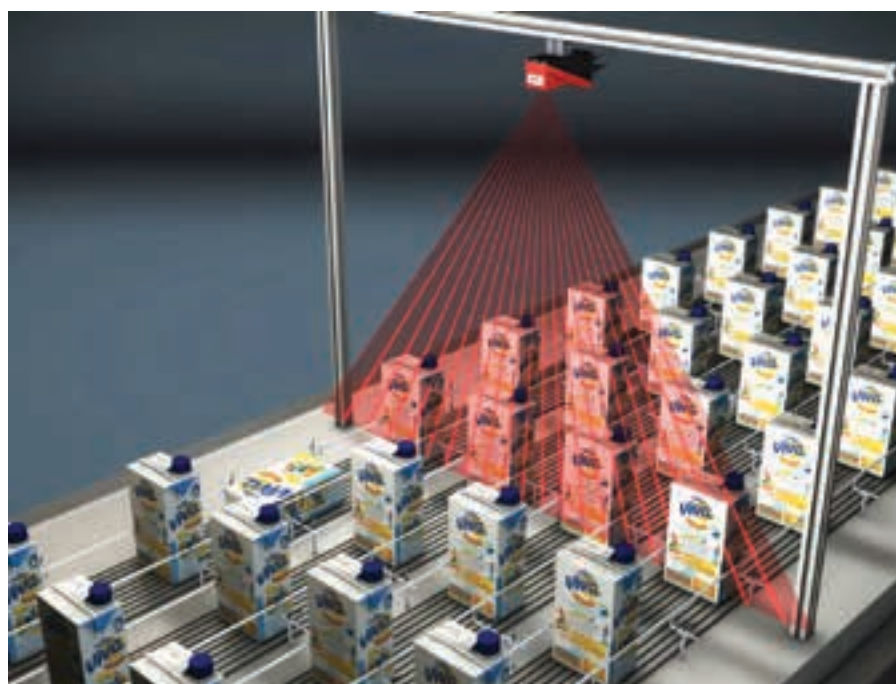
Leuze offers a wide range of Class 1 laser sensors and the advantage of these devices is that the laser radiation emitted does not pose a hazard to the human eye. These sensors can be used in exactly the same way as classic LED-based sensors, with no need to take additional measures to protect workers in the area from exposure to the laser as would have been necessary with conventional laser sensors.

Countapulse Controls is the official distributor of Leuze sensing solutions and offers a comprehensive range of laser sensors and devices that will meet even the most demanding operational requirements. The wide selection of switching as well as measuring opto-electronic sensors all comply with the operating principles of Class 1 lasers. □

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Expanded information solutions offerings

John Genovesi, Rockwell Automation's global vice president of Information Software and Process Business, talks about how the Connected Enterprise enables collecting information on intelligent assets in plants which, it estimates, will mean that more than 50-billion devices will be connected to the Internet by 2020.

Now more than ever, manufacturers can readily take advantage of growing intelligence through modern technology, such as cloud, mobile and converged, plantwide EtherNet/IP. To maximise value from this data, Rockwell Automation is expanding its information solutions capabilities to support manufacturers as they move through their own digital transformation and realise their version of the Connected Enterprise.

"Access to information is changing the face of industrial operations," says John Genovesi, vice president of Information Software and Process Business at Rockwell Automation. "We have made significant investments in technology and resources that make operations smarter, and make the data from control systems more useful.

"Now we are taking it a step further, expanding our integrated control and information offerings to help customers drastically reduce production variability and risk, while optimising production," he says.

"The journey to smart manufacturing has

heightened the reality that collaboration between OT and IT is not an option – it's a necessity," added Genovesi. "We've been working with Microsoft to focus our products and technology teams on a series of strategic initiatives to simplify and enable that collaboration."

"The Rockwell Automation vision for The Connected Enterprise is aligned with Microsoft's vision to integrate intelligence into all assets within a connected system," says Çağlayan Arkan, general manager, worldwide manufacturing and resources at Microsoft. "We're bringing together domain expertise in a series of co-innovation projects, focused on enabling the convergence of OT and IT to create new value for their organisations. True enterprise intelligence requires co-ordination and compatibility from the edge device up through enterprise operations, applications and business decisions."

The expansion of the applications and services offered by Rockwell Automation Information Solutions uses the scale and openness of Microsoft's intelligent cloud

platform, Microsoft Azure IoT Suite, Cortana Intelligence and mobility services. The expanded offerings give manufacturers access to analytics capabilities that best fit their operation – within a device, throughout a system and/or across the enterprise. At every level, the solutions contextualise data; enable collaboration between people, processes and technology; and drive value with new outcomes.

Regardless of where companies are in their journey to The Connected Enterprise, Rockwell Automation Information Solutions provides domain expertise to help manage production at each step, from planning and execution through optimisation.

Rockwell Automation's information solutions are built on more than a century of automation experience, over 1-million installations and more than 5 000 companies in the Rockwell Automation Partner Network programme and developer ecosystem. These solutions bridge the gap between manufacturing data and IT, putting the power of production systems to work. □

Modular control and switchgear packages

Adrian van Wyk from Rockwell Automation's sub-Saharan Africa subsidiary marks seven years of successful collaboration with panel and cabinet assembler, Low Voltage Switchboards.

For Low Voltage Switchgear, Rockwell Automation is maximising its capabilities to package its IEC-rated drive and control equipment in tailored, fully compliant panel technology solutions to industrial markets in sub-Saharan Africa. Some of the largest mining and industrial projects across the region are presently making use of this offering, which includes the assembly of Rockwell Automation switchgear and control gear in Low Voltage Switchboards' modular panel and cabinet configurations.

"Our collaboration with Low Voltage Switchboards broadens our project delivery capabilities with synergies from both sides," explains Van Wyk, business manager for Rockwell Automation's power and components business, southern and sub-Saharan Africa. "As Rockwell Automation, we supply a product and the technical ability to

deliver solutions required from a customer perspective. Low Voltage Switchboards then integrates this into a structure so that the solution meets both customer and local specifications. It's an integral part of increasing the competitiveness of Rockwell Automation in delivering full-scale projects that meet local end user and application-specific standards and quality requirements."

The association demonstrates Rockwell Automation sub-Saharan Africa's continuing strategy of aligning with independent suppliers to bring about attractive, competitive and innovative product solutions to industrial end users. In a company like Low Voltage Switchboards, with a track record of over 18 years, Rockwell Automation has an independent panel-building agent that leverages its knowledge of regional industrial applications to supply customised solutions to the specific requirements

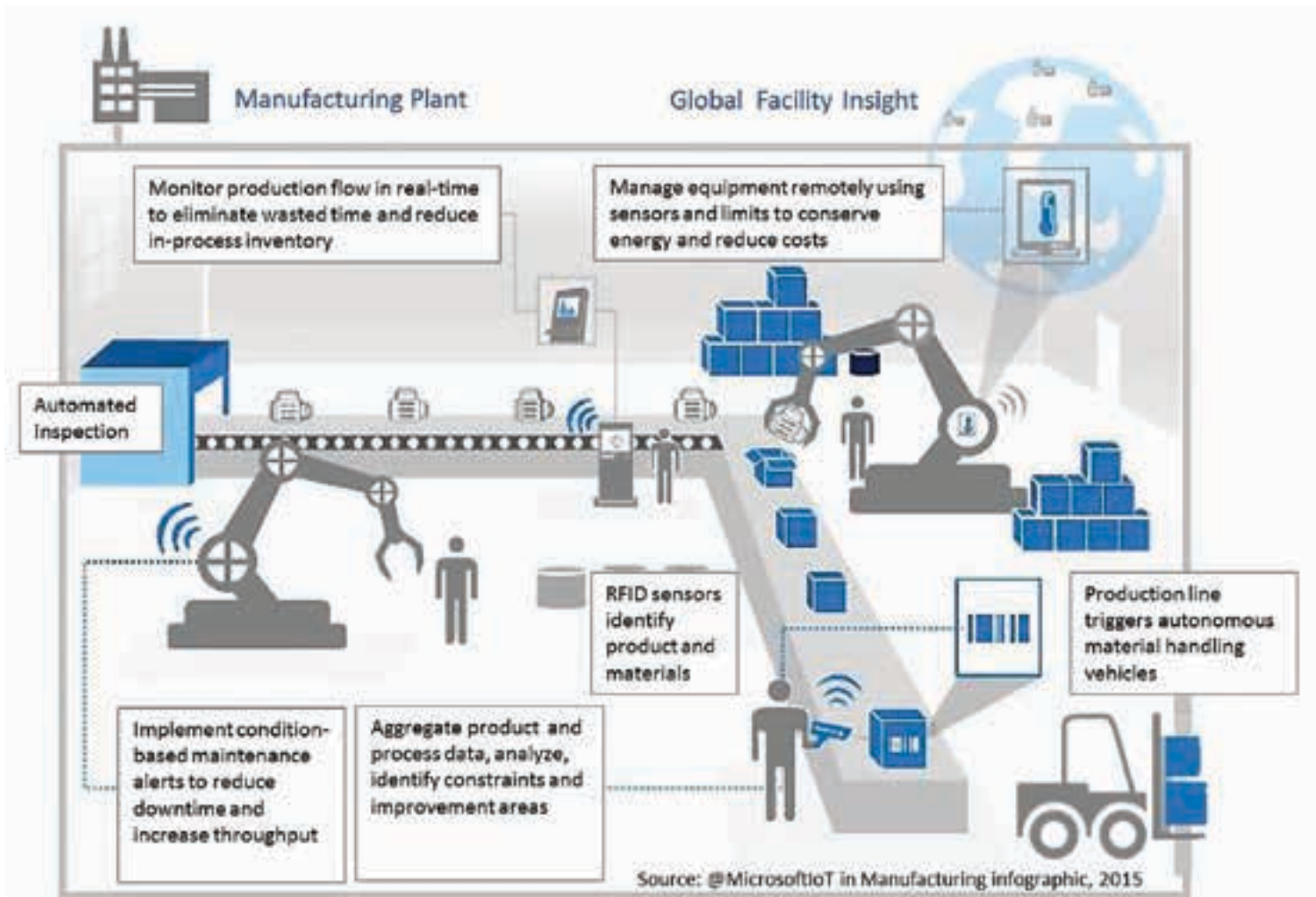
of each industry and workspace.

"Low Voltage Switchboards is an ABS-certified assembler of IEC 60439- and 61439-compliant electrical switchboards, aligning ourselves with the CUBIC modular panel system brand," explains Stephan Smit, operations director, Low Voltage Switchboards. "These systems provide solutions for main distribution boards, marine panels, MCCs, fully withdrawable systems, PLC panels, 19-inch modular racks and desks – in a range of steels."

Since its formation in 2009, the collabo-



Low Voltage Switchboards is an independent panel assembler running production lines for the complete range of industrial control and automation equipment.



The expansion of the applications and services offered by Rockwell Automation Information Solutions uses the scale and openness of Microsoft's intelligent cloud platform, Microsoft Azure IoT Suite, Cortana Intelligence and mobility services.

ration has supplied electrical control and instrumentation (EC&I) systems to some of the largest mining projects in the world, including the world's two-largest gold mines, located in Central Africa. "These are systems providing critical control functions in tremendously hostile environments, with high ambient temperatures and high humidity in extremely remote locations," van Wyk explains. "We've supplied equipment to a large portfolio of mining projects in sub-Saharan Africa that cover a range of minerals, from a large ilmenite plant in Madagascar to uranium mines in Namibia. Outside of mining, we've supplied critical solutions in oil and gas; food and beverage; and water and wastewater treatment plants."

In what is becoming an increasingly important component of successful business expansion in today's industries, Rockwell Automation sub-Saharan Africa's collaboration with Low Voltage Switchboards demonstrates the value of strategic synergies in packaging complete, customised solutions that offer attractive and competitive project bids to market. □

\$12-million STEM investment for next generation

Over the past ten years, Rockwell Automation has provided more than \$15-million of broad-based support to address the critical need to fill science, technology, education and mathematics (STEM) education jobs essential for driving innovation. Many of these jobs go unfilled because of the lack of awareness of the kinds of high-tech jobs available, and the lack of skills to meet today's needs.

"Through our technology and people, we are helping to inspire the next generation of innovators to fill the talent pipeline for our customers and for our company," says Blake Moret, president and CEO of Rockwell Automation. "Our strategic partnership with FIRST helps us increase our reach and visibility to STEM students around the world."

In addition to being a global sponsor of the FIRST® LEGO® League programme and sole sponsor of the FIRST Robotics Competition (FRC) and the Rockwell Automation Innovation in Control Award, nearly 200 Rockwell Automation employees around the world donate their time for the FIRST programmes and more than 300 employees volunteer for the organisation in other capacities. The company also donates products

integral to FIRST programme games and scoring. These product donations are specifically used for the FIRST Robotics Competition playing fields and scoring systems and they are included within the parts kits teams use to build their robots.

"This generous, multi-year commitment from Rockwell Automation will allow us to focus on the strategic aspects of our partnership while continuing to help scale our programmes and expose students to a broader range of industry-leading products and applications," says Donald E Bossi, president of FIRST. "The company has a long, rich history of supporting FIRST."

Accomplished inventor Dean Kamen founded FIRST in 1989 to inspire an appreciation of science and technology in young people. Based in Manchester, New Hampshire, FIRST designs accessible, innovative programmes to build self-confidence, knowledge, and life skills while motivating young people to pursue opportunities in science, technology and engineering.

Rockwell Automation is recognised as a FIRST Strategic Partner and a FIRST Robotics Competition Crown Supplier. □

Stainless steel and lifecycle costing

The Southern African Stainless Steel Development Association (sassda) has developed a new lifecycle costing (LCC) programme to enable the costs of using stainless steel in projects to be compared to alternatives based on realistic estimates of the total costs of products or structures across their full service lives.

Stainless steels have traditionally been specified in applications where the primary requirement is for corrosion resistance. However, since their invention over 100 years ago, stainless steels have also been recognised for other attributes such as durability, versatility, quality, sustainability, hygiene and aesthetic appeal.

It is this combination of properties that has seen stainless steels become the material of choice in a wide variety of uses: from the utensils and kitchenware used to prepare food; in a range of applications in the transport industry; as process equipment in the food and beverage industry; for the manufacture of pharmaceutical products; in the medical field; and through to very demanding applications in the chemical processing and power generation industries.

Stainless steels contain at least 11% chromium and this forms a chromium-rich passive layer on the surface of the steel. It is this passive layer that confers corrosion resistance on stainless steel. However, the key to stainless steel is that the passive layer is self-healing. Unlike coated carbon steel, which will rust or corrode if the coating is scratched or damaged, stainless steel has the ability to regenerate and heal the passive layer spontaneously. It is this corrosion resistance and the passive layer properties that make stainless steels such an ideal choice in so many applications. Higher alloyed stainless steel can resist very aggressive chloride, acidic or alkaline solutions, while the lower alloyed stainless steels can resist atmospheric corrosion. The heat resisting grades of stainless steels can resist oxidation up to temperatures as high as 1 200 °C. Thus knowledge of the application and the corrosive environment allows the selection of the most appropriate and cost-effective grade.

There are three main groups of stainless steels that are classified according to their microstructure as austenitic (comprising about 72% of all stainless steels), ferritic (about 25%), duplex (about 2%) and the balance being other (e.g. martensitic) or unclassified grades.

Apart from their corrosion resistant properties, there are many other reasons to specify

stainless steel. For example, the strength of stainless steel allows thinner sections to be used than with other materials. Some grades of stainless steels, such as the duplex stainless steels, have strength levels double that of standard austenitic or ferritic grades.

If ductility and formability are critical, such as in deep-drawing applications (e.g. pots and pans and sinks), then austenitic stainless steels have outstanding properties. Austenitic stainless steels also remain tough at very low temperatures, even down to that of liquid nitrogen. On the other hand, the martensitic stainless steels are extremely hard and thus are ideal for knives as they can retain a sharp edge.

Stainless steels are often selected for their visual appeal. They are available in industrial finishes, where aesthetics are not important, but they are also used in mirror finishes, highly polished finishes, brush and scratch finishes, depending on the visual effect sought.

Stainless steels are recognised as the most hygienic surface in the food and beverage industry. The stainless steel will not contaminate the product and the smooth surface ensures that bacteria can be easily removed. This excellent cleanability has seen stainless steel become the preferred choice in a wide range of industries from pharmaceuticals and hospitals to kitchens and breweries.

Stainless steels are 100% recyclable without any loss in quality no matter how many times the process is repeated. When products reach the end of their useful lives, over 80% of the stainless steel is collected and recycled.

Stainless steels are durable and have low maintenance costs due to their corrosion resistance. There is no coating or painting requirement and normal maintenance would simply be occasional cleaning.

The LCC advantage

Stainless steel may not always be the cheapest candidate material for an application when considering upfront costs. However, its durability and ease of maintenance compensate for the sometimes higher initial purchasing costs and it is often the least expensive choice in a lifecycle cost comparison.



With stainless steel walkways, there is a higher initial cost, but due to the excellent corrosion resistance, no corrosion protection is required and the maintenance costs are minimal.

This ability to provide long-term performance with a minimum of downtime and cost associated with maintenance is determined by calculating the material's lifecycle costing, which is of particular importance to the stainless steel industry.

LCC is a technique developed for identifying and quantifying all costs, initial and ongoing, associated with a project or installation over a given period.

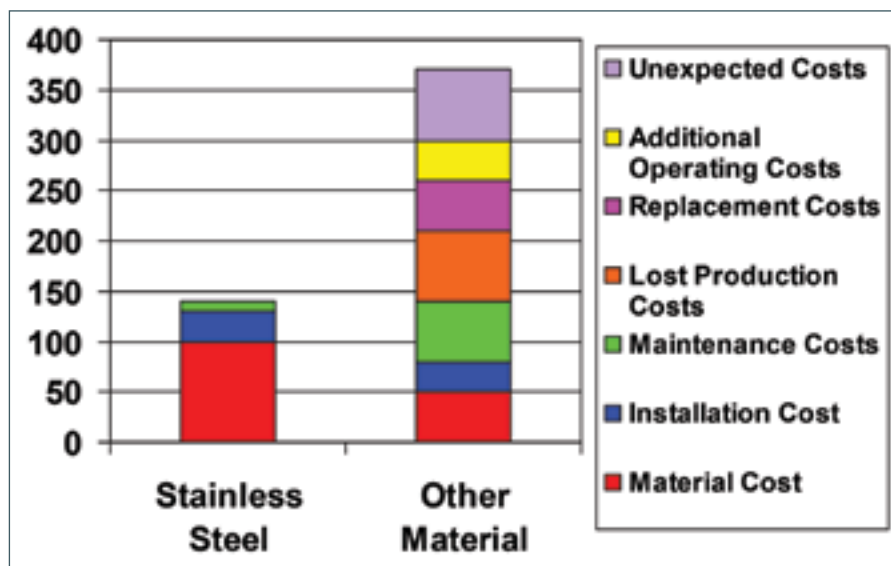
LCC uses the standard accountancy principle of discounted cash flow, so that total costs incurred during a lifecycle period are reduced to present day values. This allows a realistic comparison to be made of the options available. As far as material selection is concerned, LCC enables potential long-term benefits to be assessed against short-term expediency.

Materials costs are assessed with their related implications, such as: initial outlay; maintenance and its frequency; downtime effects and production losses; repair and replacement costs; and other operationally related costs such as manpower and energy consumption.

The LCC model is more than a philosophy of forward thinking. It has been refined to a detailed system of specific calculations; comprehensive LCC software is available, free of charge, from sassda to aid decision makers to compare accurate forecasts that have taken all the pertinent factors into consideration.

In general terms the total LCC can be broken down into components:

LCC = Acquisition Cost + Fabrication and Installation Cost + Maintenance Costs



A comparison of the lifecycle costing for a steel walkway made in stainless steel as compared to a typical galvanised equivalent.

(periodic) + Replacement Costs (periodic) + Cost of Lost Production (periodic) - Residual (Scrap) Value.

Each of these terms must be known if a realistic result is to be calculated. The environment and scope of usage, mentioned earlier are, therefore, crucial in determining the LCC benefits when choosing stainless steel.

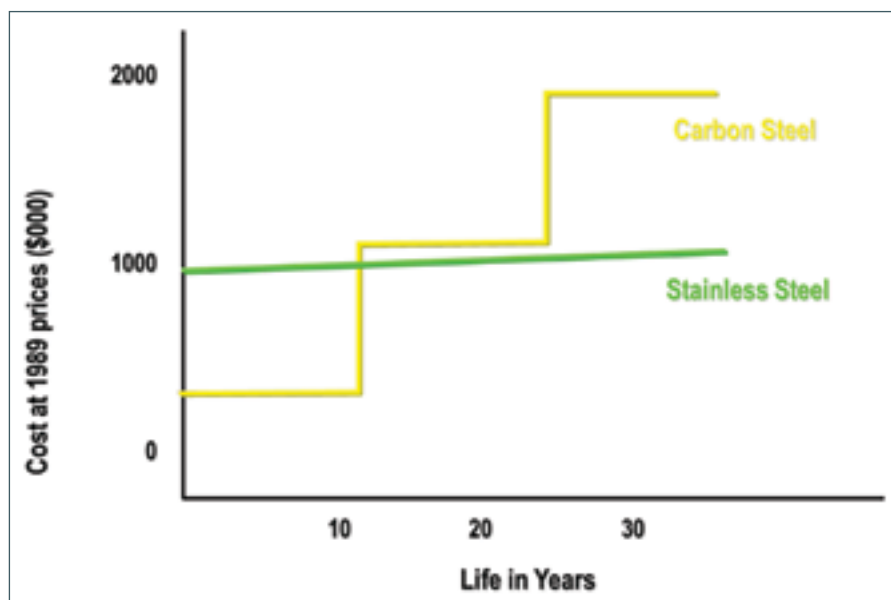
A full lifecycle cost analysis thus enables the materials specifier to consider the full implications of future costs, in terms of both actual monetary value and inconvenience of future maintenance and replacements. Experience has shown that future maintenance and associated downtime costs can far outweigh the initial material costs.

The consequences of using the cheapest materials should therefore be quantified before the final material selection, as it inescapably commits the company/client to a total financial package. Generally speaking, the longer the demanded lifetime, the higher will be the operating costs.

Stainless versus galvanised for walkways

For example, a lifecycle costing was conducted on a stainless steel walkway compared to a galvanised carbon steel equivalent. Galvanised carbon steel walkways have a low initial cost but they are susceptible to corrosion. This leads to reduced structural integrity. Periodic examination is essential and these walkways would typically be replaced every ten years. This would require cutting out the worn walkways, shipping out new components and assembling them on-site.

With stainless steel walkways, there is a higher initial cost, but due to the excellent corrosion resistance, no corrosion protection is required and the maintenance costs are minimal. The stainless steel walkway would



Galvanised carbon steel walkways require periodic examination and would typically be replaced every ten years. Over longer periods of time, therefore, the lifecycle costing of stainless steel can be significantly lower.

last the lifetime of the process plant and significant financial benefits would be gained over the full service life. The LCC programme for this example shows that there is a financial benefit in using stainless steel following the first replacement of galvanised carbon steel components, that is, if the walkway's required life is more than ten years.

In addition, the residual scrap value of stainless steel is much higher than for carbon steel, allowing an additional cash-back option at the end of the process plant's life.

Stainless steel is an extremely versatile product with an excellent combination of mechanical and corrosion properties. It is durable, environmentally friendly, recyclable, hygienic and visually appealing. All of these attributes mean that stainless steel is widely used in the home, in industry, in hospitals, in town and in our everyday lives.

The LCC programme for stainless steel is available free from sassda's website (www.sassda.co.za) as a downloadable App from the Google PlayStore or Apple's iStore. □

“Stainless steels are 100% recyclable without any loss in quality no matter how many times the process is repeated. When products reach the end of their useful lives, over 80% of the stainless steel is collected and recycled.”



Materials engineering in practice: Hygiene and the process plant challenge

In the first 'Materials engineering in practice' column for 2017, Tony Paterson from the School of Chemical and Metallurgical Engineering at Wits, talks about the work being done to ensure that the pharmaceuticals and food-grade products coming out of our process plants are safe to ingest.

With increasing urbanisation, the 20th century introduced process plants to mass-produce pharmaceuticals, food and beverages, focusing on optimising cost, time to market and reliability.

The 21st century process plant is faced with more complex needs. The triple bottom line requires a solution involving people, prosperity and the planet, with its finite resources, particularly water.

Process plants concerned with products for consumption are required to meet increasingly robust legislation demanding reduced (or zero) bacterial/spore counts in the final product.

The challenge is how to manage the fabrication of new plants and maintain the old plants to accommodate these changing operating conditions.

Hygiene is often seen as both as a reputation and market risk, and as a costly alternative to current practices. Realistically, hygienic welded fabrication will be more challenging and more costly.

Whilst this puts capital budgets under pressure, it should ease operational costs, enhance productivity and reduce clean-in-place (CIP) and water needs. The strategic choice is business value and risk-driven.

Process plant construction

Process plants include a variety of, typically stainless steel, components including factory-made tanks, heat exchangers, columns and pumps. These are interconnected by pipes. During construction, fabricated components are transported to site for assembly. These are linked on site using thin-walled (wt < 3%D), small diameter piping. Connection is usually by welding.

Most connecting pipes are measured on site, ends prepared, aligned and welded. Internal weld imperfections in small-bore pipework are generally inaccessible. Site welding requires skill, is more difficult to control, and more difficult to manage for a variety of reasons.

Biofilm formation and control

Complete sterility of plant, input materials and water, whilst not a realistic expectation, is the ideal. In the absence of complete sterility, other methods need to be considered for plant construction or refurbishment practices to eliminate or mitigate against bacterial load.

Private sources of water have declined. Municipality supplied water is of inconsistent quality over time and product input materials are often shipped from sources far away from the process plants.

Biofilms form on exposed surfaces of process plant as thin layers of microorganisms adhering to surfaces. These may be organic or inorganic, together with the polymers that they secrete and biofilms can include harmful bacteria.

Biofilm depth increases with increased surface roughness, increased temperature and lower flow speeds and is, therefore, promoted by occluded and dead areas. One source of surface roughness and local occlusions are welded joints.

Resulting from biofilm formation, bacteria can grow and be released into the product.

Welded joints support biofilm growth where there is:

- Inadequate penetration – the inner weld profile leaves crevices (dead areas).
- Over penetration or cauliflowering – the inner weld profile is proud (dead areas).
- Porosity.

- Cracks.
- Misalignment during manufacturing or fabrication – occluded areas.
- Surface roughness due to welding process effects across the width of the heat affected zone (Laser < CMT < TIG/MIG).

Currently CIP methods are used to reduce the impact of biofilms, but CIP is not completely effective as:

- The loss of heat and chemical concentration over distance reduces effectiveness.
- The process does not clean hidden and occluded areas.
- CIP requires the extensive use of water.

Manufactured pipes

Manufactured pipes are oval and bow to a greater or lesser extent. Whilst accepted tolerances exist, the impact on welded joints is significant particularly with thin walled pipes.

Pre-programmed orbital TIG welding is the preferred method of joining pipes. It assumes well-matched faying surfaces because:

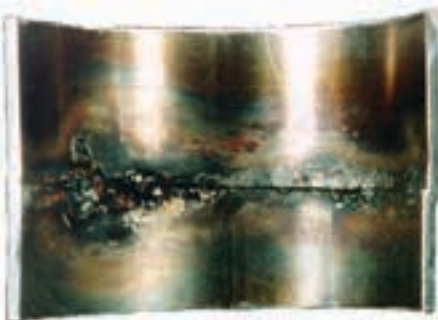
- The pre-programmed controlling current and travel speed has to allow for the impacts on the molten weld metal of internal inert gas pressure, gravity and the overlapping wall thickness.
- If the faying surface overlap varies, the current will be either too high or too low leading to incomplete fusion or to over-melting leading to poor weld geometry.

Research

Initial research used *E-coli* build-up to characterise the effects of weld processes and joint geometry. More recent research based on real plant pipe analysis and a pair of mathematical algorithms using an 80% minimum criterion as suited to orbital welding showed poor results if randomly aligned, but better if aligned through the major axis. This indicated the likelihood of bacterial build-up at joints.

Whilst the results were far better with tighter tolerances, moving to a higher strength material with a thinner wall thickness showed the desirability of extremely low tolerances. This places huge challenges on manufacturing costs.

Current research is concentrating on site-based methods of achieving closely matched faying end surfaces using plastic forming approaches. The intent is to check effectiveness using *E-coli* build up as the rating criteria. □



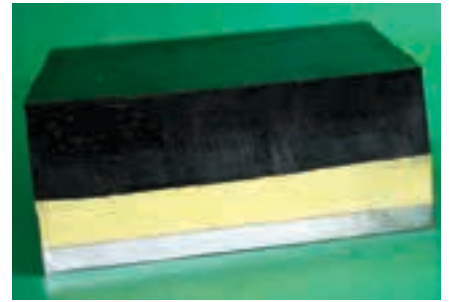
Pictures courtesy of JD Cluett: www.arcmachines.com

Left: The ideal orbital weld for minimising Biofilm formation. **Right:** A manual weld taken from an operating pharmaceutical plant. This weld is unacceptable by any sanitary standard.



Yellow belly liners for inspecting rubber wear plates

Inspection of rubber wear plates just became easier with the recent introduction of Multotec's Yellow Belly wear indicator, this according to Matthew Fitzsimons, technical manager at Multotec Rubber.



The Multotec Yellow Belly Liner is supplied with an integral yellow rubber compound which, in addition to having identical wear and abrasion resistant properties, acts as a visual aid for condition monitoring purposes.

The Multotec Yellow Belly Liner is the same quality rubber liner or plate that the market has come to accept, but now it is supplied with an integral yellow rubber compound which acts as a visual aid specifically for condition monitoring purposes.

Matthew Fitzsimons, technical manager at Multotec Rubber, says that the launch of this innovative rubber wear plate follows on Multotec's philosophy of providing wear indicators on consumable products.

"Developed as the optimum solution for simple and safe inspection of rubber wear plates in all types of applications, the Multotec Yellow Belly Liner will allow personnel to make a visual inspection and it eliminates the need for people to enter confined spaces such as transfer points. It also eliminates the need for time-consuming lock-out procedures," Fitzsimons says.

The traditional well-accepted Multotec

black rubber wear plates now have a bright yellow layer above the steel backing plate. When this is exposed it will clearly indicate that the level of wear has been reached when replacement is necessary.

An in-depth understanding of the operational requirements in a plant resulted in the development of this wear indicator, and at the stage where the yellow becomes visible, equipment operators or mine maintenance personnel have a period of time in which to schedule the liner changeout.

Fitzsimons explains that this will assist maintenance personnel to plan the inclusion of such changeouts in already scheduled maintenance activities, or plan an appropriate shutdown for the replacement. "When recognised and acted upon, this wear indicator will avoid damage being done to equipment," he says.

The inclusion of the yellow compound rubber liners does not in any way affect the supe-

rior performance of the Multotec rubber wear plates and these can be applied in a multitude of applications where impact and abrasion cause wear. Typically, these include chute or transfer points, bins, vibrating screens at the feed point, dead boxes, protection liners in mill applications and trommel liners.

Fitzsimons is quick to add that Multotec Rubber wear liners and wear plates are not off-the-shelf products. These liners are engineered-to-order products and the result of significant input on the part of Multotec engineers. □

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Cummins positions for African growth

On December 1, 2016, Thierry Pimi was formally introduced to the press as the new MD for Cummins' Southern Africa's regional distribution business. *MechChem Africa* attends and reports.



Thierry Pimi and his wife, Yannick.

“I was born and raised in Cameroon, just around the corner,” Pimi begins. “Cameroon is in the heart of Africa, in the corner between Central and West Africa and a vertical axis through eastern Cameroon divides Africa into two equal halves.

“I am proud to be back in Africa. There

Thierry Pimi

Born and raised in Cameroon, Thierry Pimi completed a mechanical engineering degree in 1999 at Yaoundé University in Cameroon before starting his career in Africa as a field engineer in the oil and gas industry. Following a stint in operations management and factory re-engineering for British American Tobacco, in 2004 he took up an opportunity in Canada for AEC.

He joined Cummins in June 2008 as a corporate strategy manager, became the company's mining manager for the African engine business in 2010 and was promoted to general manager of aftermarket distribution for North and West Africa in 2013.

In September of 2016, he was appointed to his current post, MD of regional distribution for Southern Africa.

As well as his BSc Mech Eng degree, Pimi holds an MBA in finance and strategy from Indiana University and a Certificate of Mining Studies from the University of British Columbia. He is also a graduate of the Cummins Global Leadership Programme in Johannesburg.

is nowhere in the world I would rather be. While the continent presents big challenges, it also offers huge opportunities and, as an African, I look forward to contributing to developing our beloved continent,” he says.

Addressing Cummins business outlook, he says that Cummins was founded in a small town called Columbus in Southern Indiana, USA. “Today, we are the largest diesel and natural gas engine manufacturer in the world. We are a global company with manufacturing facilities in 135 countries, more than 7 300 points of customer support and a market cap of around US\$20-billion.

“Back when I was a student, Cummins was already thinking about investing in my home country. The company plays in the heart of what is needed in Africa today: infrastructure development, power generation and minerals extraction. We are a central player in all these arenas,” he believes.

Split into four separate business units: the engine business; power systems; components; and distribution, Pimi says: “Engines is the mother of our company, but it is the distribution business that is striving to make Cummins products ubiquitous all over the world. My role here is to lead the Southern African distribution business, which includes mostly the SADC countries, Tanzania and the countries south of the DRC.”

In Southern Africa, Pimi sees strong opportunities in the construction of infrastructure; mining and materials handling; power generation; marine and other industries. “Where things are not going well, we see opportunities to solve problems and do better, and where they are going well, we look for ongoing improvements, better efficiencies and more sustainable business opportunities,” he tells *MechChem Africa*.

Turning attention to the important

social responsibility role of companies operating in Africa, he says: “Cummins believes in giving back to the community. Corporate responsibility is big thing for us.

“On a personal level, I am part of the Africa Social Responsibility Council and in that role I am proud to announce that, from January 2017, we will start to roll out our programme for technical education for communities, the third roll out for Africa following Morocco and Nigeria. Cummins, in partnership with local education providers, will invest in a curriculum and resources to augment community members' employment potential,” he reveals.

Areas of interest include practical artisan skills such as electrical wiring and engine repair, as well as basic business skills and professional behaviour. “Our role is not to train these people for our own needs but simply to augment their general employment potential,” Pimi notes.

In closing, Pimi expresses gratitude to Cummins' customers. “Our commitment is that the support we will make available to customers in Africa will be no different to that on offer in Australia or the USA or on any other continent in the world.

“We intend to deliver the service we believe all of our customers deserve and we will be investing heavily to support that goal,” he says.

When asked about his immediate priorities, he responds, “to create credibility and to develop talent”.

He cites three aspects to local talent development: “Hiring good people, developing them and empowering them to deliver”.

From a customer credibility perspective, Pimi believes it all about delivery. “We strive to solve customers problems – and the challenges are sometimes bigger in Africa. But the team is strong and we intend to reinforce that team to exceed customer expectations.

“We are striving to motivate our people to take ownership, so that they deliver high standards while enjoying working for Cummins,” concludes the new regional distribution MD for Cummins Southern Africa. □

“Where things are not going well, we see opportunities to solve problems and do better, and where they are going well, we look for ongoing improvements, better efficiencies and more sustainable business opportunities,” he tells *MechChem Africa*.

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Protecting high-value electronic equipment from fire



The I-CAT cylinder kit includes a supply unit in the form of a fire-suppression cylinder (1 kg, 2 kg and 5 kg capacities).

Electrical malfunction and auto-ignition of combustible materials due to exposure to heat are two of the most common causes of fires. These threats have resulted in the development of the innovative I-PROTECT low-pressure automatic fire detection and suppression system by the Fire Division of I-CAT, a leading environmental solutions company.

I-CAT business development and marketing director, Lourens Jansen van Rensburg explains that the electrical equipment most often involved in auto-ignition includes electrical wiring, panel and switchboards,

transformers, generators, lighting, cords and plugs. The most significant aspect of combating electrical fires in confined spaces is early detection, not only to miti-

gate the risk of injuries and fatalities, but also to minimise equipment damage and system downtime.

“However, the restricted and congested nature of most small rooms or enclosures with electrical equipment or other ignition sources means that early detection is difficult and unlikely,” says Jansen van Rensburg, who adds, “I-CAT has found a solution to this perennial problem with the development of its I-PROTECT direct, quick-response system.”

Typical applications include HT, MV and LT switchgear, MCC electrical panels, wind turbines, data centres and server rooms, and telecommunications environments. “The system is ideal for any enclosure containing high-value electronic equipment,” says Jansen van Rensburg.

He explains: “The system consists of I-PROTECT fire-detection tubing that is pressurised with a fire-extinguishing agent from a fire-suppression cylinder. The heat-sensitive tubing activates when exposed to specific elevated temperatures, and then suppresses the source of the fire virtually

instantaneously. The system activation results in minimal to no property damage, due to the non-conductive and extinguishing properties of the CLEAVOS 1230 suppression agent used.

“The I-PROTECT tubing acts as a trigger mechanism and directed discharge method for the suppression agent at the source of the fire. The tubing is purely pneumatic in its functionality, and does not rely on a power source. This translates into high system reliability, and a reduction in the number of false alarms.

“The I-PROTECT system consists of a cylinder, tube and accessories kit. The cylinder kit includes a supply unit in the form of a fire-suppression cylinder (1 kg, 2 kg and 5 kg capacities). The cylinder is filled with the CLEAVOS 1230 suppression agent, which is non-flammable, non-conductive, non-hazardous, and environment-friendly, and pressurised with nitrogen up to 15 bar. The tube kit consists of linear fire-detection tubing (in 5 m, 10 m and 30 m lengths) and associated pneumatic fittings.” www.i-cat.co.za

Steel donation assisting rhino relocations

Robor recently donated 12 tons of steel and assisted in the re-drawing of steel boma designs to ensure the coordinators of the ‘Rhinos Without Borders’ project could continue with its valiant efforts to

preserve this endangered species. So far, the project coordinators have facilitated in the relocation of 31 rhinos, with further plans to move 100 rhinos.

The steel will be used for the construc-

tion of mobile steel section bomas that can be moved from one release site to another across reserves. The ability to do this greatly reduces the trauma associated with releasing many rhinos from the same boma and, therefore, significantly improving the success of the rhino project.

Robor is honoured to have been able to assist in this worthy project and hopes that its role in this journey will go a long way toward the preservation of the rhino species.

Robor is a manufacturer and supplier of steel products and associated services across the automotive, mining, water, construction, transport, renewable energy and telecommunications sectors.

www.robtor.co.za

Fit-for-purpose 3D steel structure design tools

Intergraph® Process, Power & Marine (PP&M), part of Hexagon and a world-leading provider of enterprise engineering software to the process, power and marine industries, has announced the release of Intergraph CADWorx® Structure 2017, an AutoCAD-based fit-for-purpose tool for creating concrete and steel structure designs for engineers who model plant buildings, pipe racks, offshore topsides and industrial structures that are part of the process, power, and manufacturing plant world.

Intergraph CADWorx & Analysis Solutions’ president, Rick Allen says this solution has been developed with end-users in mind. “It includes the targeted tools needed to create revenue-driven plant structure models quickly and easily. Just as CADWorx Plant Professional provides an easy-to-use solution for piping designers, CADWorx Structure is focused on structural modelling and design. CADWorx Structure has been purpose built to deliver structural designs with virtually no

technical and administrative overhead.”

Allen explains that Intergraph CADWorx & Analysis Solutions’ offering allows design and engineering to share relevant information seamlessly, thereby maintaining accuracy and improving efficiency. These include CADWorx Plant Design Suite, for AutoCAD-based intelligent plant design modelling, process schematics and automatic production of plant design deliverables; CADWorx DraftPro®, a free solution for intelligent 2D design and layout; CAESAR II®, one of the world’s most widely software used for pipe stress analysis; PV Elite®, for vessel and exchanger design and analysis; TANK™, for the design and analysis of oil storage tanks; GT STRUDL®, one of the most trusted, adaptable and fully-integrated structural analysis solutions; and Visual Vessel Design, a comprehensive pressure vessel, shell and tube exchanger, and boiler design and analysis solution.

ppm.intergraph.com



The first steel section for the Robor mobile boma.



Compact substation supplied to Cape Peninsula University of Technology

ABB, a leading power and automation technology group worldwide, is supplying a R1,2 million UniPack compact substation to the Cape Peninsula University of Technology's (CPUT's) chemical engineering building. The compact substation will help to improve monitoring of its electrical network and will offer a real-time training platform for critical electrical engineering skills.

Manie Jooste, product group manager, secondary switchgear and modular systems, electrification products, explains that the new UniPack compact substation, the first supplied by ABB in South Africa, is "a special type of mini substation that facilitates viewing and analysis of electrical signals fed to a control room computer screen known as a Remote Terminal Unit (RTU)".

Installation of the new substation is part of the current CPUT project for refurbishment of the Bellville campus' electrical reticulation network with new switchgear and new protective relays compatible with IEC61850 standard technology. This project was initiated to implement the research outcomes achieved by the postgraduate students at the Centre for Substation Automation and Energy Management Systems.

An important consideration for the customer in the implementation of ABB's UniPack compact substation was compliance with IEC 61850 and compatibility for intelligent electronic devices (IEDs).

ABB's substation automation products and systems are fully compliant with the IEC 61850 standard. This open protocol covers all communication issues inside the substation; assures interoperability between the functions existing inside the substation; supports all types of architectures used; reduces operating costs; and safeguards investments. ABB has deliv-



ABB's UniPack Compact Substation is a special type of mini substation that facilitates viewing and analysis of electrical signals fed to a control room computer screen known as a Remote Terminal Unit (RTU).

ered numerous IEC 61850-based substation automation systems worldwide.

ABB's products interoperate with other IEC 61850-compliant intelligent electronic devices (IEDs), tools and systems. They are able to handle comprehensive communication tasks, for example GOOSE (Generic Object Oriented Substation Event) messaging for horizontal communication. ABB's 670 series protection and control IEDs provide versatile functionality, as well as maximum flexibility and performance to meet the highest requirements of any application in generation, transmission and sub-transmission protection systems.

"The compact substation together with its automation system will assist the university to monitor its electrical network status, equipment such as closed circuit breakers, open circuit breakers as well as protection trip history and electrical fault location," says Jooste.

www.abb.com



Internship programmes – paving future career paths for unemployed learners

Atlas Copco South Africa's internship programme is "an excellent initiative that provides unemployed learners with a unique opportunity to gain invaluable, hands-on experience in the workplace," says Kathryn Coetzer, the company's academy manager.

First adopted in 2015, the six-week internship programme exposes the learners to a functioning business environment by presenting them with a platform to shadow various job functions and roles within the organisation. Coetzer adds that they interact with employees from all levels within the company as well as with customers and suppliers.

"We invite learners aged between 18 and 35 who have successfully completed the academic component of a business-related diploma – such as marketing, human resource and business management, through a TVET college – to our internship programme." Coetzer explains that the learners are required to submit a motivational letter along with their application, which, she stresses, is "one of the most important criteria for selection".

"We look for a group of dynamic and talented individuals who are really eager to grab this opportunity with both hands. Their passion and enthusiasm must shine through." Coetzer also points out that "work experience is not a requirement".

The handpicked interns are divided into groups before being given a themed project to work on for the duration of the programme. The theme for 2015 was 'Employer branding – what can Atlas Copco do differently to attract young talent?' and 'Reception as brand ambassadors for Atlas Copco' was the topic for this year's interns.

They are given various training and development opportunities from internal subject matter experts as well as NQF-aligned skills programmes from accredited training providers.

At the end of the programme, the interns are expected to put forward a project presentation to a panel of judges. Human resources and line management are invited to these presentations and interns are encouraged to use this opportunity to market themselves and apply for longer duration internships within Atlas Copco.

www.atlascopcogroup.com



A perfect ending to the 2016 Atlas Copco Internship Programme – interns putting their go-karting skills to the test.

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Packo Pumps for the food and beverage industry

South Africa is gaining traction in the food and beverage industry with the successful introduction of the new Packo range of food-grade pumps, says Kobus Fourie, pump specialist at Verder South Africa.

The Dutch-based Verder Group acquired the UK-based Fullwood Packo Group in 2015, with Verder South Africa embarking on an extensive marketing campaign for the food and beverage industry in August 2016.

Fourie explains that the range has application in 11 niche sectors: dairy; meat and fish; textiles; wastewater and potable water; breweries and distilleries; food and beverages; washing and disinfection; surface treatment; vegetables; animal feeds and biogas; hot frying oil; petrochemicals; and pharmaceuticals.

Fourie says that, currently, the focus is on breweries and beverages. "But we will target additional sectors this year." He adds that Verder Packo pumps are available in capacities of up to 40 m³/hour, with the latest addition to the range capable of 1 200 m³/hour. "This particular pump weighs an astonishing 1,6 t, with a 250 kW motor."

In existence for 230 years, Packo was the first company ever to design a food-



Packo pumps boast a monobloc design for ease of maintenance and durability.

grade pump. "Our extensive experience has allowed us to eliminate typical problems and issues that smaller companies are only beginning to grapple with now," says Fourie.

Some of the innovations introduced by Packo include an electro-polishing process for all internal components. This results in a mirror-like finish that helps to combat build-up of bacteria. Another feature is an optional heating jacket for materials such as chocolate, creams and fats, which all need to remain liquid, even if the production process is interrupted.

www.verderliquids.com/za

Analysis laboratory invests in equipment

Condition monitoring specialist company WearCheck, based in South Africa and within the African continent, is dedicated to remaining at the forefront of the reliability solutions game, and invests regularly in new laboratory equipment and training for its scientists.

The latest addition to WearCheck's Pinetown laboratory is a brand new air release tester – a sophisticated instrument that measures the ability of oil to release

entrained air by pumping air through the oil sample at predetermined conditions.

Laboratory manager, Meshach Govender, explains: "We record the time taken for the entrained air in the sample to reduce in volume to 0,2%. Entrained air that is not readily released from the oil can lead to spongy hydraulic action, inability to maintain oil pressure, incomplete oil films and the acceleration of oxidation of the oil.

"The new air release service was previously outsourced, and is now done in-house. This has reduced the turnaround time for sample results, and is of particular benefit to our customers with turbines and hydraulics, as well as gear oils to a lesser extent."

Govender adds that WearCheck offers a host of tests, including the scientific analysis of used oil, which form a complete condition monitoring programme,



Senior WearCheck laboratory assistant Sheila Naidoo operates the brand new air release instrument.

Level 2 B-BBEE status: focusing on transformation

Royal HaskoningDHV SA consulting engineers announced late last year that the company has achieved Broad-Based Black Economic Empowerment (B-BBEE) Level 2 status. "This demonstrates Royal HaskoningDHV's ambition towards Enhancing Society Together and a great recognition for the role the company plays in South African society," says Salani Sithole, Royal HaskoningDHV SA's managing director.

"Royal HaskoningDHV's strategic intent is to benefit all our stakeholders and communities in which we operate. We believe in actively focusing on transformation initiatives and in practising good corporate governance and ethics. We recognise this as a critical business imperative that creates employment opportunities for our future engineers," adds Sithole.

"Infrastructure development is at the core of the Government's National Development Plans Vision 2030 and in line with this, Royal HaskoningDHV is actively involved in a number of government initiatives. The organisation plays an active role in a number of industry bodies including Consulting Engineers South Africa (CESA), the South African Institution of Civil Engineers (SAICE), the South African Black Technical and Allied Careers Organisation (SABTACO) and the Black Business Council (BBC), to mention a few," Sithole explains.

Royal HaskoningDHV's Education Foundation was developed to provide education initiatives in support of its community schools as well as the Corporate Social Responsibility activities in society. This includes the Saturday School initiatives that operate from six branch offices, in Johannesburg, Pretoria, Cape Town, Bloemfontein, Durban and Pietermaritzburg. "This has provided support for more than 1 000 learners since its inception."

For young talent within the engineering industry, Royal HaskoningDHV has a Young Professionals Forum, Y-RHDHV. This group of upcoming young leaders actively promotes the industry and is dedicated to sharing experiences and inspiring others to bring positive change to society – and recently walked away with the first prize at the 2016 CESA Job Shadow Day.

"Working alone, we cannot change the world. Working together with our clients, knowledge institutions, partners, stakeholders and communities, we are in the process of moving towards a better future for all," concludes Sithole.

www.royalhaskoningdhv.com/za

servicing components in many industries, predominantly mining, electrical, earth moving, aircraft and transport.

www.wearcheck.co.za

Hydrogen, electrolysers and the future service station

Nel Hydrogen's Eric Dabe (right of photo) recently visited South Africa in support of southern African agency, RTS Africa Engineering. *MechChem* talk to Dabe and RTS Africa MD, Ian Fraser (left of photo).



Nel's history goes back to 1927 when, as Norsk Hydro, it developed and installed a large-scale hydrogen production plant for an ammonia fertiliser plant in Rjukan, Norway. As Norsk Hydro Electrolysers (NHEL) the company delivered its first hydrogen refuelling station in 2003. Acquired by Statoil in 2007, the company sold its 500th water alkaline electrolyser in 2008.

"We left Statoil in 2011 and were renamed Nel Hydrogen. In 2014, a group of highly regarded Norwegian investors came in and listed Nel Hydrogen on the Oslo Stock Exchange. This has enabled us to raise capital for development, most notably for the strategic acquisition of Denmark-based H2Logic, the leading global developer of hydrogen refuelling stations. We are currently building a factory in Denmark with the capacity to manufacture and deliver 300 hydrogen refuelling stations per year," says Dabe.

Nel Hydrogen is now split into three divisions: Nel Hydrogen Electrolyser; Nel Hydrogen Fueling; and the newly established division, Nel Hydrogen Solutions, set up to accommodate the increasing need for integrated systems and solutions.

"The new division targets emerging hydrogen markets such as the mobility and the energy sectors, that are increasingly looking to hydrogen as a storage solution," Dabe tells *MechChem Africa*.

Generally known as 'power-to-gas', he

says that the use of hydrogen as an energy storage medium for renewable energy systems has been successfully demonstrated over the past three to four years. "Power-to-gas arises from the deployment of renewable energy, most notably in Germany, which has the world's most ambitious renewable energy programme. Germany is currently producing 25% of its electricity needs from renewable sources. The target is to reach 50% by 2030 and, by 2050, hopes are that 80% of the country's energy requirements will be met via renewables," notes Dabe.

The intermittent nature of renewable energy sources such as PV solar and wind creates instability and balancing issues if grid-connected. The low capacity factors also drive the tendency for the installed capacity to be higher than the demand. "This means that, at certain times, the system experiences enormous energy surpluses, which cannot be accommodated by the grid. The only current solution is curtailing, which is the equivalent of throwing away substantial quantities of high-value green energy," Dabe suggests.

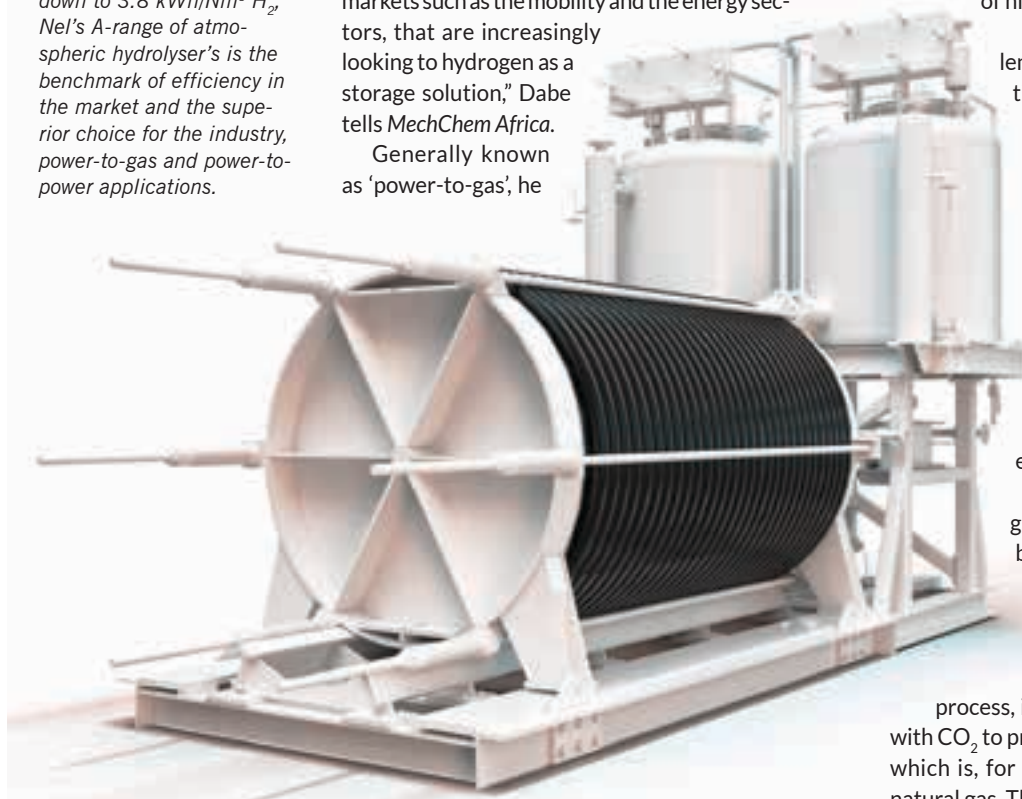
"The use of batteries is currently prevalent in smaller systems, but these substantially increase system costs and they still have limits in terms of capacity. So we are now looking at using electrolysers to create hydrogen from any excess generation of electricity to store for later use," he informs *MechChem*.

"In Europe, the natural gas network represents a huge storage capacity. Up to 5% hydrogen can be directly injected and stored in this network, increasing both the gas volume and the calorific value, resulting in a net energy benefit greater than 5%," Dabe says.

"Also, the hydrogen in the natural gas reduces emissions to some extent, because when the hydrogen burns, no CO₂ is produced. The emissions consist only of water vapour," adds Fraser.

In addition, via the methanation process, it is also possible to react the hydrogen with CO₂ to produce synthetic natural gas (methane), which is, for all intents and purposes, identical to natural gas. This can be viewed as a way of reusing or

With power consumption down to 3.8 kWh/Nm³ H₂, Nel's A-range of atmospheric hydrolyser's is the benchmark of efficiency in the market and the superior choice for the industry, power-to-gas and power-to-power applications.





H2 Logic's Esbjerg Denmark hydrogen refuelling station being inaugurated in June 2016. Hydrogen for the Esbjerg station is delivered from a central electrolyser plant operated by Strandmøllen and based on technology from Nel-Hydrogen.

recycling CO₂ so as to keep it from entering the environment for as long as possible.

"Hydrogen produced by electrolysis from renewable energy sources is known as 'green hydrogen' and it is starting to offer a good business case – because the electricity generated maximises the value of the renewable capacity. Power-to-gas solutions, however, are currently seen as medium- to long-term. A few demonstration plants are operational but the capex for hydrogen solutions is still relatively high and there is a need to upscale production levels.

"We believe that from 2030, this will be common practice in Europe," says Dabe.

Third generation refuelling stations

Since Norway's power generation is largely from hydro-sources, the transport sector contributes the highest percentage of CO₂ emissions. There is, therefore, a national focus on the transport sector in order to achieve reduced emissions commitments, with a strong emphasis on electric vehicles powered by hydrogen fuel cells (HCEVs) and the associated hydrogen infrastructure. "The cleanest way of making hydrogen is to use an electrolyser powered by electricity from a renewable energy source. This makes hydrogen a logical choice for the transport sector in Norway, since most of its grid is powered by hydro and wind.

Uno-X Hydrogen, which is a joint venture between Nel Hydrogen, Praxair's Norwegian affiliate and the fuel station operator, Uno-X Gruppen, opened its first hydrogen fuel station in Oslo on Tuesday 22 November, with a target to build 20 stations by 2020 covering all major cities in Norway.

This is our third generation hydrogen refuelling station and the entire system has an approximate footprint of 2.2×3.3 m, 70% down on previous systems," Dabe reveals. "This station combines local PV electricity generation with a clean-grid connection to drive an Nel electrolyser. The general idea is to generate hydrogen on site, but to guarantee 100% availability, Praxair has been contracted to deliver hydrogen generated from offsite sources via tankers, delivering fuel in the conventional way. The electrolyser produces fuel onsite, but

a backup supply is maintained from deliveries to cater for any onsite production stoppages," Dabe explains.

With high levels of incentives to industry, these cleaner technologies are becoming more attractive to transport companies, without affecting competitive advantage.

Describing the full system, Dabe says that Nel's A-range of atmospheric electrolysers, the A-150 and A-300, with capacities of 50 to 150 Nm³/h and 151 to 300 Nm³/h respectively, are commonly used for refuelling stations. The electrical transformer, rectifier, control cabinet and electrolyser stack; as well as the purification system; feed water circuit; lye (alkaline) electrolyte tank and separators; gas scrubber and gasholder; the compressor; interconnecting control valves and piping, and more, are built into two or three dedicated containers, "making them much simpler" than their predecessors.

If required, for applications such as refuelling stations, for example, reciprocating or diaphragm compressors are used to pressurise the hydrogen produced for storage. "Generally, tankers deliver hydrogen at 200 bar, but cars such as the Toyota Mirai and the Hyundai ix35 FCEVs use 700 bar tanks. Just before the dispenser, therefore, the fuelling station has 950 bar storage tubes to enable filling to 700 bar. This pressure offers a range of up to 600 km, and the tank can be filled in about three minutes.

Trucks and buses, however, use 350 bar tanks, so both 450 and 950 bar tubes are currently fitted to enable dispensing at 350 and 700 bar respectively," he says.

"In South Africa, Illovo Sugar's Sezela mill has one of the largest electrolysers in the world," says Fraser. "An Nel-485 is used to make furfuryl alcohol from the waste stream of the sugar production process," he explains.

This unit was purchased in 1983 and is still operating, 24/7 today, thanks to the ongoing maintenance and support provided by RTS Africa. "We were one of the first service agents that Nel Hydrogen appointed. We supply full design, sales and service support and we have been called upon to help with installations in Mombasa and as far as France," Fraser concludes. □

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Mobile refueller for Mirai fuel-cell fleet

Toyota Australia has unveiled a mobile hydrogen refueller that will enable its three Mirai fuel-cell sedans to go anywhere that a conventional car can be driven. This breakthrough, which has been developed by the company's local engineers and partner suppliers, represents a clever temporary solution to counter the current lack of a refuelling infrastructure in Australia for fuel-cell cars.

The Mirai itself represents a turning point in the automotive industry, introducing a new age where electricity is generated on demand using hydrogen as a fuel. Mirai – its name is Japanese for 'future' – is designed to diminish the world's dependence on oil and reduce harm to the environment. Named 2016 World Green Car, Toyota's Mirai is a remarkable zero-emissions car with all the convenience of today's conventional vehicles.

Toyota Australia's fuel-cell project sponsor and senior executive adviser to the board, Bernie O'Connor, believes the mobile refueller will be instrumental in demonstrating the significant benefits of owning a Mirai. As an

interim measure, Toyota's mobile refueller incorporates a generator and a compressor mounted in a purpose-built trailer attached to a Hino 700-series truck.

Hydrogen, delivered to the refueller in bottles, is cooled and pressurised to the required 70 MPa (700 bar) before being pumped into the three Mirai sedans. The refueller can also be used to deliver hydrogen to other fuel-cell vehicles, such as buses and forklifts, as well as being capable of transporting a Mirai vehicle itself.

"The decision to invest in a mobile refueller demonstrates Toyota's commitment to maintaining its leading role in developing flexible and personal mobility solutions for the next 100 years. This is a practical and necessary measure to enable people to learn about and experience first-hand, the game-changing Mirai and its ground-breaking technology," says O'Connor.

O'Connor added that Toyota will continue to work with governments, industry and other key stakeholders to fast-track the development of the refuelling infrastructure required to support the widespread sale of fuel-cell vehicles.

Mirai offers a driving range of approximately 550 km when its two on-board tanks are filled with about 5.0 kg of compressed hydrogen. Refuelling from a commercial site takes just three to five minutes – and the only exhaust gas emission is water vapour.

Hydrogen is as safe as any other automotive fuel and, unlike fossil fuels, it does not contribute to global warming during vehicle operation. It is the most abundant element in the universe and can be produced from almost anything – including sewage sludge – by using

primary energy sources such as pollution-free solar and wind power.

Mirai is also fun to drive, delivering punchy performance while offering the convenience and driving pleasure of a conventional car. It produces maximum power of above 110 kW from its fuel-cell stack through the electric motor.

Mirai utilises the same hybrid technology developed for Toyota's hybrid synergy drive systems, replacing the petrol engine with a fuel-cell stack. The Mirai is available in Japan, Europe and the United States and there are currently no plans to introduce it in South Africa. There are also no plans to offer the car in Australia ahead of the development of an appropriate hydrogen-refuelling infrastructure. □



Toyota Australia's mobile hydrogen refueller incorporates a generator and a compressor mounted in a purpose-built trailer attached to a Hino 700-series truck.

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African Energy Indaba, 2017

The African Energy Indaba 2017 Conference and Exhibition will be held at the Sandton Convention Centre on February 21 and 22, 2017.

"The Africa Energy Indaba provides the process for you to meet with others who share your dream of a thriving Africa; a continent where all its citizens prosper; a continent we are proud to call home," says conference chairman, Brian Stratham. "I invite you to step forward; share your knowledge and expertise and open your mind to receive the wisdom and experience of others," he adds.

The Indaba will also host the SE4ALL (sustainable energy for all) member countries that will be showcasing their high priority renewable energy project opportunities, identified at country level as the high priority projects.

African SE4ALL countries will be present to showcase their Investment Prospectus and potential investors will have the opportunity to carefully examine each project, enter into one-to-one discussions with the project owners and conclude specific deals with the project owners.

This initiative is being facilitated by the NEPAD Planning and Coordinating Agency.

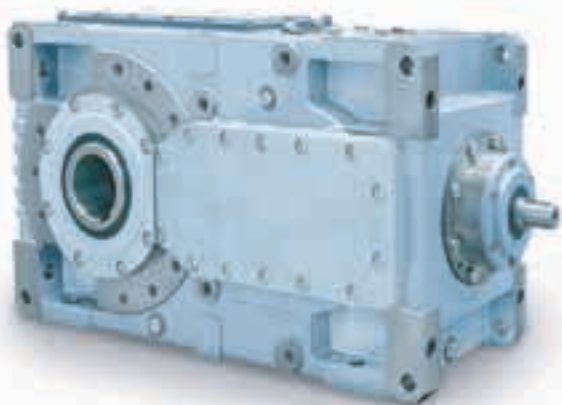


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The HD series is the perfect choice for demanding industrial applications. The advanced design technologies are setting new standards for industrial gearboxes. High precision ground gears, closely spaced reduction ratios and a wide range of mounting options, guarantee excellent configurability for every application.



CONVEY

FLEXI-DISC™ Tubular Cable Conveyors gently slide fragile foods and non-foods through smooth stainless steel tubing routed horizontally, vertically or at any angle, over short or long distances, dust-free. Single or multiple inlets and outlets.



DUMP

FLEXICON™ Manual Dumping Stations allow dust-free dumping of bulk material from bags and other containers. Automatic reverse-pulse filter cleaning allows continuous, efficient operation. Available with integral bag compactors for total dust containment.



UNLOAD

BULK-OUT™ Bulk Bag Dischargers unload free- and non-free-flowing solids from bulk bags automatically. Allows untying, retying and collapsing of bulk bags—all dust-free. Available with weigh batching controls.



CONDITION

BLOCK-BUSTER™ Bulk Bag Conditioners loosen materials that have solidified during storage and shipment. Variable height turntable positions bag for hydraulic rams with contoured conditioning plates to press bag on all sides at all heights.



FILL

SWING-DOWN™, REAR-POST and TWIN-CENTREPOST™ Bulk Bag Fillers can fill one bulk bag per week or 20 per hour at the lowest cost per bag. Numerous performance options. Available to industrial or sanitary standards.



CONVEY

FLEXICON™ Flexible Screw Conveyors transport free- and non-free-flowing bulk solid materials from large pellets to sub-micron powders, including products that pack, cake or smear, with no separation of blends, dust-free at low cost. No bearings contact material. Easy to clean quickly, thoroughly.



CONVEY

PNEUMATI-CON™ Pneumatic Conveying Systems move a broad range of bulk materials over short or long distances, between single or multiple inlet and discharge points in low to high capacities. Available as dilute-phase vacuum or positive pressure systems, fully integrated with your process.



TIP

TIP-TITE™ Container Tippers dump bulk material from drums (shown), boxes or other containers into vessels up to 3 metres high. Dust-tight (shown) or open chute models improve efficiency and safety of an age-old task.



SUCCEED

The FLEXICON™ Lifetime Performance Guarantee* assures you of a successful result, whether you purchase one piece of equipment or an engineered, automated plant-wide system. From initial testing in large-scale laboratories, to single-source project management, to after-sale support by a worldwide network of factory experts, you can trust your process—and your reputation—to Flexicon.



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