

MechChem

JUNE 2017

AFRICA

CROWN
PUBLICATIONS

FESTO



Engineering tools to make your work easier:
The new **Cabinet Guide Online**

This month:

Contactless energy transfer system improves handling reliability in wax plant

Plant-based drinking bottles from FDCA

Process-focused solution ups crusher plant output

Gas and electricity generation for Southern Africa: Shifts in the landscape

REJUVENATING

the South African Chemical and Polymer industries



Trust the NIDF to assist with
chemical and polymer development and scale-up



DST-CSIR Nanomaterials Industrial Development Facility (NIDF)

DST-CSIR Nanomaterials Industrial Development Programme
DST-CSIR Nanotechnology Innovation Centre

Council for Scientific and Industrial Research

Meiring Naude Road, Brummeria

Pretoria 0001, PO Box 395

Tel: (+27) 12 841 4738

E-mail: mrscriba@csir.co.za

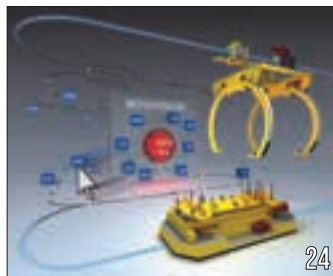


**science
& technology**

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

CSIR
our future through science

CONTENTS



CROWN PUBLICATIONS

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@crowm.co.za
www.mechchemafricamagazine.co.za

Editors: Peter Middleton

e-mail: peterm@crowm.co.za

Glynnis Koch

e-mail: glynnisk@crowm.co.za

Advertising: Brenda Karathanasis

e-mail: brendak@crowm.co.za

Design: Darryl James

Publisher: Karen Grant

Deputy publisher: Wilhelm du Plessis

Circulation: Karen Smith

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



Transparency You Can See

Average circulation

January-March 2017: 4768

Printed by: Tandym Print, Cape Town

Cover story: Festo

Contact: Adrian Bromfield

+2711 971 5500

adrian.bromfield@festo.com

sales.interaction@festo.com

www.festo.co.za

PUMP SYSTEMS, PUMPS, VALVES AND SEALS

8 Process-focused solution ups crusher plant output

After implementing a full process-focused solution from Weir Minerals Africa, Stilfontein-based sand and aggregate supplier CNC Crushers raised throughput at its Roadstone Shaft 5 crushing plant by 45% while cutting back on maintenance and simultaneously increasing production.

10 Pumping systems 101: Getting a return on your training investment

13 Pump rental success on copper mine

14 New generation Etanorm is a winner

15 Curve pump proves its capability

SUSTAINABLE ENERGY AND ENERGY MANAGEMENT

16 Cast resin transformer technology: an efficient low-risk option

MechChem Africa talks to Mervyn Low, MD of Greenergi, the sole distributor of cast resin transformers (CRTs) from Trafo Elettro Italy.

19 Aluminium offers benefits in transformer windings

20 African hydropower plant receives international recognition

22 New high-tech energy-efficient water heating solution

23 Load bank system supplied into Botswana

PETROCHEMICAL, OIL AND GAS

24 Movitrans improves handling reliability in wax plant

MechChem Africa's Peter Middleton visits Sasol's wax packaging plant and reports on the use of SEW-Eurodrive's Movitrans® contactless energy transfer solution to manage the transfer of loaded pallets from its robot packing cell.

27 All-in-one service from rope access workers

28 Investment in grass-root talent changes lives

29 Tanzania to pipe natural gas to capital

30 Gas and electricity generation for Southern Africa: Shifts in the landscape

32 NIDF: Crossing the nano innovation chasm

INNOVATIVE ENGINEERING

38 Producing plant-based drinking bottles from FDCA

VTT Technical Research Centre of Finland has developed an environmentally sound and economical method for producing furan dicarboxylic acid (FDCA) from plant sugars enabling production of plant-based products.

REGULARS

2 Comment: The energy mix: the case for maximising renewables

4 On the cover: Festo South Africa: engineering tools for success

Festo South Africa's Adrian Bromfield talks about Festo's modern drive to enhance the competitive edge for customers and the launch of the new Cabinet Guide Online tool.

6 SAICHe Spotlight: SA's global chemical award finalists

34 Product and industry news

40 Back page: Benchmark Green Star building in Namibia

The energy mix: the case for maximising renewables

Peter Middleton

COMMENT



An article by LeeAnne Graves published in UAE's *The National* reports that the Abu Dhabi Water and Electricity Company has signed a 25-year power purchase agreement with Japan's Marubeni and Jinko Solar for a 1.17 GW PV solar power plant.

The plant's weighted bid price was 2.42 US-cents per kWh, just under R0.32/kWh at an exchange rate of R13/\$.

Bloomberg New Energy Finance (BNEF) estimates that the current local (UAE) price of power from combined cycle natural gas plants in the Middle East is at least 3.0 US cents (R0.39/kWh), which, with adjustments for inflation, puts the price of solar PV from this plant at between 2.0% and 19% cheaper than new-build gas plants.

The article also notes that solar PV panel prices have fallen by 80% since 2009, according to the Abu Dhabi-based International Renewable Energy Agency. IRP 2010 was published shortly after this date, so the renewable energy and other energy mix recommendations were based around much higher renewable energy tariffs.

Despite the recent spat between Eskom's ex-acting CEO Koko and, well, everyone else, South Africa's renewables story is "truly inspirational", said Max Thabiso Edkins, from the World Bank's Connect4Climate programme, speaking earlier this year at an Energy21 Exchange Hub meeting. One of his main messages about renewable energy: it is no longer as expensive as people think.

To date, the REIPPPP has facilitated nearly R200-billion worth of investment across projects with a combined capacity of over 6 000 MW. The 26 delayed projects procured under the fourth bid window and its expansion are said to have a combined additional investment value of R50-billion.

From a price perspective, average wind prices in South Africa went down from R1.51/kWh in 2011's bid Window 1 to the current R0.62/kWh. Average solar PV prices went down from R3.65/kWh in bid Window 1 to the current R0.62/kWh. For bid Window 4, Koko was prepared to sign all 13 IPP bids at R0.62/kWh or below, but not for the others, which are all below R0.72/kWh: a deal breaker?

It is hard to understand why there appears to be so much resistance to expanding the renewable programme and a contrasting determination to go full steam ahead with the nuclear programme. On the renewable side, Eskom says that we do not need the additional capacity at the moment and signing the

bid Window 4 PPAs will "negatively affect the utility financially".

But a 9.6 GW nuclear build programme won't?

One of the key strengths of the REIPPPP is that it is based on long-term power-purchase agreements (PPAs) and that the developer invests the capital required to build the plant. The utility buys the power, which it immediately sells on to the consumer.

For renewable plant, therefore, Eskom does not have to secure billions of rands of funding from lending agencies with associated Government guarantees. Varying lending agency interest rates need not be factored into the annual tariffs and all operational, breakdown and maintenance costs are borne by the IPP. The only commitment the state and/or the utility makes is to purchase the power produced.

As a consumer of Joburg Electricity, I am already paying R 1.08/kWh on the minimum (Step 1) tariff: this before network charges and demand side management additions. I understand that distribution also costs money and that the utility cannot depend on PV or wind generated power alone, but the IPP model and the costs of the renewable energy generated by these technologies can surely no longer be rejected because they are too expensive.

Relating to energy issues this month, we report on: Gas Africa 2017, which adopted the theme, 'Southern Africa is now proven to have huge natural gas deposits. How will this major clean power source affect South Africa and the region'; the gas pipeline being built in Tanzania to give 2 000 MW of new gas-fired electricity generation by 2018; Aurecon Hydro and REH's small hydro successes; and the increasing use of aluminium and dry-type cast-resin transformers for renewable and industrial plants.

Across Africa and in South Africa, we are blessed with multiple energy options. We have coal, gas and uranium to fuel thermal power plant. Around our coastline, we have abundance of wind energy resources; inland, we have some of the best solar irradiation levels in the world; and north of our borders, hydro-resources in abundance.

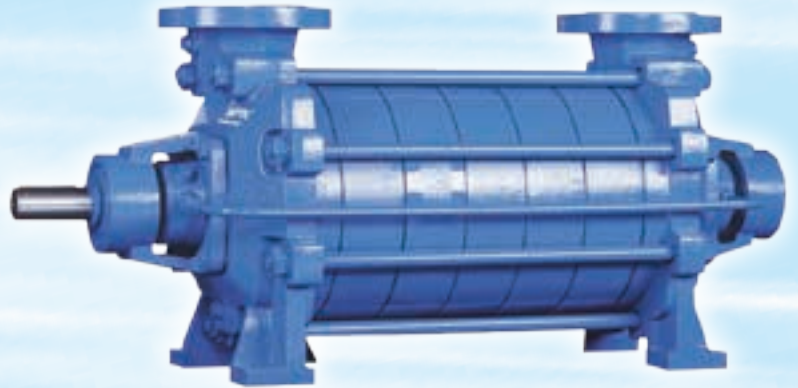
We should be looking to use them all. But for the new IRP, as per the circulating draft, it has got to be sensible to maximise our dependence on renewables – 13.5% PV, 29% wind and 2.0% hydro from Inga is being proposed; while using more gas (10% OCGT and 17% CCGT is being suggested) to accommodate weather fluctuations. Nuclear, along with coal, will remain essential for base load generation, but shouldn't we be introducing these on a minimum possible basis? □

MechChem Africa is endorsed by:





M+P Split Casing Pump



Multi-stage Pump



E.I.M.



Viking Gear Pump

Stockists of Tianjin small submersible, vertical multi-stage and close coupled water pumps.

Suppliers of the following:

Mather+Platt

VANTON

EIM

VIKING
PUMP

Tel: 011 824 4810 Fax: 011 824 2770 Web: www.matherandplatt.com

26 Nagington Road, Wadeville, 1422, Gauteng

Festo South Africa: engineering tools and the launch of Cabinet Guide Online



Adrian Bromfield, who has been with Festo South Africa for 19 years, succeeded former national sales manager, Warren Harvard, when he transferred to Festo UK in December 2016. In this article, Bromfield, who brings a wealth of knowledge and experience with him, talks about the Festo's modern drive to enhance the competitive edge for customers and the launch of the new Cabinet Guide Online tool.

Festo South Africa was founded in 1973 and has acquired a tremendous amount of experience and expertise in the African marketplace. In our 44 years of operation, we have never lost sight of the bigger picture. We don't just focus on our operations in South Africa but on Africa as a whole. Africa has huge potential for automation and with the ever-increasing effects of globalisation, we understand the importance of giving our customers a strong competitive edge.

Our motto says, 'we are the engineers of productivity'. It's a phrase that truly encapsulates the ideals of our organisation. We work with our customers to increase their productivity thereby helping them gain differentiation and making them globally competitive. This 'productivity' that we refer to is generated in a number of ways.

Ease of access

Over the past few years, we have transformed our business model to allow for more convenient access to the Festo product range throughout Africa. We've significantly increased our distribution channels to market. We've signed up large distributors such as RS Components, the Bearing Man Group (BMG) and Hyflo. This means that we have over substantially increased our distribution footprint throughout the continent.

We still have a strong and loyal network of representative distributors who are able to support more intensive technical queries on projects. Further to that, we have an additional 70 resellers nationally who stock our products. We ensure that all our distributors are trained so that they maintain a standard of technical support and product knowledge.

Our Online Shop serves as a popular and convenient option for customers to purchase our products.

Last but not least, we still have direct channels to market through our Sales Engineers, Contact Centre and our Outbound Sales division.

Innovative and expansive product portfolio for multiple industries

Whilst Festo has been traditionally known for its competence in Pneumatic automation, we are well equipped to assist customers in other segments such as electric automation and process automation. We aim to provide our customers with the automation solutions that best suit their needs.

We offer over 33 000 products that cater for a plethora of industrial sectors such as water technology, automotive, food and beverage, chemical, mining and energy to name a few.

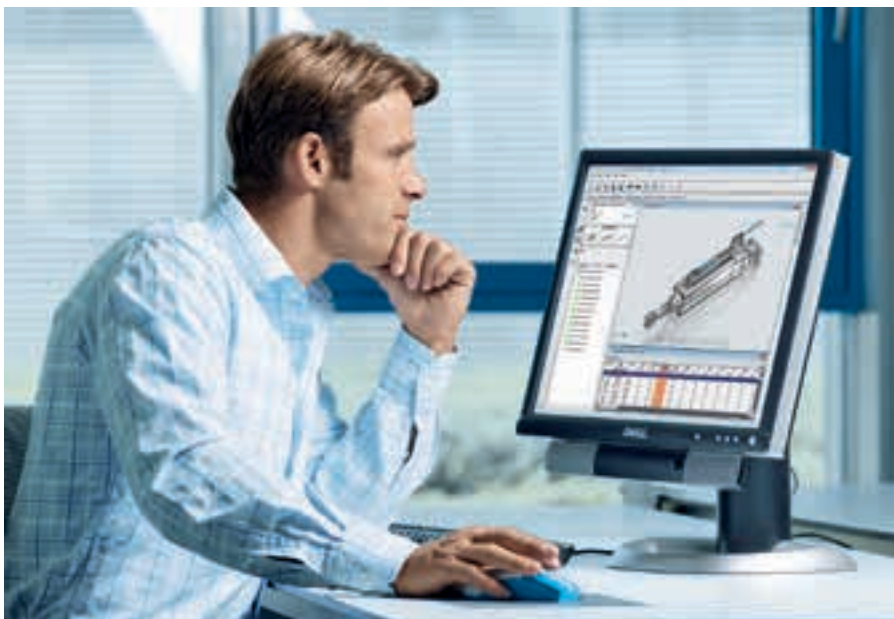
From a cost perspective, we have invested heavily in the more-economical Festo core product range. This range consists of some 2 200 products that cover 80% of common automation applications. Through higher global unit volumes and our own implementation of Industry 4.0 in our Scharnhausen Technology Plant, we have not only been able to cut unit costs, but the range offers excellent price/performance ratios.

Innovation is essential to gain market share. The company's approach is innovative research and development, not only to develop new automation solutions, but also to inspire people to adopt modern technology. "We have successfully completed numerous bio-mimicry projects such as our Handling Assistant that simulates an elephant's trunk and our bionic-ant robots that cooperate with each other to move items.

With these futuristic innovations, Festo strives to inspire people all over the world towards smart and intuitive automation solutions.

On the product development side, Festo's new Industry 4.0-ready Smart Motion Terminal is a revolutionary new valve that incorporates completely new thinking. This is the world's first digital pneumatic valve to be controlled by apps. It can be programmed to perform functions that currently require customers to order and install more than 50 separate products or positions.

Combining the advantages of electric and pneumatic technologies, the Smart Motion



Festo offers several engineering tools that enable pneumatic and electrical circuit diagrams to be selected and drawn via online services and downloaded for use in engineering processes.

for success

Terminal will offer automation adopters the highest possible level of standardisation, reduced complexity, rapid time-to-market, reduced installation costs and increased energy efficiency. The Smart Motion Terminal product release date for the local market is scheduled for 2018.

We don't just sell products – we sell solutions

Festo offers a range of value-added services such as customised product configurations, consulting and training services. Our Customer Solutions division can manufacture and repair a variety of components and turn-key systems locally.

We partner with our clients and use a consultative approach for services such as project conceptualisation, design, energy saving and air quality testing services that save clients both time and money. We've gone a step further for conceptualisation projects and we can provide highly accurate test data for a client's handling system prior to the deployment of the project using our Application centre.

One of our most important solutions offering is our Didactic division. Industrial automation is a complex field. It's not good enough to sell the product without provisioning for proper training on how to utilise it. We realise that investment in training and coaching are smart investments in sustainability, knowledge, skills, loyalty, and retention of staff.

Festo Didactic offers a full suite of training courses, learning systems and consultancy services. The consulting division offers customised planning, designing, and equipping of complete workshops and laboratories (in science, technology and education). Most tertiary technical colleges are equipped with our systems, which demonstrates our commitment to empowering young people in the automation field.

We train tomorrow's technology today and this has never been more appropriate than it is now with emergence of Industry 4.0. The reality, particularly in South Africa, is that customers aren't necessarily familiar with new automation technology and we see our role as bringing that awareness and technical understanding to as many users as possible.

To further validate our commitment to facilitation and preparing the industry for this industrial evolution, we have invested in a multi-million rand Cyber-Physical (CP) system, which will form part of our Industry 4.0 training courses. The CP System is in South Africa and is being introduced to our clients nationally ahead of the I4.0 Course launch in 2018.



Above: The HGO (Handling Guide Online) allows the user to configure a system very quickly and then download CAD drawings.

Right: Festo's new CGO (Cabinet Guide Online) offers control cabinet solutions for water technology or handling systems.

Engineering tools for success

While advancing technology at the highest level, Festo's business model is currently striving to make industrial automation as easy to implement and convenient to access.

We have an extensive range of tools easily available via Festo's website, many of which are free. Festo also offers several engineering tools, including: Tubing Selector; Component Selector; a 3D Product Configurator; and Fluid Draw – which enables pneumatic and electrical circuit diagrams to be drawn and downloaded for use in engineering processes.

"These support structures are ideally suited to new-generation engineers, who are used to having 24/7 access to the information they need.

Another useful engineering tool is the HGO (Handling Guide Online). This is a design tool for gantry based mechanical automation systems. It allows the user to configure a system very quickly and then download CAD drawings that can be directly incorporated into all commonly used engineering design software packages.

Ideal for pick-and-place, inline filling or packaging systems, these guides have some 800 pre-assembled models that can be accessed as starting points for customised solutions.

The launch of the Cabinet Guide Online

The newest addition to Festo's portfolio of engineering tools is the Cabinet Guide Online (CGO). The CGO complements the HGO (Handling Guide Online) in that it offers Control Cabinet solutions for handling



systems. This Cabinet configuration tool covers the necessary considerations, with a few simple prompts, namely: I/O requirements, communication protocols, interface requirements (HMI), and electrical power connections needed as well as valve terminal requirements.

Some of the benefits of this tool are that it is:

- **Fast:** The right Cabinet for your water technology or handling system in 10 minutes.
- **Efficient:** The CGO cuts your engineering time and effort to a minimum.
- **Intuitive:** The CGO is very easy to use and features structured prompts for data input.
- **Reliable:** Direct enquiry to the Customer solutions department.
- **Ready-to-install:** Fully assembled and tested systems mean reduced time and effort for logistics, installation and commissioning.
- **Flexible:** A variety of options offer flexibility for your solution.

By taking an integrated solutions approach to implementing and operating automation systems, Festo is helping to raise South Africa's productivity and global competitiveness. All these 'productivity tools' help us and our customers to remain at the forefront of industrial automation. □

Spotlight: SA's global chemical award finalists

MechChem Africa shines a spotlight on South Africa's three chosen finalists for IChemE's Global Awards 2016: Willie Coetzee of TerraServ; Michelle Low of the University of the Witwatersrand and Vernon Harding of Vuselela Energy.

The IChemE Global Awards celebrate excellence, innovation and achievement in the chemical, process and biochemical industries. Three South African entries were in attendance having been selected as finalists: Willie Coetzee for the Resource-Poor Technology Award; Vernon Harding for the Sustainable Technology Award and Michelle Low for the Young Researcher award.

The Awards attracted nearly 500 applications from highly successful organisations such as Amec Foster Wheeler, Aqua Metals, BP, Chevron, DB Breweries, DEKRA Insight, Emerson, Ferrari, Folia Water, George Washington University, International Centre for Advanced Materials, Johnson Matthey, Loughborough University, National Nuclear Laboratory, Recycling Technologies, Sellafield, Shell, and many more.

Willie Coetzee and an outstanding innovation for resource-poor people

Willie Coetzee grew up in Bloemfontein in the Free State and matriculated in 2004. He obtained a Sasol bursary and subsequently commenced his studies at the University of Stellenbosch, where he obtained his chemical engineering degree in 2008.

"My early career was mostly centred around Sasol. I worked on several projects at Sasol Technology, including large projects such as the Secunda Growth Programme

and the Sasol Clean Fuels programmes. I also spent some time at Sasol Instrumentation and Control Engineering (I&CE), where I developed enhanced operating systems (EOS) for Sasol," he says.

In operations, Coetzee then spent some time as the process engineer responsible for a major processing unit in the Secunda Refinery, the Naphtha Hydrotreater and CCR Platforming Units.

Of specific significance at Sasol was his lead role in a part of the CF2 programme and the development of a groundbreaking EOS development platform at I&CE: creating software solutions for work processes and product quality management.

From Sasol, Coetzee joined CDE Process as a Principal Engineer where he led several initiatives, including the technology development and design of a major underground coal gasification plant in Theunissen, which included an array of associated processes and infrastructure including gas processing, utilities, effluent treatment/recycling and electricity generation and transmission.

"At the end of 2014 I started two companies, one of which was an engineering consultation and software development company,

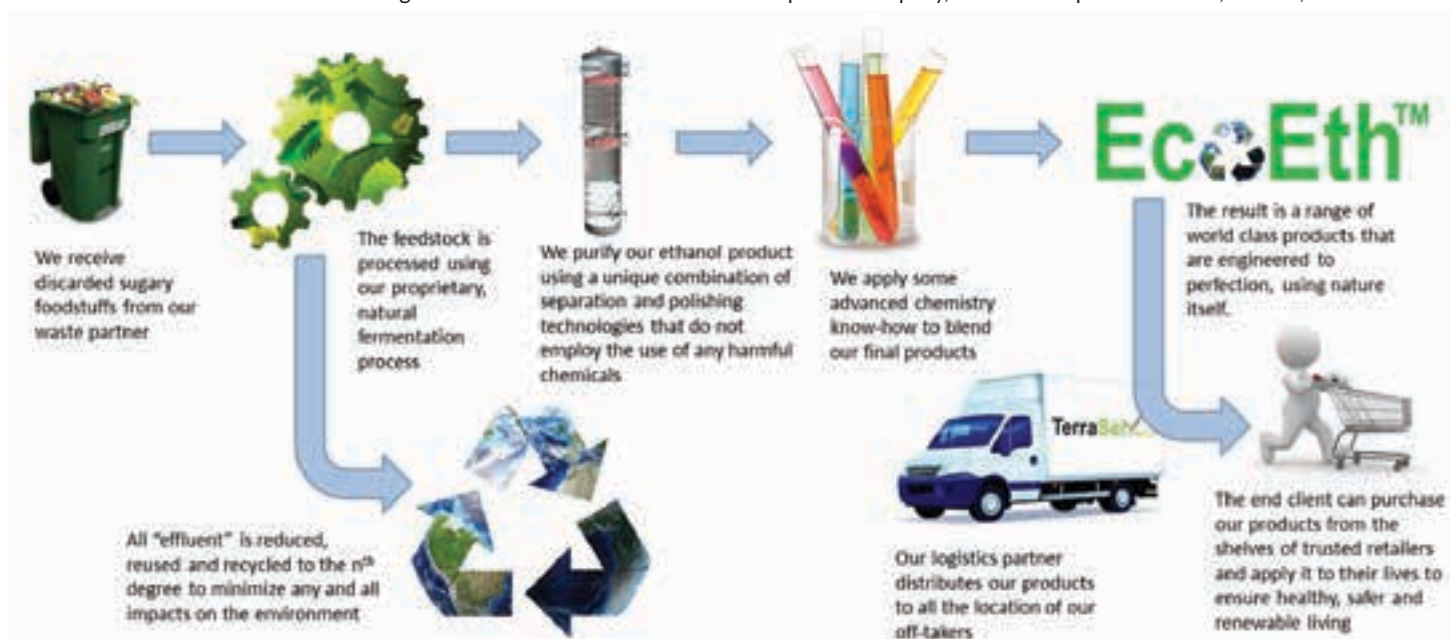


SA's finalists at the IChemE's Global Awards 2016: from left: Willie Coetzee of TerraServ; Michelle Low of the University of the Witwatersrand and Vernon Harding of Vuselela Energy.

and the other was TerraServ, which is specifically aimed at technology development in the field of 'waste-to-gold', which is all about wastage elimination opportunities," he says.

Coetzee's entry was chosen as a finalist in the category for Outstanding Chemical Engineering Innovation for Resource-poor People. "My partner, Neels Welgemoed and I developed a process - on a very tight budget - to efficiently convert food waste into valuable consumer products," he explains.

The premise of the innovation was that this food, which would normally be dumped, where it would degrade into CO₂ and methane, could be used to develop valuable and saleable products. This, in turn, stimulates



Coetzee's TerraServ entry was chosen as a finalist in the category for Outstanding Chemical Engineering Innovation for Resource-poor People.

the local economy and creates jobs.

"It is estimated that more than a billion people worldwide live below the \$1-a-day poverty line! In addition to this, the products that we developed are extremely effective and by growing the business, it enables TerraServ to apply these products, in a subsidised manner, to further help those in need.

"As an example, TerraServ's sanitiser product can be applied to help the fight against cholera in poor regions and TerraServ is currently investigating such a project in the North of Namibia. Hand hygiene is also a primary concern in terms of the spread of other deadly viruses such as Ebola," Coetzee says.

Michelle Low: our young researcher finalist

Michelle Low is a lecturer with PhD at the School of Chemical and Metallurgical Engineering, at the University of the Witwatersrand, Johannesburg. Her research focuses on the development of sustainable processes, such as the production of sustainable bio-feedstock for biofuels, while reducing carbon dioxide. Michelle is also an active and effective science communicator. She is a young academic who has excelled in terms of lecturing, research and community outreach in Africa.

"My PhD work, which was the focus of the Global Awards submission, comprised both theoretical and experimental work, focusing on the reduction of carbon dioxide through the production of sustainable bio-feedstocks. My research also focuses on biodiversity, as I was using algae to investigate the possibilities for carbon dioxide (CO₂) reduction," Low tells *MechChem Africa*.

She says that the use of algae is favourable as it is freely available from local ponds or lakes, easy to cultivate, and can be used as a feedstock for biofuels. From a financial point of view, the use of algae could assist in the reduction of CO₂ in various countries.

"I was supervised by professor David Glasser – an NRF A-rated scientist known as a leading international researcher – as well as professor Diane Hildebrandt – an NRF B-rated scientist known as an internationally acclaimed researcher. Being mentored by scientists who are proven to be at the top of their profession is an honour and a great experience," adds Low.

Low supervises many undergraduate students. In addition to the renewable feedstock research, her undergraduate research is based on community outreach, as well as other specialist topics.

"I believe that collaboration is one of the keys towards professional growth. I am collaborating with several people based on work that I have done and work that I am interested in doing in the future," says Low.



Vuselela's groundbreaking initiative uses waste heat from Anglo Platinum's ACP convertor cooling circuit to evaporate an organic liquid and drive an expansion turbine.

Vernon Harding, Vuselela and the Eternity Power Thermal Harvesting project

Vernon Harding is a chemical engineer with over 20 years experience in the design and construction of furnaces and environmental systems in the pyro-metallurgical field. He holds an Honours degree in environmental engineering and a Masters degree in Business Management.

Harding is a director of Vuselela's Environmental & Process Solutions (EPS) and is currently heading the environmental and energy business line. He has developed several industrial process patents in environmental and energy footprint reduction through his career.

Vuselela Energy's Eternity Power Thermal Harvesting™ project was selected as a finalist for the Sustainable Technology Award at the IChemE Global Awards, with Vuselela Energy being the sole finalist from Africa. The nomination marks Vuselela Energy's debut on the world stage as a cutting edge sustainable energy technology.

Built at the Anglo American Platinum Waterval Smelting complex near Rustenburg, the Eternity Power project uses patented Thermal Harvesting concepts connecting an ORC (organic Rankine cycle) power plant with a metallurgical converter. This is a world first.

This groundbreaking initiative uses waste heat from Anglo Platinum's ACP convertor cooling circuit to evaporate an organic liquid and drive an expansion turbine. The plant is designed to generate 4.3 MW of clean power using waste heat generated by the converter, resulting in a reduction of the smelter's carbon footprint.

The plant was hot-commissioned in June 2015 and is performing beyond expectations, generating more power than designed even at lower than expected heat loads. Eternity Power has generated in excess of 15.8 GWh of electricity for the ACP smelter with an average availability of over 95%.

"This project is another addition to Vuselela's suite of novel, non-intrusive and

custom-fit clean energy solutions, complementing its Thermal Harvesting portfolio," says Harding. "We have also completed other feasibility studies that are awaiting implementation, including several based on patented thermal applications," he says. □

SAICHe IChemE



SAICHe Board members:

President:	C Sheridan
Imm. Past President	D van Vuuren
Honorary Treasurer	L van Dyk
+ Vice President:	
Honorary Secretary:	EM Obwaka
Vice President:	D Lokhat
Council member:	JJ Scholtz
Council member:	AB Hlatshwayo
Council member:	K Harding
Council Member:	M Low
Council member:	BK Ferreira
Council Member:	H Mazema
Council Member:	M Chetty
Council Member:	A de Bond
Council Member:	M Mabaso
Council Member	NN Coni
Member (co-opted):	MD Heydenrych
Chair Gauteng:	C Sandrock
Chair KZN:	D Lokhat
Chair Western Cape:	H Mazema

Contact details

SAICHe
PO Box 2125, North Riding, 2162
South Africa
Tel: +27 11 704 5915
Fax: +27 86 672 9430
email: saiche@mweb.co.za
saiche@icheme.org
website: www.saiche.co.za

Process-focused solution ups crusher

Stilfontein-based sand and aggregate supplier CNC Crushers raised throughput at its Roadstone Shaft 5 crushing plant by 45% while cutting back on maintenance and simultaneously increasing production, after implementing a full process-focused solution from Weir Minerals Africa.

According to JD Singleton, Weir Minerals general manager for Trio™ and Enduron® equipment, CNC Crushers of Stilfontein was experiencing high wear on the installed conventional cyclone, as well as on the older technology pump, having to replace liners every 120 hours of operation.

“Our brief was to increase solids to the cyclone underflow and increase the wear life on the cyclone feed pump,” says Singleton. “The continuous breakdowns experienced with the older-technology crushing equipment, and the excessive oil usage was also causing high downtime for the plant. CNC Crushers needed a solution that would utilise the existing footprint and infrastructure.”

As a solution, Weir Minerals Africa installed a new technology, Warman® WBH® 100 slurry pump and a Cavex® 400CVX10 hydrocyclone; while it also replaced the existing cone crushers with Trio™ TC51S and TC36SH cone crushers to increase uptime and reduce maintenance costs.

“After 1 900 operating hours, the slurry pump was still running without needing any replacement parts, a vast improvement on the previous mean time between liner replacements of 120 hours,” he says.

Warman WBH pumps are the world’s new standard for heavy duties. A wide variety of impellers and shaft seals provide an excellent

fit for a wide range of applications. The WBH pump is designed to provide excellent wear life while maintaining efficiency through ‘one point adjustment’ during the wear cycle for the best total operating cost.

In addition, the low-flow gland seal, expeller seal and mechanical seal options on the WBH pump mean there is less dilution of the slurry and lower required flow of gland water.

Key features include:

- The one-point front liner adjustment feature that allows an operator to both rotate and axially move the liner to minimise the front impeller gap to reduce wear and maintain performance.
- Adjustments can be made while the pump is running so there is no need to stop production. Wear components are designed and optimised using state-of-the-art CFD software.
- Large capacity bearings are used, which can withstand high loads, including thrust, while still providing long bearing life.
- Warman WBH pumps use commercial labyrinth-style bearing-end cover seals.
- Streamlined impeller and volute design flow paths offer combined advantages of high efficiency and long life.
- A new enhanced-performance impeller and liner have been incorporated.
- High-pressure ratings are achieved with metal and rubber liners.



A Trio TC36 short head cone crusher.

- Encapsulated rubber liners are available for longer life and to prevent liner extrusion or blowout.
- Weir Minerals’ large diameter Warman® Hi-Seal® expeller is available for sealing at high intake pressures.
- Ease of maintenance has been improved and longer maintenance intervals are achievable.

According to CNC owner, Carl Crous, this has meant that the company could take pumps off the critical maintenance list.

“Pump problems are something of the past,” says Crous.

With regard to the hydrocyclones, these proved to be more efficient than the conventional cyclones, highlighting the benefits of the Cavex® hydrocyclone’s laminar spiral inlet geometry.

“The Cavex hydrocyclone increased the mass pull to the underflow, which resulted in increased production and reduced slimes to the tailings dam,” he says. “Using new technology equipment pays.”

For their part, the cone crushers have increased plant availability as well as production, while meeting the criteria of matching the customer’s existing footprint. These crushers also incorporate multiple hydraulic cylinder clamping and adjustment, which enables them to reduce the closed-side setting adjustment time from an hour and a half to just five minutes. In addition, their larger socket assembly was able to give full support under both extreme and light load



A Warman WBH 100 slurry pump.

plant output



A Trio TIO5162 double deck inclined screen.



CNC Crushers' owner, Carl Crous, next to a Cavex 400CVX10 hydrocyclone.

conditions, providing a longer service life.

"Partnering with Weir Minerals Africa increased my production output significantly and my uptime increased overnight," says Crous. "I should have done this long ago."

After the cone crushers were installed, a spares and service agreement was put in place to maintain maximum plant availability.

"Spare parts are kept in stock with our agent in Klerksdorp, in close proximity to the customer, and a dedicated service team for the North West province is always at hand," says Singleton.

Following the crusher upgrade, a competitor's installed primary and tertiary classification screens were replaced with a Trio™ TIO5162 (5' x 16' double deck) inclined screen, and the final product screen was replaced by a Trio™ 4102 (4' x 10' double deck) inclined screen. □

Four ways to optimise pump performance: an SKF guide

Pumps are the foot soldiers of the process industry, but their quiet dedication means they are often ignored. Ignoring the pumps is a big risk, because when these components break down – or run below optimum efficiency – the whole process suffers. Manufacturing and process companies are under huge cost pressures at the moment, making it vital to maximise assets and maintain uptime. Below are four suggestions from SKF to optimise pump performance.

The right bearing: Bearings in centrifugal pumps support hydraulic loads imposed on the impeller; the mass of the impeller and shaft; as well as loads due to couplings and drive systems. They also keep the shaft axial and radial deflections within acceptable limits for the impeller and shaft seal. The bearings often will face high axial loads, marginal lubrication, and high operating temperatures and vibration, all while the bearings attempt to minimise friction – which, if uncontrolled, can result in power loss, excessive heat generation, increased noise or wear, and early bearing failure.

So, first and foremost, evaluate bearings (types, designs and arrangements) in the context of their anticipated operating environment. Suitable bearings are available to satisfy even the most difficult conditions faced by centrifugal pumps.

Proper lubrication: Improper lubrication accounts for more than 30% of bearing failures. Good lubricants prevent metal-to-metal contact and undesired friction. The common methods for the effective lubrication of pump bearings include: grease; oil bath; oil ring and oil mist; and air-oil.

Oil mist generates the least amount of friction, allowing rotational speed to be based on the bearing design instead of lubrication limitations. In addition, it creates a positive pressure within the bearing housing, fending off invasive contaminants.

Regardless of lubrication method, always specify lubricants according to the demands on vertical shafts and resistance to solids, pressure, temperatures, loads and chemical attack.

Sealing the system: Bearing seals

in centrifugal pumps handle four crucial tasks: they retain lubricants or liquids; exclude contaminants; separate fluids; and confine pressure. The choice of seal for centrifugal pump bearings depends on the unique demands and operating conditions of the application.

Keep in mind, though, that the bearing and sealing arrangement represent an integrated system. Dynamic radial seals are generally the best choice for centrifugal pumps. These seals create the barrier between surfaces in relative motion. Seal selection must ultimately be based on a thorough review of application parameters and environmental factors.

Particularly for pump applications, seals will be exposed to relatively constant pressure differentials, making pressure seals in which the seal cavity is pressurised the preferred choice. Seals usually provide a much shorter life than the components they protect, so don't fall into the common habit of limiting seal replacement interval to the requirements dictated by other components such as bearings.

Monitoring pump health: Regular measurement and analysis of key physical parameters such as vibration and temperature can detect pump system problems before they occur. Basic instruments can assess and report on vibration, temperature and other parameters.

More advanced tools include online surveillance systems and software that can deliver real-time data. Many problems will manifest as vibration, which is widely considered the best operating parameter to judge pump drive-train condition. Vibration can detect problems such as imbalance, misalignment, bearing oil-film instabilities, rolling bearing degradation, mechanical looseness, structural resonance and a soft foundation. Vibration measurements are quick and fairly non-intrusive because pump equipment remain undisturbed.

Operators can play a pivotal part in proactive maintenance strategies by serving as the 'eyes and ears' to detect equipment faults before problems escalate and performing basic maintenance activities. □

Getting a return on your training Investment



Harry Rosen's Pump systems 101 column this month deals with pump systems training. More specifically, Rosen highlights how lessons learned during 2KG training courses are now being directly applied by delegates as proof of the educational value of the training. In addition, by identifying and implementing energy efficiency savings on plants during course assignments, delegates are able to demonstrate how to make immediate returns on training investments.

Business is all about getting a return on your investment and training is not excluded from this. So how do you know that the time and money you've invested in a skills development programme is bringing you good returns? The ultimate objective of a good skills development programme is to bring about a positive behaviour change in the delegates. How do you check that the delegates have not only understood the topics covered in

the course, but can apply these concepts in their workplace? How do you measure this behaviour change?

At 2KG Training we believe we have found the answer to this question and, surprising to some, it does not entail the writing of an exam.

Anyone attending one of our 2KG Training courses over the last 12 years has received a certificate of attendance. This is a very posh looking certificate, made all the more impressive by a very official seal of approval from one of our learned engineering institutions stating that the course was accredited for CPD points. This means that the course is of a sufficiently high engineering standard to be accepted by ECSA - the Engineering Council of South Africa.

However, as the certificate is only one of attendance, all we know is that the delegate was present for the duration of the course: it does not mean that he or she learned anything. An analogy in pumping terms would be buying the latest technology,

premium efficiency pump with a BEP (best efficiency point) of 85% and expecting it to operate at that level. As you should know after reading these articles, the fact that the pump is capable of running efficiently and reliably does not necessarily mean that the pump operating in your system will do so. Similarly, exposing your staff to technical courses of high standards does not mean that they will pick up any of the necessary skills required to do their job better.

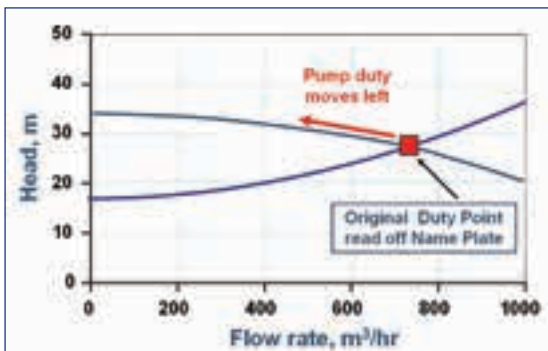
To address this shortcoming there has been a trend in recent years to include a short test on the final day, to evaluate whether a delegate has benefited from the training. These are also problematic as the course provider is often put under pressure to ensure the majority of the class passes, thus making the test easier than it should be. Correctly answering a few multiple-choice questions after the course, therefore, is also not a useful gauge of competency.

I have recently had two opportunities where we tried something different, with very positive results.

The first involved a pumping systems optimisation programme presented to a large gold mining group, where the delegates were required to do a post-course assignment. Each delegate had to gather data on a functioning pumping system, identify sub-standard performance parameters, and suggest improvements that would bring about significant improvements in repairs and MTBFs (mean time between failures), plant reliability and, most importantly, reductions in energy consumption. The assignment was a huge success, with savings being identified that paid for the costs of the training many times over. The assignments submitted were nothing short of insightful. And the task of assessing whether the delegate could be rated as competent was clear in the first few paragraphs!

The whole process turned out to be beneficial in multiple ways - the delegates received excellent applied skills, the mine got clearly-defined returns for their investment, and the facilitator could reinforce his course content with some very exciting and thought-provoking case studies.

The second opportunity was during a train-



If the actual pump head is higher than the duty head shown on a nameplate, then we know that the pump must be operating far left on its curve, delivering substantially less flow at a far lower efficiency.



Figure 1. The nameplate of this pump shows the rated flow rate (280 m³/h) and total dynamic head (72 m). Note that this does not refer to the BEP of the pump, but rather the original design duty that the pump was supplied for. In many cases, the pump will be found to be operating far away from this duty, leading to major savings opportunities in energy and reliability.



Following theoretical training on pump operation, pump and system interaction and the benefits of improved efficiency, delegates walk through the plant looking for visible signs of energy wastage, such as throttling control valves, overflows, recirculation, etc.

ing session held on site at a refinery in Durban, which was different in that it combined both theory and practical applications in one course. Day one was spent on theory, with an emphasis on centrifugal-pump operation, pump and system interaction and the benefits of improved efficiency. Day two began with a group discussion and selecting two separate pumping systems for evaluation. The class was split into groups for a walk-through of the plant, where delegates were encouraged to look for visible signs of energy wastage, such as throttling, control valves, overflows, recirculation, etc.

The rest of the course involved applying pumping systems theory to the opportunities identified in the plant. Significant energy savings opportunities were identified during the walk-through, and by using these as the basis for the workshop, plant personnel were also far more receptive to being trained on optimising their own pumping system.

On the final day of the training, a list of potential projects was agreed on including a brief description of the system, what savings opportunities were identified and an approximate estimate of the energy savings anticipated. The opportunities consisted of both 'Quick fix' short term solutions as well as recommendations for longer term projects requiring a more detailed assessment or feasibility study.

Each group was required to submit an assessment report within two weeks, which was evaluated together with their attendance at the training to justify successful candidates receiving a Certificate of Competency.

In both of the above cases, substantial savings opportunities were identified, the implementation of which led to savings many times in excess of the cost of the training. This proves beyond doubt that a good skills development programme with a strategic assessment task at the end, pays!

This is how to get more bang for your training buck.

Pumps systems 101 tip: Check the actual head vs original duty head

The following example shows how easy it is to identify a major savings opportunity when conducting a plant walk-through, using only some common sense and an existing pressure gauge.

The nameplate on a pump can sometimes contain more useful information than just the pump model and serial number. In many cases the rated flow and head are also stamped on the nameplate. These do not relate to the BEP of the pump as many people think, but rather the original duty flow and head that the pump was selected for.

This is a very valuable piece of information as it tells you where the pump should be operating to be most efficient and reliable. If the measured head or flow is substantially different to these values then we know there is an opportunity for savings. In most cases, it is difficult to measure flow rate, but pressure is often available.

As an example, the nameplate on a demineralised water-processing pump showed a duty of 280 m³/hr at a 72 m head. A pressure gauge on the discharge of the pump

read 960 kPa. Although there was no suction gauge, it was possible to estimate the height of the water in the suction tank, which was used to calculate an approximate value for the pump suction inlet pressure.

It should be noted that, in many cases with a large diameter unobstructed suction, it is acceptable to ignore the friction losses in the suction pipe when working out suction pressure at the pump inlet. From the above we can estimate the pump's total dynamic head to be around 78 m. By comparing this with the duty head of 72 m, we know that the pump must be operating far left on its curve, delivering substantially less flow.

The opportunity

- Check that the discharge pressure gauge is correct and that the assumption for level of water in tank is accurate
- Find a copy of the pump curve and see where the pump will now be operating. A higher pressure head makes the pump move left on its curve, providing less flow and lower efficiency. If the pump curve is relatively flat in this region, then a small increase in head will lead to a large drop off in flow rate.
- Investigate why the friction head has increased in the system: throttled valve? scaled pipes? blocked strainer? changes to piping?
- Propose changes to the system to reduce friction: clean out pipes and strainers or make change to the pump to reduce the operating head: trim the impeller or reduce the speed. □

Why should you pay more for quality?



Improved performance with upgraded SKF Explorer spherical roller bearings

- Upgraded and optimized as part of the SKF EnCompass Field Performance Programme
- Improvements in steel composition, heat treatment, geometries, surface finishes, lubrication and seals
- Extended bearing life in the most demanding industrial applications - can last up to twice as long as previous bearings under contaminated or poor lubrication conditions.



Find out more at www.skf.co.za

Pump Rental success on copper mine

Integrated Pump Rental, in Joint Venture with EC mining, secured the contract to desilt four acid ponds at a copper mine in the DRC. This recent project follows on the successful completion of the cleaning up of two similar dams by the company at the same mine.

Managing director of Integrated Pump Rental, Lee Vine says that acid ponds and dams that have become silted have serious repercussions for a mining operation.

“It is critical that mining operations have sufficient storage capacity for solution and water, and when reservoirs are neglected and sediment is allowed to build up, the downstream and upstream processes are affected,” Vine says. This can have huge implications for the productivity of an operation.

He reports that there has been a marked increase in the demand for the company’s Slurry Blaster hydro mining equipment. “Locally developed to operate in the harshest environment, this equipment has proved itself in the field and even the most challenging applications have not been an issue.”

“We are cognisant that not all desilting and cleaning applications are the same and for this reason Integrated Pump Rental cus-

tomises the equipment to ensure an optimum outcome. Typically the Slurry Blaster is site trailer mounted for this type of task, however it can be pontoon mounted if required,” Vine says.

Each installation of the Slurry Blaster comes standard with a 37 kW feed pump with float, a 22 kW slurry pump for the removal of the slurry, a 200 m heavy duty layflat hose and an electric control panel. In applications where harsh abrasion is found, stainless steel components including pumps are used to facilitate optimum reliability and performance.

The Slurry Blaster units are available for medium or long-term rental, outright purchase and on a full turnkey project basis.

Focused on a total desilting turnkey solution, Integrated Pump Rental’s service level



Each installation of the Slurry Blaster comes standard with a 37 kW feed pump with float, a 22 kW slurry pump for the removal of the slurry, a 200 m heavy duty layflat hose and an electric control panel.

agreement (SLA) includes the provision of a full maintenance service. This entails regular inspections of pumps before and during the contract to ensure reliable operation with optimum uptime.

“By contracting a solutions provider such as us, mines can concentrate on their own business,” Vine concludes. □

Nitrogen dependent production?

Atlas Copco is a reliable partner throughout the nitrogen generation process, supplying equipment from compressors to reliable (NG) nitrogen generators. The compact NG units produce cost effective, dependable, secure nitrogen on-site eliminating transport and bottling costs. The NG units can reach the exact required purity from 97% to 99.999%.

www.atlascopco.co.za

Sustainable Productivity

New generation Etanorm is a winner

KSB Pumps and Valves' latest generation of its standardised Etanorm water pump series continues to top the sales charts in South Africa, as well as the rest of the world.

In Africa, KSB's Etanorm it has become a trusted name in the agricultural, municipal and other industries where its versatility, efficiency and reliability have made it one of the most popular clear-water pump types in use today.

Produced non-stop since 1936, the Etanorm has sold more than 1,5-million units, which have proven themselves over more than eight decades. In its latest form the range comprises 43 pump sizes, which can be driven by either 2-pole or 4-pole motors. The selection chart has also been extended with additional pump sizes, so that sizes can be selected that are the closest to the best efficiency point.

Efficient design

In intensive work with CFD (computational fluid dynamics) for flow simulation, KSB's development engineers have also optimised the hydraulic contours, making it more efficient in order to easily meet tough global efficiency requirements, including the benchmark EU requirements (ErP) of Commission Regulation 547/2012/EC for water pumps.

According to Dave Jones, regional sales manager for KSB Pumps and Valves, the engineers placed a particular focus obtaining an excellent suction and a low NPSH value, thus minimising the risk of cavitation and obtaining a smooth and stable pump operation even in difficult operating conditions. This means the pumps run reliably and contribute to a greater availability of the overall system.

He adds that the material range comprises cast iron, bronze and nodular cast iron as well as stainless steel. The diversity of materials and a large choice of seal variants have extended the suitability of the new type series to applications beyond those of water. The space allocated to the mechanical seal has also been enlarged to enhance venting to make allowance for this. The new spacious design also facilitates dismantling and reassembly of the mechanical seals.

Locally manufactured

"In line with KSB's common practice for industrial pumps, every pump will be supplied to the customer with the impeller diameter trimmed exactly to the duty point. Impeller



trimming combined with the large range of pump sizes available for selection is the only way of keeping the energy consumption of the pump to the minimum necessary.

Operators benefit from the type series

Colossus food-grade centrifugal pump arrives in SA

The largest centrifugal pump available on the South African market for the food

and beverage industry, the stainless-steel Verder Colossus, is being introduced into

South Africa by Verder Pumps.

Launched towards the end of last year as part of its new Packo range of food-grade pumps, a new centrifugal pump from Verder Pumps SA is capable of pumping beer into eight million 250 ml bottles an hour.

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

Kobus Fourie, Packo pump specialist at Verder South Africa, explains that the range has application in 11 niche sectors. These are dairy, meat and fish, textiles, wastewater and potable water, breweries and distilleries, food and beverage, washing and disinfection, surface treatment, vegetables, animal feeds and biogas, hot frying oil, petrochemicals and pharmaceuticals.

"At the moment, our campaign is focused on breweries and food and beverage," Fourie confirms. Globally, a demand for increased production capacities and more efficient processes in the food and beverage industry has seen a need for stainless steel pumps



Verder South Africa has launched its Colossus pump, the largest centrifugal pump available for the local food and beverage industry.



KSB Pumps and Valves' new Etanorm pump follows an 80-year trend of proven reliability.

Curve pump proves its capability

Pump and Abrasion Technologies® (PAT) unveiled its new Curve™ range of pumps in September 2016. Among the first South African companies to adopt this new technology was Hernic Ferrochrome who currently plans to retrofit all the pumps at their OB-Plant to the Curve range.

“The Hernic Ferrochrome retrofit was in effect the first true test of the Curve S150 pump,” says James Pienaar, PAT sales director. “The changeover of all existing pumps at Hernic Ferrochrome’s OB-Plant to the Curve range is a process that takes time, but we are currently standing at close to 10 pumps installed and operating at the OB-Plant.”

The S150 offers several innovative features that make it an ideal candidate to meet Hernic Ferrochrome’s operational needs. These include: a one piece volute liner; fully profiled impeller vanes; adjustable throat-bush; enhanced cutwater profile; and a clip-in suction joint. Sealing performance and life have been addressed by a larger diameter expeller and high chrome shaft sleeve and lantern ring. The Curve S150 also features a discharge piece designed to eliminate the need to remove the discharge pipe during routine maintenance.

According to Pienaar: “The major benefit in investing in the Curve is cost saving. Through the use of the latest design and technology, these pumps are more efficient and highly durable and thereby reduce the Total Cost of Ownership.”

PAT has been monitoring the performance of the first pumps installed at Hernic

Ferrochrome’s OB-Plant on an on-going basis and the results underline the Curve’s operational performance. “One of the most astounding results we have seen so far is a 73% reduction in downtime. The pump is only opened every third maintenance cycle due to its longer wear life. This was measured in comparison to the wear life and required maintenance of the previously installed pumps,” Pienaar says.

Along with this, maintenance on the pump was reported as being easier for the client as compared to their experience with previous pumps. This is due to inherent features such as: the pump’s encapsulated one-piece volute liner reduces opening and closing time by 80%; eye bolts allow for safe removal of the casing; the casing assembly is a balanced load for safe handling; and the discharge pipe no longer needs to be removed when opening the pump thanks to the newly designed discharge piece.

Pienaar says that the pump also reduced electricity consumption due to its efficient design. “An 8.0% power reduction was reported. This power saving is achieved through the improved impeller and volute profile design. Slurry follows through the pump in a more natural flow pattern. A uniform wear design means that the hydraulic profile is maintained and efficiency remains higher for longer.”

Additional benefits that the client reported with this pump include quick and easy dismantling, inspection and reassembly; improved safety when working on the pump; excellent sealing over the trial period; and zero choking. □

being manufactured at four different sites – in Germany, India, China and South Africa – which all comply with the same quality standards. This makes global procurement much easier and insures pumps and spare parts are readily available. □

with flow rates in excess of 1 000 m³/h.

Responding to this latest market trend, Verder South Africa has launched its Colossus pump, an extension of Packo’s MCP3 and MFP3 pump range. It weighs 1.6 t, and offers a flow rate of 1 200 m³/h from its 200 kW motor.

While many breweries still use cast-iron pumps for higher flow rates, the stainless-steel design of the Colossus is much more hygienic. “It is likely to become the standard in the food and beverage industry in the future,” Fourie comments.

The MCP3 and MFP3 pumps are also energy-efficient and easily maintained, with an electro-polished finish that is highly corrosion-resistant and easy to clean. Applications include dairies, breweries, and distilleries. The pumps are a particularly reliable option for filtration applications, pasteurisation, yeast propagation, and in cleaning systems.

Fourie reveals that Packo itself is undergoing an expansion and renovation of its facilities, which will allow it to manufacture and test pumps with a flow rate of up to 2 000 m³/h. □



Hernic Ferrochrome is currently retrofitting the pumps at its OB-Plant with Curve S150s from Pump and Abrasion Technologies.

Cast resin transformer technology

an efficient low-risk option

GreenErgi (Pty) Ltd, the sole distributor of cast resin transformers (CRTs) from Trafo Elettro Italy, has established a relationship with Martec – now part of the Pragma Group – to take this dry-type transformer technology further. *MechChem Africa* talks to Mervyn Low, the company's MD.

A dry-type transformer, says Low, has no oil in it, which has a number of benefits. "There are several types of dry-type transformers. The first-ever transformers were open wound transformers where the coils were visible and these were air-cooled. One of the major drawbacks of this type of transformer is that the coils are not kept structurally rigid in fault conditions. Currents passing through a transformer coil produce forces – (Fleming's left hand rule) – and if these currents are excessive, such as in short circuit conditions, then the transformers are subjected to very large radial and axial forces, which very likely will damage the coils," he tells *MechChem Africa*.

"Mechanically, it is very important to keep a transformer's coils as rigid as possible and prevent any movement of the windings, which is where cast resin type transformers come in," he continues.

Describing the construction of a typical cast resin transformer, he says that, instead of rolling transformer wire onto a cotton-reel-like core, "we use flat foil windings like those on a roll of paper towel or an old-fashioned film reel. Usually the windings are made from aluminium foil but copper is also used. Separating the winding is a double layer of insulating film. For the HV coil for cast resin transformers we connect ten or more of these pancake coils in series and stack them in columns to form the complete coil. Compared

to conventionally wound transformers, this pancake/foil coil construction reduces inter-turn stresses with the benefit of increased resistance to high-voltage impulses," Low says.

"The high voltage (HV) coils and the low voltage coils (LV) are nested in the same column on a common core, with an air gap between them for cooling. For transformer with higher power ratings, the LV coils are manufactured with gaps in the LV winding itself to promote airflow for better cooling. The cast resin HV coils, due to their construction, have the benefit of significantly reduced partial discharge – typically less than 10 pC (picocoulomb)," he explains.

"For three-phase cast resin transformers, we use an EI-core with the I forming the yoke across the top to close the magnetic flux circuit. Mechanically, the construction is very simple and this enables us to make these transformers robust and reliable," he adds.

But it is the construction and materials used that make this technology electrically efficient and safe.

Describing the material used for the cores, Low says they are made from grain oriented silicon steel (GOSS), which reduces the induced losses associated with the magnetic flux. "Transformers are constantly running at 50 Hz. Depending on the grade of steel, the losses in the core can be minimised by reducing the material's 'resistance' to the magnetic flux. Reduced losses translate into less heat



generated in the core which, over the life of the transformer, are significant," he adds.

From an efficiency perspective, he says distribution transformers are typically connected all the time. "From an 11 kV three-phase supply, these would typically be stepping the voltage down to 400 V phase to phase (or 230 V phase to neutral) on the LV winding. Even if no LV current is being drawn, the transformer is still idling, with switching 50 Hz flux heating the core – and this is going on 24/7/365 over the life of the transformer.

"A resin type transformer was installed in 1983 at the BMW Rosslyn plant and this is still in operation today. If it had a more energy efficient core, just think how much energy could have been saved over those 30+ years," Low suggests, "and we can also now use an amorphous core material, which offers even better efficiencies as the composition of the core reduces the eddy current losses significantly," he adds.

As well as core losses, all transformers exhibit I^2R or copper losses, which produce waste heat in the windings as the transformer is loaded. Transformers can be made more efficient and the losses reduced by using more/thicker winding material, which reduces the resistance and hence the losses.

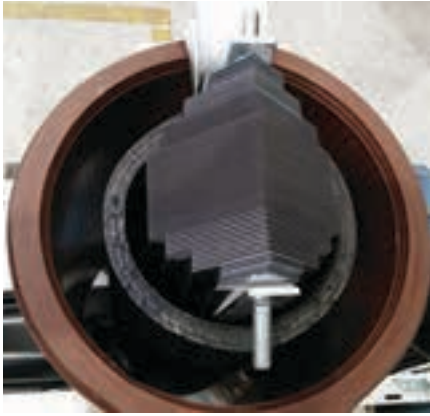
Regarding the choice of coil winding material, "we use aluminium foil/strip as the conductor material, for a number of reasons: it's cheaper than copper; the expansion coefficient of Al is closer to that of the resin we use, which reduces the expansion stresses and the likelihood of expansion cracks; over and above this, aluminium is not as great a target for theft compared to copper," Low continues.

Describing the HV coil manufacturing process, he says that a double layer of insulation is placed between the flat aluminium strip during the winding process. "This creates a double layer of insulation between each loop of the pancake coil whereas some manufacturers use a single layer," he explains.

The coils are then connected in series and stacked on top of one another – suitably spaced



GreenErgi can offer 11, 22 and 33 kV cast resin transformers, with the largest supplied to date in South Africa being a 5.0 MVA unit for the Stortemelk Hydro plant near Clarens.



The high voltage (HV) coils and the low voltage coils (LV) are nested in the same column on a common core, with an air gap between them for cooling.

of course. Once the full stack of coils has been connected, the stack is reinforced, inside and out, with glass-fibre matting and placed into a mould. The moulds are placed inside a vacuum chamber to remove air. The resin must be pumped in under vacuum to prevent bubble formation, which would very likely become a source of partial discharge (PD) in the HV coil. Once the correct vacuum level is reached, the heated epoxy resin mixture is pumped into the mould to encapsulate the entire coil.

"The coils are then heated and cooled in an autoclave at closely controlled rates to maximise the strength of the cast HV coils.



For CRTs, instead of rolling transformer wire onto a cotton-reel-like core, flat foil windings are used.

The vacuum casting and baking process have crucial and ensure that each HV coil is very solid and rigid and able to withstand mechanical stresses and exhibit extremely low levels of partial discharge," he tells *MechChem Africa*.

In addition, the fibre-reinforcement gives the coil the lateral strength to resist cracking due to expansion or shock loading forces. "The result is an extremely strong coil that can safely operate at transformer temperatures between -25 to more than 120 °C," Low says.

A fire-retardant resin composition is responsible for the extremely low fire risk associated with cast resin transformers, while

precise outside and inside resin thicknesses enable sufficient air-cooling. "The enemy of coil-based machines such as transformers, motors or generators, is heat," Low notes.

"For CRTs, air gaps between the HV and LV coils as well as the LV coils and the core allow cool air to enter the bottom, which rises due to convection and cools the transformer. The upright design enables cooling via natural convection in most cases, but if the transformer is placed inside an enclosure, then the enclosure needs to be designed to allow for adequate ventilation to enable the heat to dissipate into the atmosphere. →

RELIABLE ENERGY SOLUTION

for the entire industry.

- 1 Overhead Lines
- 2 Distribution Transformers
- 3 Motor Control Centres
- 4 All Weather Outdoor Control Panels
- 5 Diesel Generator
- 6 Push Buttons and Pilot Lights
- 7 Motor Protective UF Switchgear
- 8 Direct Online Starters (DOL)
- 9 LV Motors and Drives
- 10 Invertor Vibrator Motors
- 11 Mini Substations
- 12 MV Motors
- 13 MV Generators
- 14 Automation Control Rovers
- 15 MV Switchgear
- 16 Tiger Ring Main Unit
- 17 Power Transformers

The Zest WEG Group has been servicing the mining, infrastructure, construction and manufacturing sectors for more than 35 years and by leveraging best practice engineering and manufacturing capabilities, the group is able to offer a range of standard off-the-shelf products as well as end-to-end energy solutions.

An in-depth understanding of the operational conditions found across all these sectors and years of experience have ensured that the Zest WEG Group service offering is fit-for purpose.

Tel: +27 11 723 6000

www.zmfweg.com



Pt100 temperature probes measure the temperature on each of the LV coils, and a temperature controller designed for cast resin transformers manages the fans and alarm and trip alerts.

→ “If needed, however, we can also incorporate squirrel cage fans to the system, one placed on each side of each transformer coil. Then, when the LV winding temperatures reach 70 °C or so, the fans kick in to force-cool the transformer until the temperature subsides to a temperature of 60 °C.

Pt100 temperature probes measure the temperature on each of the LV coils, and temperature controllers designed for cast

resin transformers manage the fans and alarm and trip alerts are made available to prevent the transformer being damaged due to overheating,” Low explains.

Why is the use of cast resin transformers growing? “Many projects have and plan to implement dry-type cast resin transformers. This is mostly related to the much higher fire risk associated with oil-filled transformers,” he responds.

With respect to costs, he says that the capital costs are largely dependent on infrastructure. “Typically oil-cooled transformers are separated from the main building with a bund wall to contain the oil in the event of a leak and a fire suppression/detection system. Furthermore high current LV cable has to be run much longer distances to connect into the facility’s electrical systems.

“By installing a resin cast transformer, which can be located in the centre of a building in a basement very close to the LV switchgear, cabling costs can be significantly lower – 120 m of LV-cabling for a 2.0 kVA transformer can cost close to R1-million – and no additional civil works are required for an external outdoor substation.

More importantly, the long-term operational costs come down dramatically, first because of lower energy losses (I^2R) in the LV cables, but also because cast resin transform-

ers require lower maintenance requirements. An oil-filled transformer should be constantly monitored and if possible an annual DGA (dissolved gas analysis) performed. This all adds to the TCO (total costs of ownership). Cast resin transformers simply need cleaning occasionally and the bolts re-torqued,” Low informs *MechChem Africa*.




GreenErgi can offer 11, 22 and 33 kV cast resin transformers, with the largest supplied to date in South Africa being a 5.0 MVA unit for the Stortemelk Hydro plant near Clarens. “Grid connected hydro, wind and PV plants are ideal applications for cast resin technology. The plants are often geographically remote, so ease-of-maintenance becomes more important as well as product reliability over the lifetime of the plant.


Total ownership costs are a big thing for owner operator plants on tariff-based procurement contracts, because ongoing costs directly impact long-term profitability. More efficient and maintenance friendly cast resin transformer technology is, therefore, often a preferred solution.

General industry is the biggest user of power, however, and here too, the long term savings can be significant. We have transformers in hospitals, hotels, office parks, exhibition centres, fuel refineries, water treatment plants, and factories,” Low concludes. □

DONALDSON FILTRATION

The most extensive range in filtration and dust extraction technology

<p>DFE The NEW Downflow Evolution Cartridge filters</p> <div style="text-align: center;">  <p style="font-size: 2em; font-weight: bold; color: #0070C0;">40%</p> <p style="font-size: 0.8em; color: #0070C0;">UP TO FEWER FILTERS & SMALLER FOOTPRINT</p> </div>	<p>SVU Industry leading technology in Silo Venting Applications</p> <div style="text-align: center;">  <p style="font-size: 2em; font-weight: bold; color: #0070C0;">54%</p> <p style="font-size: 0.8em; color: #0070C0;">UP TO SMALLER THAN TRADITIONAL SILO VENTING COLLECTORS</p> </div>	<p>Powercore Smaller, Smarter Dust Collectors</p> <div style="text-align: center;">  <p style="font-size: 2em; font-weight: bold; color: #0070C0;">50%</p> <p style="font-size: 0.8em; color: #0070C0;">UP TO SMALLER THAN TRADITIONAL BLACKHOUSE COLLECTORS</p> </div>
--	--	---



+27 (0) 11 997 6000

0860FILTER (345837)

SAMarketing@donaldson.com

www.donaldson.co.za

Aluminium offers benefits in transformer windings

Global specialist, WEG Transformers, has successfully manufactured thousands of transformers with aluminium windings, even though, historically, copper has mostly been the material of choice. It turns out that either metal gives the transformer the same quality of operation and performance.

While copper has been assumed to be the material of choice for transformer windings, global specialist WEG Transformers has successfully manufactured thousands of transformers with aluminium windings.

An important factor behind this is the likely future increase in the price of copper, as worldwide reserves of the metal gradually decline. The price of copper has fluctuated greatly in the past and has recently risen much faster than the price of aluminium, making the winding of conductors with aluminium increasingly attractive.

After years of testing, it has been established that there are no significant differences between the use of aluminium windings and copper windings in designing and manufac-

turing distribution transformers, as well as small to medium power transformers. Either metal gives the transformer the same quality of operation and performance.

Since 1970, aluminium was used intensively in the United States and the technology of aluminium-wound transformers was further enhanced; it has now gained widespread acceptance in European countries and other parts of the world.

One of the myths that has been disproved is the belief that aluminium-wound transformers are associated with bigger power losses. While the aluminium conductors are larger than copper conductors, they are lighter. The result is that the mass of the core in an aluminium transformer is 5.0 to 20% more, but the total transformer mass is almost the



WEG Transformers has successfully manufactured thousands of transformers with aluminium windings.

same – for the same level of electrical loss.

With regard to the respective thermal properties, aluminium has a lower melting point than copper but it is still well above the real working temperatures of the windings. In normal circumstances, the 'hot-spot' temperature in the windings is between 105 °C and 120 °C, while aluminium only melts at 665 °C.

More importantly, the lower thermal conductivity of aluminium does not affect the performance; the temperature differences in the conductor are negligible in relation to the temperature difference between the ambient air and the windings. □

Motors hunger for power

Over 40% of global electricity is consumed by electric motors, and the figure for South Africa is higher still, according to Zest WEG group sales engineer, Machiel de Bruyn.

"This is an indication that most farmers are not fully aware of how much their motors are costing them in electricity," says De Bruyn. "In turn, this explains why many farms hang on to old, inefficient motors for longer than they should, thinking they are saving money."

Farms incur particularly high electricity costs to drive pumps working in energy-heavy applications such as irrigation. While in previous decades the price of electricity was much lower and less of an impact on the financial bottom line, rocketing energy costs in recent years have meant that the electricity bill is now a major factor in farm viability and profitability.

De Bruyn says the cost of running a motor, even viewed over just 12 or 24 months, is many times greater than the motor's original purchase price. "Up to 90% of an electric motor's cost of ownership relates to the power it consumes, so it may not make sense to keep repairing a low-efficiency motor in the belief that this is a cost-saving exercise," he says. "In fact, modern high-efficiency motors can pay for themselves in a relatively short time, and then start saving the farm money into the future."

An effective strategy employed by some of the country's most successful farms has been to steadily replace the older, less efficient motors whenever they fail. This approach provides an affordable way of working towards a lower-cost operation, without having to jettison existing assets.

Zest WEG Group was the first equipment supplier to move from IE2 compliant (high efficiency) to IE3 compliant (premium efficiency)



Zest WEG Group has a comprehensive product and solutions offering for the agricultural sector, including IE3 compliant (premium efficiency) motors, which can also be installed with variable speed drives (VSDs) in order to minimise electricity costs and, therefore, total costs of ownership.

motors, raising the bar with WEG's fit-for-purpose design for the African market. Using even less electricity than the old IE2 units, WEG IE3 motors were introduced at no additional cost to Zest WEG Group customers.

De Bruyn says many farmers have also reduced energy costs by installing variable speed drives (VSDs), which control the speed at which motors run depending on the required power output at any stage in the pumping cycle.

"Combining VSD technology with the new WEG IE3 motors gives farmers two of the best strategies for improving their cost structure in respect of power consumption for activities like irrigation," De Bruyn concludes. □

African hydropower plant achieves international recognition

Several of Aurecon's local hydropower development clients, including Renewable Energy Holdings (REH), have recently received international recognition for their successes, marking a stamp of approval for the progress of the hydropower industry in South Africa.

Many African countries, notably South Africa, operate in coal-fired energy economies. Energy constraints have historically been a major inconvenience in South Africa, despite Government having gone a long way in dealing with the energy shortages in the country but also diversify energy sources to more sustainable alternatives.

Hydropower is part of South Africa's long-term energy master plan, with the goal of sourcing 2 600 MW of hydro-electric capacity from the Southern African Development Community (SADC) region. While private sector investment in the Independent Procurement Programme continues to operate under uncertainty, a few local hydropower plants have recently received international recognition, marking a stamp of approval for the progress of the local industry.

One of Aurecon's clients has been awarded a 2017 Monsonyi Award for Excellence in Hydropower from the International Hydropower Association (IHA). Presented to Anton-Louis Olivier, managing director

Anton-Louis Olivier, managing director of Renewable Energy Holdings (REH).



of Renewable Energy Holdings (REH), at the World Hydropower Congress, which was held in Addis Ababa from 9 to 11 May, the award recognises individuals within IHA's membership for outstanding contributions to the sector.

"I am honoured to win this award," said Olivier. "Huge potential exists for hydropower development in Africa and we have achieved many notable goals over the past decade. I would like to thank my team at REH as well as all of the technical advisors, engineers, consultants and stakeholders that helped us bring our visions to life."

REH is one of the first independent power producers (IPPs) in South Africa. The company develops hydropower plants from the green-field stage through to financial close and also operates the plants. Since 2002, Aurecon has



Stortemelk Hydro plant.

partnered with the company and together the firms have successfully developed and implemented three small hydropower plants: Stortemelk Hydro and, as elements of the Bethlehem Hydro Project, Merino Hydro and Sol Plaatje hydropower stations, as well as currently working on several other schemes.

The Bethlehem Hydro Project was initiated to generate renewable electricity from the constant flow of water, which runs into the Ash River as part of the Lesotho Highlands Water Project. Aurecon was appointed to undertake the project management, detailed design, construction supervision, ECO monitoring and contract administration duties for Merino and Sol Plaatje mini-hydro stations after completing the feasibility study in 2002, and assisting with environmental approvals for the project. The two sites were commissioned in 2009 and 2010 respectively.

The Stortemelk hydropower plant, developed under a Project Finance structure, has an installed capacity of 4.4 MW and operates as a run-of-river power station with an estimated annual output of 28 GWh. A single vertical

Winning the case for small hydro

Can South Africa's highly successful Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) be made even better? One man certainly felt it could be if changes were made to the network requirements for small hydro.

The REIPPPP has stimulated an investment commitment by the private sector in excess of US\$14-billion, and the award of 64 projects predominantly in wind and solar. But small hydro, a valuable source of renewable energy for countless millennia, was at risk of losing out!

Jimmy Goulding, a technical director and electrical technologist with Cape Town-based Energy Unit of global engineering and infrastructure advisory company, Aurecon, championed the cause of small hydro in a determined effort to ensure its rightful place

in South Africa's energy future.

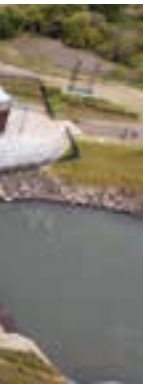
"In 2014, I considered that if improvements were made to the newly introduced Version 2.8 Grid Code for Renewable Power Plants (RPPs) to make the Code more compatible with viable small hydro technology, it would open the door to small hydro development in our country," says Goulding. "The necessary changes, as I saw them, specifically related to the Grid Connection Code for RPPs connected to South Africa's electricity transmission or distribution system, as well as the clauses in the Code relating to meteorological data requirements and forecast data.

"Everybody in the industry understood that changes to the Code were required to ensure small hydro was a viable option under the REIPPPP. With years of experience in both hydro and Grid Code compliance, Goulding stepped forward and set out to

develop recommended changes to the Code for discussion with the National Energy Regulator of South Africa (NERSA) and the South African power utility, Eskom," comments Paul Nel, Aurecon's unit manager for Energy & Resources, Cape Town.

The introduction of the REIPPPP Code was achieved with admirable speed, and reflected the fact that wind and solar power would be the major renewable contributors to the electricity grid. Consequently, the drafting of the Code was based on inverter type technologies, whereas, unlike wind and solar, hydro generators are synchronous machines. This fundamental technical issue, among others, was at odds with the requirements of the Code and effectively constrained the development of small hydro.

"Once wind and solar were successfully on track, it was a case of drawing the attention of the authorities to the fact that, although of lesser potential, small hydro



The Sol Plaatje mini-hydro station.



Bethlehem hydro-power project.

Kaplan turbine was installed in a powerhouse alongside the existing Botterkloof Dam, situated on the Ash River in the Free State province of South Africa.

Aurecon acted as the EPCM contractor on the project and was responsible for the entire project management, detailed design, construction supervision, ECO monitoring and contract administration, as well as the Health & Safety oversight. The construction commenced in October 2014 and 22 months later reached commercial operations date in July 2016, on time and within the project budget, without using any of the project contingencies.

"We are proud to have been involved in these projects, which delivered many firsts for hydropower stations in South Africa," says Bertrand Rochecouste Collet, technical director, Aurecon. "Aurecon's professional relationship with REH Power Development over the past 15 years has been extremely rewarding and we look forward to working with them on several new hydropower projects in the future."

Aurecon engineer, Ross Mahaffey, who attended the 2017 World Hydropower Congress on behalf of the Aurecon team, commented on the company's long-standing involvement in hydropower, saying: "Developers face a number of challenges with regard to implementing hydropower projects in South Africa and it is crucial that we share our experience and findings at international platforms such as the World Hydropower Congress."

"With over 75 years of experience in providing design and management services for all types of dams and hydropower, the company, with its fully in-house expertise, is well-positioned to help clients with everything from specialist engineering and logistics to interconnections facilities, licences and Power Purchase Agreements," Mahaffey concludes. □



Lesotho Highlands water.



Stortemelk Hydro plant.

could have a worthwhile future. Especially considering that, unlike wind and solar, hydro has very high levels of availability that could be unlocked if certain changes were made to the Code," says Goulding.

The key issue with the Code was that it required a hydro facility to stay connected to the grid under some specific network disturbances, which would have been extremely complicated given the different nature of these types of machines.

"To comply with the Code, small hydro units would have had to be designed with massive flywheels to ensure they had enough momentum to 'ride through' the faults. Ultimately, this would have made the designs exorbitantly expensive and unfeasible," explains Goulding. "Other issues that I felt needed to be raised included the way energy forecasts had to be done based on meteorology that was incompatible with the characteristics of small hydro generators."

After pursuing a lone campaign for a considerable time, the value of Goulding's expertise began to be appreciated and he was asked to chair a small hydro work group to discuss his proposals with the system operator Eskom. The engagement process started in November 2014 and presentations of proposed amendments for the Code were made to the Grid Code Advisory Committee and an industrial expert team in October 2015.

Once these two bodies accepted the proposals, they were drafted by Eskom into a new Code for presentation to NERSA for their approval. This led to a proud day for Goulding, when the Version 2.9 revision of the Grid Code was published in November 2016.

"I believe a key lesson learned is that, too often, problems such as the issues I had with the Grid Code for small hydro facilities are dismissed as the government's problem," says Goulding. "Eskom and NERSA are to be

commended for their willingness to work with industry experts to develop regulatory Codes that facilitate beneficial technological development. It is tremendously important for the private sector to be actively engaged in helping to define this country's energy future," he concludes.

"We congratulate Jimmy Goulding on a remarkable achievement. He has established himself as an industry leader in this field and his individual services are being sought by Aurecon's clients," says Nel. "There are currently four small hydro projects in South Africa that have either been developed or are being developed and will benefit directly from the 'Goulding' changes to the Code, saving developers millions of rands in engineering design and compliance mitigations. Most importantly, small hydro has come in from the cold and future development is now realistically possible and financially viable," he adds. □

New high-tech energy-efficient water heating solutions

Hot water costs can account for 40 to 60% of users' total electricity bills. HydraTherm, the newest player in the highly competitive water-heating sector, offers solutions for the commercial, industrial and residential markets from a growing range of high quality, high-tech, energy-efficient heating solutions.

HydraTherm co-founder, Michael Alton, says: "Our expertise lies in the design and specification of centralised hot-water plants for any project – we offer solutions for clients from large commercial enterprises right through to domestic home owners. We've used that expertise to develop our own brand of water-heating technology under the HydraTherm brand, and we can confidently promise the solutions the market is looking for.

"We set out to create high-quality, affordable and long-lasting hot-water solutions for private homes, the hospitality industry, the agricultural and healthcare sectors, and we have achieved that aim. Quality and performance are at the forefront of our product philosophy. For this reason, we use only the very latest technology, with all parts and components carefully selected and tested to ensure ultimate efficiency, reliability and durability."

The HydraTherm range currently includes integrated heat pumps and split hot water heat pumps, with gas water heaters and solar collectors in the final stages of development and due for launch later this year. "The

HydraTherm integrated heat pump is an energy-saving, cost-efficient solution for private homes, while the split heat pump offers a solution for industry at a highly competitive level of investment where payback periods are minimised and returns are maximised," says Alton.

HydraTherm's split heat-pump systems use enhanced vapour injection (EVI) technology combined with highly efficient air-to-water heat exchangers to ensure improved efficiencies in a wide range of ambient temperature conditions and nominal coefficient performance figures of up to 4.5 to 1. For residential projects, HydraTherm can show that choosing the HydraTherm heat pump instead of a conventional geyser can save end users as much as 70% of their hot water costs.

Alton's experience dates back to 2006 when, still a student, he launched a successful solar water-heating company, which was one of the first to participate in the ESKOM SWH rebate programme. He then took up a position at another company in the same sector, where he and his team piloted the ESKOM heat pump rebate programme, sustaining double-digit growth over the five-year period he was there. In 2014 he was the executive lead on the launch of a new SABS-SANS 151



The HydraTherm range currently includes integrated heat pumps and split hot water heat pumps, with gas water heaters and solar collectors in the final stages of development and due for launch later this year.

compliant integrated heat pump.

"At HydraTherm we are continuously seeking new ways to deliver efficient solutions to water heating challenges," says Alton. "As Eskom continues to cap the total power offered to new developments and the price of electricity increases, it is making more and more economic and practical sense to embrace solar and natural/LPG gas for water heating. We are therefore currently developing solar collectors and gas water heaters, which will be available this year."

But innovative products are not where it ends: HydraTherm provides the full spectrum of services to their customers, from initial consultation all the way through to personal after-sales service and revolutionary cloud support.

"Where unique solutions are required, we also design heating products on demand, to meet exact specifications," adds Alton. "We are very excited to launch these sophisticated products and look forward to revolutionising this sector." □

Enhanced vapour injection (EVI)

EVI injects a small amount of refrigerant gas from the condenser through an expansion valve and then into a refrigerant heat exchanger (economiser). This injected refrigerant gas is then passed back into the compressor.

In the economiser the chilled injection of refrigerant is used to cool the main refrigerant down, which further lowers its pressure before it enters the main expansion valve.

On passing into the compressor, the injected vapour also cools the overheated refrigerant gas, allowing the compressor to compress the refrigerant to higher pressures.

The net result is higher heat pump efficiency and performance. By injecting the lower temperature gas, the condensation temperature is higher therefore higher flow temperature is achievable. □

New acquisition boosts steam and combustion offering

Energy Partners, a leading supplier of energy solutions in South Africa and part of the PSG group of companies, has announced the acquisition of refurbished coal-, oil- and gas-fired packaged steam boiler suppliers, Dryden Combustion. This acquisition falls within the Steam and Combustion division of Energy Partners that focuses on the supply of steam energy, boiler control and the optimisation of systems.

The sale, which took effect in January 2017, will enable the group to provide the full spectrum of services and equipment to users of steam in industry in southern Africa and beyond, facilitating a one-stop-shop experience for customers.

The acquisition sees national sales man-

ager – Steam & Combustion for Energy Partners, Jonathan Probert taking the reins as CEO of Dryden Combustion, with company directors, Gordon Slater and Sue Kiley remaining with the business until the end of 2017.

"We are very excited about the prospects for future growth and development that this deal brings into play. It is a major step forward in terms of the opportunities it opens up to expand the scope of both companies' operations, including better penetration into their respective markets, improving efficiencies of both outsourced and user-owned boilers and ancillary equipment and achieving meaningful operating cost savings to the benefit of customers," Probert comments.

Load bank system supplied into Botswana

Vert Energy, distributors of ASCO power switching and control components in Southern Africa, has supplied its first load bank system into Botswana.

Peter Investments has acquired an ASCO Froment load bank, which will be used for load testing, to ensure reliability of generator sets and standby power systems. This system will be trailer-mounted and used at various sites around the country, including government infrastructure, telecommunications, mining and game lodges.

ASCO load banks, which are designed to replicate working load conditions, provide electrical loads for testing power sources – including generators and uninterruptible power supplies (UPS).

“A well-planned, preventative maintenance programme, that includes load testing of a generator set, is vital to reliable operation and extended service life of the standby power system,” says Ryan Robertson, director, Vert Energy. “Load banks offer efficient power test solutions and also reduce the harmful effects of ‘wet stacking’ and glazing problems caused by under-loading of the generator.

“Wet stacking – the primary cause of failure of diesel engines in backup generating systems – occurs when unburned fuel accumulates in the combustion chamber, reducing engine ratings and affecting performance. Load banks used as part of proactive maintenance, improve efficiency of the diesel engine and significantly increase service life.”

This combined ASCO Froment load bank

(resistive/inductive) with Sigma load control and instrumentation hardware, allows fully variable power factor loading and can test generators up to 800 kVA at 80% load.

Resistive elements and inductors of ASCO load banks are connected to the supply on test by electromechanical contactors fitted internally within the load bank. The easy to operate Sigma system ensures flexibility in automatic load control and provides cost-effective solutions to power testing requirements, which often require high level instrumentation, data capture and verification.

Vert Energy’s ASCO range also encompasses transfer switches and controls, as well as Avtron load banks. Other electric power generation (EPG) components include Leroy Somer alternators, API Covrad radiators and customised control panels.

Also in the range are NSM single and three-phase two-pole alternators for portable power, as well as ac and dc two-pole welders and permanent magnet generators (PMG).



Vert Energy has supplied an ASCO Froment load bank to Peter Investments Botswana. From left: Peter Kgosi-moloi, Peter Investments Botswana; and Vert Energy’s managing director, Grant Robertson.

AllightSykes MSGEN2 lighting towers, which offer over 50 000 hours of light per unit, are also available.

A critical part of Vert Energy’s solutions service is to meet growing demand from generator set builders and electro-mechanical power transmission industries, to ensure there is no interruption in power supply as a result of load shedding or mains failure.

Through an extensive range of quality branded EPG products and a highly skilled team of factory and OEM trained technicians, the company plays a major role in providing dependable power to companies, even in Africa’s most remote regions. □

Probert adds that the deal also provides a strong foundation for developing new products and services to better cater to the diverse requirements of the market.

“The acquisition enables Energy Partners to extend its reach, bringing substantial value-added benefits to more customers with world class boiler repair and refurbishment capabilities, as well as an array of high-efficiency steam controls and energy optimisation systems,” he says.

Probert notes that the acquisition opens up a host of opportunities in an industry with considerable scope for outsourcing services at present. “We estimate that less than 10% of steam users in our market, encompassing industrial, commercial and service organisations, have adopted outsourcing solutions to date.”

“Steam users who convert to outsourcing as provided by Energy Partners stand to gain higher production efficiencies – regardless of how sophisticated their existing boiler plant is – compared with systems being operated in-house,” he says.

“In recent years, Energy Partners has been gathering momentum in its ongoing drive towards changing the traditional pattern of steam production management. The accumulation of sites, where we can demonstrate the success of the concept to potential new customers, has helped us in this regard.”



Energy Partners has acquired refurbished packaged steam boiler suppliers, Dryden Combustion. From left to right: Jonathan Probert, Jean Le Roux, Sue Kiley, Gordon Slater.

“By showcasing our successes to potential customers, including allowing them the opportunity to confirm directly with our existing customers that outsourcing is effective and yields significant benefits, we provide the motivation needed to make the switch,” Probert concludes. □

MOVITRANS improves handling

MechChem Africa's Peter Middleton visits Sasol's wax packaging plant to find out about its use of SEW-Eurodrive's MOVITRANS® contactless energy transfer solution to manage the transfer of loaded pallets from its robot packing cell.

Sasol Wax and Solvents is a leading global producer of a comprehensive range of mineral oil-based and synthetic paraffin waxes, petroleum jellies and liquid paraffins, the company's GTL process making Sasol's waxes unique to the market.

Sasol's waxes are derived from sustainable feedstock, ie, natural gas, and offer superior performance in a variety of applications thanks to a combination of high melting points, low viscosity and excellent hardness, even at elevated temperatures.

Sasol exports to more than 200 countries for a wide variety of applications: adhesives; bitumen modification; construction board; cosmetics and pharmaceuticals; industrial applications; packaging; and polymer processing, rubber and tyres. Candles are also a major market for its waxes, while some co-products are used in products as diverse as bore hole-drilling fluids/muds.

In the cosmetic and pharmaceutical industry waxes are used as softeners in lotions and creams such as cleansing milk, lipid-replenishing cosmetics and sun protection agents. They are also used as the base for creams, lipsticks, rouge and eye cosmetics such as eyeshadow, eyebrow pencils and mascara.

Other applications range from shaving foam, hot and cold depilatory waxes to thermal therapy, which exploits the outstanding heat storing properties of synthetic paraffin waxes.

Wax packaging

"Sasol offers a massive range of hard and medium waxes, all with different product codes, colours, hardness and other special properties. As soon as a pallet is fully loaded with the correct wax, it is rolled down its conveyor towards the aligned transfer trolley. Once on

the transfer trolley, the pallet is moved across to align with the exit conveyor, which then takes the pallet out of the cell to the pallet-wrapping machine.

MOVITRANS replaces the chain

The two transverse trolleys, each servicing conveyor lines from one of the packing robots, used to be powered via drag chains in the centre of the rails. The transverse pallet trolleys each have two motors, one to drive the conveyor rollers and another to move the trolley along the rails. These were powered via a drag chain that carried the power and communication cables.

According to Sasol, this was problematic. Wax would clog the chain links, impeding its free movement; operators would have to step into the cell to align the trolleys properly, often standing on the chain; and the chain would break causing production stoppages for repair or replacements. In addition, this

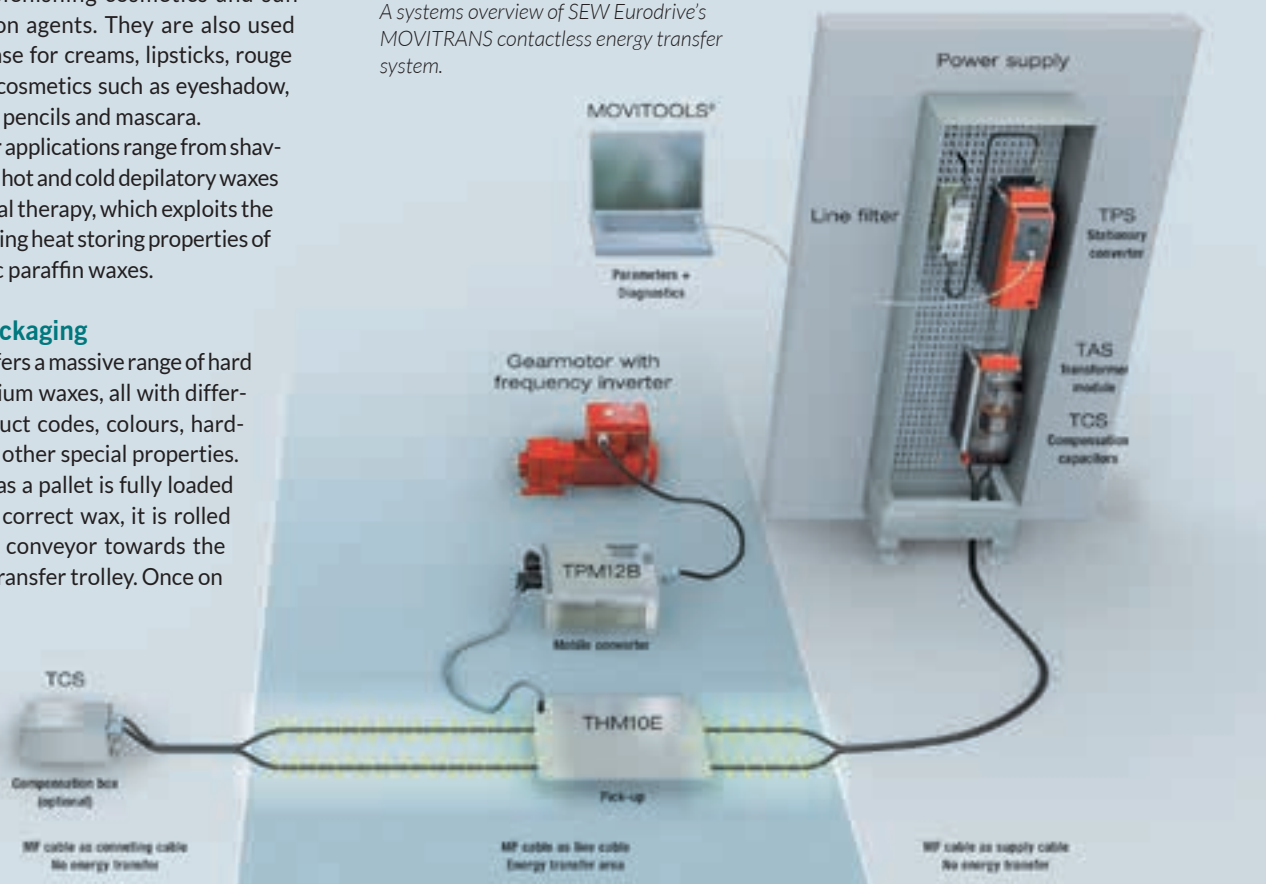


Sasol's Wax's products, such as these wax beads, are derived from natural gas and offer a combination of high melting points, low viscosity and excellent hardness, even at elevated temperatures.

palletising system runs 24/7, so any downtime creates serious problems.

Hence, when Sasol learned about the contactless energy transfer solution from

A systems overview of SEW Eurodrive's MOVITRANS contactless energy transfer system.



g reliability in wax plant

SEW-Eurodrive, the company was immediately interested.

SEW's new system was installed in two phases, starting with the instrumentation and communication side. A wireless profibus system was installed to send control signals to the moving trolleys to avoid the need for communication cables in the drag chain, while a laser-based direct line of sight optical system was adopted to send signals to the moving trolleys.

At the same time, the trolleys were modified to operate off SEW-Eurodrive's Movimot gearmotor drives, a compact modular VSD-driven system that uses the profibus-compatible Movilink® protocol for serial communication.

Physically, this involved the installation of a loop of line cable on the floor, which is covered by installation plates between the rails of the transverse trolleys. Then, under each trolley, two pick-up plates are used to transfer the electrical power to the trolleys' Movimots.

In principle, this works like a very sophisticated transformer. The induction cable is made of fine individual wire strands insulated from each other. This gives an even conduction distribution across the cable area and prevents the current from concentrating around the outside of the cable.

Also, medium frequency ac current at 25 kHz is generated to improve the energy transfer efficiency. In the control box, the three-phase mains power is converted into a 25 kHz single-phase supply, which is passed through the inductive loop on the floor. This induces a flow of ac current in the pickups under each trolley.

On the trolley, the ac supply is again rectified and converted before being passed into the Movimot inverters for use by the motors.

Sasol Wax is now into its second year of trouble-free operation. The company needed a system that was not susceptible to mechanical damage and this is exactly what it now has. The line cable is installed on the ground using installation plates in order to avoid cutting a groove on the concrete floor. This results in a quick and easy installation process, that saves time and effort and there are no moving parts that can be damaged. It is also a system that does not require any maintenance. Simply keeping the trolley clean and the track clear is enough to ensure reliable, contactless power transfer.

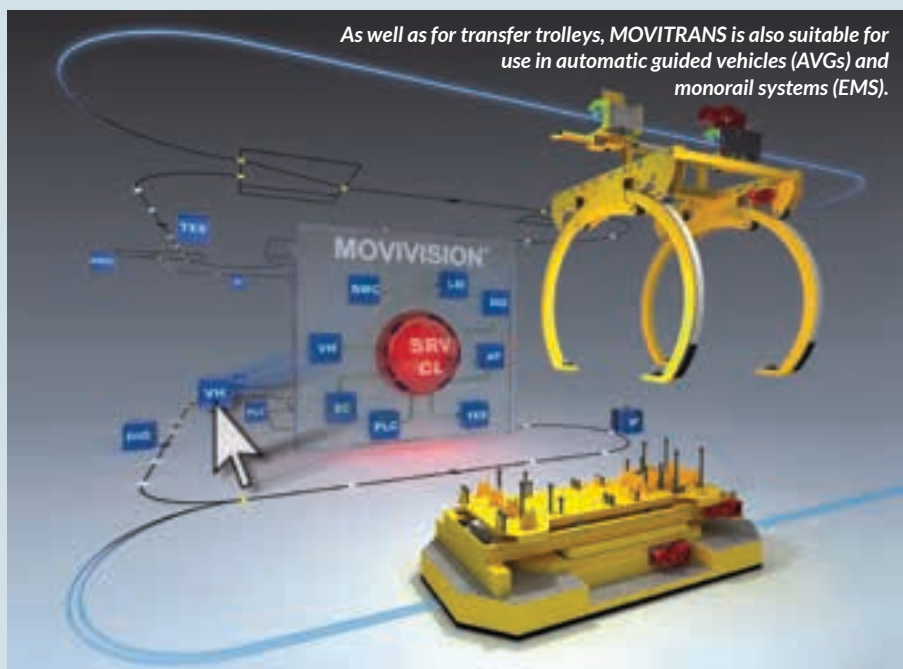
While South Africa still has a long way to go in terms of automation, this system offers enormous potential for modernising systems such as those in packaging plants. □



When a pallet of a particular wax is fully loaded, it is rolled onto the transfer trolley. The transfer trolley then moves the pallet across to align with the exit conveyor.



A loop of line cable on the floor, covered by installation plates between the rails of the transverse trolleys, carries the medium frequency (25 kHz) energising current.



As well as for transfer trolleys, MOVITRANS is also suitable for use in automatic guided vehicles (AVGs) and monorail systems (EMS).



DEDICATED TO MAKING YOUR IDEAS WORK

**60 YEARS IS ABOUT APPRECIATING ONE DAY, ONE CLIENT,
ONE COMPONENT, ONE TEAM MEMBER AND ONE VISION**

Over the years we have learnt what works and what doesn't. Few businesses last this long, and our success is down to three things: clients who trust us, dedicated staff that delivers and superior products. Give us a call with your engineering problem and enjoy the benefits of 60 years of learning and growth.

- 60 years experience
- Longstanding relationships with over 30 of the world's best brands
- More than 46 branches nationwide including Namibia
- Nationwide customer support for all emergencies

You can trust BI to provide the bearings and power transmission solutions you need efficiently and cost-effectively. We partner with you every step of the way. Our specialist teams are ready to take your call.



ALWAYS THERE. MAKING IT WORK.

A MEMBER OF THE *Hudaco* GROUP

All-in-one service from rope access workers

The flexibility of rope access was recently put to the test when Skyriders completed an inspection project on a kiln at a major cement producer in the Northern Cape. The project proved itself an excellent example of the customised, total-solutions approach that underpins all the company's projects," says Skyriders' marketing manager, Mike Zinn.

The inspection project was focused on the mill area, where a small cyclone in the middle meant that the four-person Skyriders' team had to gain access to the ducting from the top, at a height of 30 m. "Access had to be gained from this approach as there was no manoeuvring space within the cyclone itself," says Skyriders inspection manager, Gerhard Kemp.

Another challenge was that there was no area opening either, which meant a new access hole had to be made just below the cyclone. "The benefit of this is that it provides a future inspection manhole whenever the ducting needs to be inspected again," Kemp notes.

The inspection revealed a small hole in a bend of the ducting. "We were able to pinpoint the problem area precisely, which allowed the client to open up the cyclone externally at the exact location."

The inspection also revealed a few other minor issues that needed attention. These problem areas could not have been detected externally, because of the presence of cladding and lagging.

"Using rope access for an internal inspection was the most efficient means possible in terms of manpower and resources," says Kemp.

Skyriders also provided a detailed report on the outcome of the inspection process, in order to guide the client's planning in terms of maintenance and repairs. "Time is of the essence with such a shutdown, where even a single hour offline has a major impact on the bottom line. Therefore, our reports are critical to give our clients the clearest view of what is required."

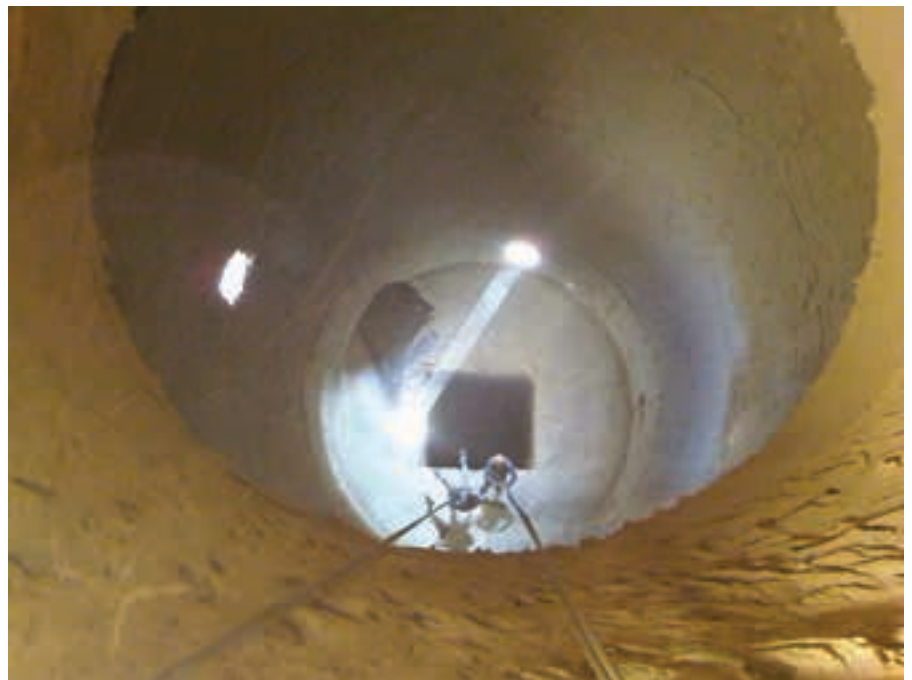
Not only did Skyriders have to deal with confined spaces in this particular project, but the ducting that had to be inspected had a 600 mm OD, which is relatively narrow to access. A magnetic particle inspection technician was also on hand to verify the quality of any welding work if this had proven necessary.

In addition, Skyriders was sufficiently flexible to carry out the inspection work during

the night shift, in order to minimise disruption at the cement producer. "We were able to accommodate our client's specific requirements, and rearrange our planning as a result," Zinn concludes. □



The inspection project was focused on the mill area of the cement factory.



The inspection revealed a small hole in a bend of the ducting.

Skyriders: non-destructive testing access specialists

South African-based Skyriders has extensive experience in providing rope access inspection, non-destructive testing and work-at-height maintenance solutions to a number of high-profile clients. The company has worked in the international power generation, mining, construction, petrochemical and industrial sectors and proved itself on an 'out-of-the-box' approach to solving work-at-height challenges.

Safety is a strategic Skyriders goal and, as evident from its zero-fatality record since beginning operating in 1998. This record disproves the common perception

that rope access is a dangerous method for working at height. Highly qualified rope access technicians are used, who have been given intensive training and gained experience serving the diverse client base.

ISO 9001:2008 and OHSAS 18001:2007 accreditation supports the Skyriders commitment to continual improvement and to implementing best practice standards of business management. If height or confined working space is an issue and a plant operator is looking for comprehensive, efficient and innovative solutions, Skyriders can offer efficient and cost-effective services. □

Investment in grass-root talent changes lives

For decades Engen has believed in 'growing its own timber' and prioritises the development of talent through the coordination of three programmes, namely: the Engen Maths and Science School (EMSS), Engen National Bursary and the Engen Graduate Development programmes. Twenty young people graduated recently, marking a significant moment for Engen.

Engen's recent graduate induction marked another major step in the business' talent development strategy and a proud day for the 20 graduates who gathered in Cape Town – along with their Engen-appointed mentors – to begin their orientation into the business.

This latest crop of maths, science and engineering graduates represents a significant moment for the company: not only is it the largest group yet, but it represents the confluence of three programmes, designed to find, develop and deploy promising talent; and so meet Engen's key business needs.

Engen's 2017 Graduate Development

Programme (GDP) began at the beginning of May, with the 20 graduates being placed within the business. Engen's bursary coordinator and graduate recruitment specialist, Nokulunga Mjwara is thrilled that the three programmes are working together to meet Engen's needs. "This year we have absorbed 20 employment equity graduates, with 19 feeding from our Bursary pipeline. A further six of the 19 have been with Engen since high school, through the EMSS Programme. This is truly a reflection of focused collaboration within the business," she says.

Currently, Engen has nine EMSS Centres. These source learners from 96 feeder schools

across South Africa and expose learners from grades 10 to 12 to high-quality teachers and educational materials in the subjects of English, Maths and Science. The EMSS programme, under the guidance of Engen Education Programme Specialist, Alice Msibi, has attracted, developed and placed many of the 82 learners, who are currently on Engen's Bursary programme.

Engen offers full bursaries to students planning on engaging in study streams such as engineering, transport, finance and HSEQ at universities across South Africa. The Engen bursary covers tuition, meals, books and transport. It also provides laptops to students to aid academics. Another benefit of the bursary is paid vacation work.

Engen's Bursary Programme supports learners as they transition through tertiary education and establish themselves in their chosen fields. It is designed to provide financial and academic support and so to bridge the gap between the students' potential and the business' needs. To facilitate this, Engen pairs students with mentors within the business. The mentor-student relationships, and experience working in the business, means that students establish relationships within the business prior to graduation.

At the end of the programme, full employment will be offered to most graduates, based upon business needs at the time. Those who leave do so armed to forge successful careers, and many can be found running their own businesses today.

Engen partners with the Department of Energy (DoE) in actively supporting career development and awareness through participation at the DoE's Learner Focus Week.

By continuing to grow the minds and talents of the future, and to shape the careers of gifted graduates, Engen's three-pronged partnership strategy is changing our world. □



Twenty proud graduates embark on their new careers at Engen.

Bulk fuel storage and handling for Ngqura

Transnet National Ports Authority (TNPA) has appointed Oiltanking Grindrod Calulo Holdings to plan, fund, construct, maintain

and operate a new liquid bulk handling facility at the Port of Ngqura. This build, operate and transfer (BOOT) agreement was concluded in December 2016.

For Oiltanking, it will be its first holding in a South African fuel terminal, whereas for Calulo, an oil supply chain company, it will be its first clean products terminal. For Grindrod, the Ngqura liquid storage facility provides diversification into fuel storage and handling.

The concept engineering design as well as the topographical and geotechnical survey has been completed and construction is due to commence in the 4th quarter of 2017, with commissioning planned for the 3rd quarter of 2019.

Phase 1 of the liquid bulk facility will provide approximately 150 000 m³ of storage capacity for refined petroleum products and will replace the tanks currently in use in Port Elizabeth.

Future phases will provide for an additional 550 000 m³ of storage capacity and handling. The new modern facility will service the Oil Majors, new entrants into the South African oil industry as well as international traders, all supporting the local shipping industry.

Oiltanking Grindrod Calulo, a majority South African owned level 1 BBBEE company, is an independent bulk liquid storage provider in South Africa. The Ngqura facility is a unique opportunity for the joint venture partners as well as for the region. □



The liquid bulk handling facility at the Port of Ngqura will boost the socio-economic state of the Eastern Cape of South Africa.

Tanzania to pipe natural gas to capital

In October 2015, Tanzania initiated a \$1.33-billion project to pipe natural gas to its commercial capital, Dar es Salaam, and help relieve chronic power shortages in the city. The 532 km Mtwara-Dar es Salaam pipeline and gas processing plants, largely financed by a Chinese loan, is part of a plan to add about 2 000 MW of new gas-fired electricity generating power by 2018, to increase Tanzania's generating capacity to 10 000 MW by 2025.

Following the handover of the Mtwara to Dar es Salaam Pipeline Project in August 2016, a project close-out ceremony was held in October 2016 in celebration of the tremendous success of the project, attended by Tanzanian government officials, client Board Members, other project stakeholders, as well as members of the media in Tanzania.

At the project inauguration, WorleyParsons was acknowledged by the former president of Tanzania with a Certificate of Achievement, "in recognition of their valuable contribution to the successful completion of the engineering, procurement, construction and commissioning of the two natural gas processing plants at Mnazi Bay and Songo Songo Island, a total of 551 km of transportation pipeline, which includes offshore pipeline from Songo Songo Island to Somanga and onshore pipeline from Mtwara (Mnazi Bay) to Dar Es Salaam (Tegeta), as the project management consultant (PMC), which has greatly benefited the United Republic of Tanzania".

The global project delivery and engineering consultancy was also commended by the Tanzania Petroleum Development Corporation (TPDC) on achieving 275 000 safe hours worked. "The project expended over 14.9-million hours worked of which more than 10-million safe hours were worked, that included the PMC team's achievement of 276 344 safe hours worked. The project total recordable frequency rate is 0.107, which is an excellent achievement and comparable globally," says Allan Slowe, WorleyParsons' senior project manager for the Mtwara to Dar es Salaam pipeline project.

WorleyParsons was appointed as the PMC in 2012 by the main EPC contractor China Petroleum Technology Development Corporation (CPTDC) in a monitoring and advisory role for the Mtwara to Dar es Salaam Pipeline Project, including training and mentoring of client personnel. The project was implemented by a consortium of contractors to undertake basic engineering, followed by detailed engineering in China; procurement and inspection in China, South Africa and various other locations around the globe; fabrication and delivery to Tanzania of materials and equipment; site establish-

ment at the gas processing plants and along the pipeline route for the storage and installation of the pipeline and associated facilities; construction, pre-commissioning and commissioning of the gas processing plants, onshore and offshore pipelines; and take-over and handover of the facilities.

The project facilities are designed for 350-million standard cubic feet per day (mmscfd) but capable of ultimately producing 1 002 mmscfd.

Allan Slowe comments that the project implementation model that WorleyParsons used played a key role in the success of the project: "The PMC model ensured that a professional, positive and close working relationship was forged between the client, EPC contractor and other stakeholders that enabled us to effectively manage the various challenges that ultimately resulted in the successes on the project.

"In addition to the positive relationships forged and excellent safety milestones achieved, the project was completed within the \$1.225-billion budget, and key date deadlines were met. Furthermore, world-class quality was achieved on the project by implementing the PMC model," says Slowe.

The objective of the Mtwara to Dar es Salaam Pipeline Project is to ensure adequate and reliable power supply for the country and to provide affordable and reliable energy for industries. This forms part of the Tanzanian government's goal to add over 2 000 MW of new gas-fired power plants by 2018 and a total 10 000 MW of generation capacity by 2025, up from the current 1 500 MW. This forms the backbone for growth of the country, as articulated in the final draft of the Natural Gas Utilization Master Plan for Tanzania. □



WorleyParsons was acknowledged by the former president of Tanzania for its 'valuable contribution to the successful completion ...' of the two natural gas processing plants at Madimba (Mnazi Bay, shown above) and Songo Songo Island.



Rope access, beyond expectations.



- High Safety
- Maintenance
- Pipeline coating
- Insulation
- Welding
- Inspection & NDT
- Confined spaces

+27 863 000 SKY (739)
www.ropeaccess.co.za





Gas and electricity generation for Southern Africa: Shifts in the landscape

GAS AFRICA 2017 was the fourth conference of its kind, which, this year, was held at the Maslow Hotel in Sandton from 23 to 25 May. The theme for 2017 was 'Southern Africa is now proven to have huge natural gas deposits. How will this major clean power source affect South Africa and the region?' MechChem Africa's Glynnis Koch reports on the keynote address delivered by Mike de Pontes, the chief operating officer of iGas, part of the Central Energy Fund of South Africa.

Dr de Pontes began by summarising the conclusions from last year's Gas Africa conference, which were as follows:

- South Africa's economy is structurally very dependent on energy-intensive sectors such as mining and manufacturing for labour absorption.
- Both sectors are performing poorly because of high and rising energy input costs (costs being lower for longer now), low cyclical commodity prices and declining labour productivity.
- Security of affordable power supply is critical to the survival of these labour-absorptive sectors.
- The current demise of load shedding is likely due to a drop in demand, rather than to improved supply.
- South Africa's existing power generation plans are 'lumpy', capital-intensive and have long implementation schedules, especially the nuclear planning.
- Providing for more gas-fired megawatts can address the security of supply based on LNG imports and stimulate exploration for indigenous hydrocarbon resources, whilst providing a safety net for delays or cancellation of the nuclear build programme, he said, adding that the LNG programme is now more focused.

De Pontes referred to South Africa's Minister of Energy, Mmamoloko Kubayi's speech during the Department of Energy Budget Vote for 2017/18 financial year at Parliament on the 19th May 2017, in which she said that gas is an integral part of South Africa's energy mix, notwithstanding that in the short to medium term, we do not have access to the indigenous gas promised by the shale gas exploitation programme. Consequently, our gas programme will be premised on the following:

- In the short term, that is between 3-5 years, the importation of liquefied natural gas (LNG) from the international

market, through Richards Bay in Kwazulu-Natal, kick-started by power generation.

- In the medium term, the development of pipeline infrastructure from Mozambique, given alignment of this approach with South Africa's regional development objectives and the possibility of it being a more attractive option than LNG. Negotiations would take place with Mozambique about a pipeline approximately 2 200 km long, from the Rovuma Basin into South Africa. De Pontes pointed out that at a cost of approximately six billion rand and having to be underpinned by 7 000 MW of electricity, this goal may well become a long term one.
- In the long term, that is between 10-15 years, shale gas sourced from the Karoo should come on-stream. Dr de Pontes noted that this last point may well move into the medium term category.

His slide showing the 2016 GDP growth assumption indicated that the 0.9% estimated GDP of South Africa needs to grow to 3.2% by 2020. He then showed us the chart displaying the revised IRP2010 new build assumptions (Net capacity in MW). Furthermore, the next slide indicated that 2020, 2021 and 2022 are where the maximum reserve margin is required and that from

2022-2025 gas will fill the role of reserve.

Summarising the status of gas in the Mozambique region, De Pontes notes that:

- Pande/Temane gas will be sufficient up to 2029.
- The new onshore production sharing agreement (PSA) area for Sasol has both gas and light oil (condensate).
- Rovuma Basin work likely to be delayed by four years or so.

Regarding coal bed methane (CBM), Anglo American has reported that it is potentially at 4.0-trillion cubic feet (Tcf), ie, there has been no recent movement. The company is also doing well in Hwange in Zimbabwe. At Ibhubesi, there has been no movement, there being around 0,2 Tcf of extractable gas available. The Kudu gas field (which has about 0,8 Tcf extractable) has seen no movement either.

Regarding shale gas, the Minister of Mineral Resources has announced that shale gas will be developed in South Africa.

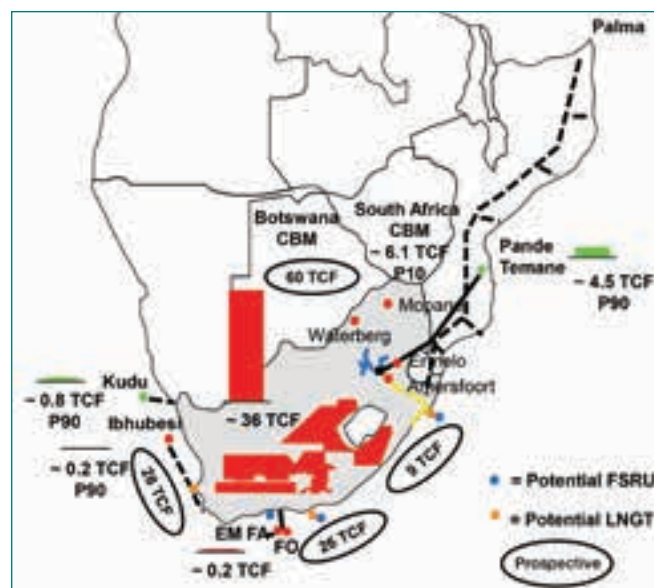
De Pontes continued by explaining to us the details of gas supply options from Mozambique, which, in brief, are as follows:

- The PSA gas/condensate field is currently being developed by Sasol. This field is close to the Pande/Temane gas fields.
- The expectation is that the gas resource is significant. However, the Mozambican

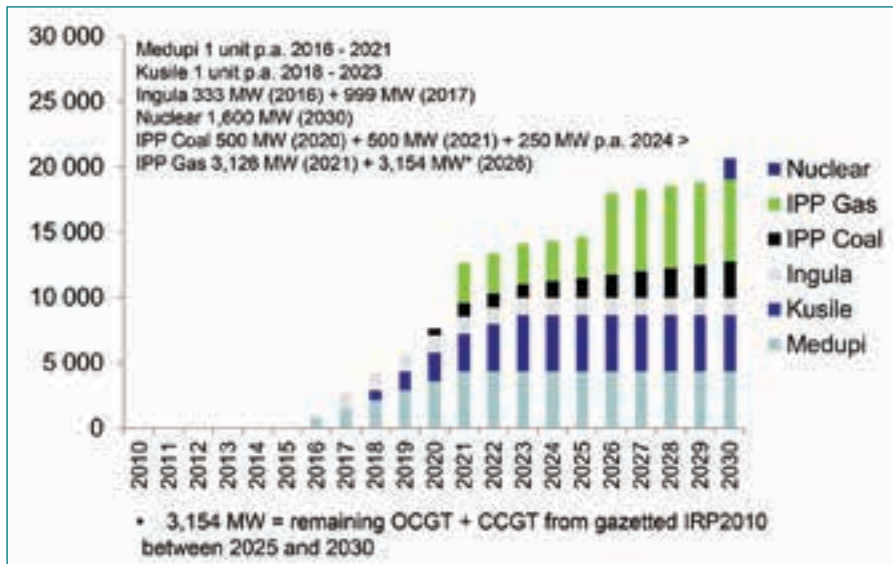
Government is planning for this gas to be used at source to generate electricity, the gas being available from about 2019. An important caveat is the requirement for an electricity transmission grid south to Maputo.

- The Buzi Field is currently being drilled again.

Regarding Sasol Gas's Condensate Production Share Agreement (PSA): four of 12 planned production wells had been drilled by December 2016; two with gas showing in the Temane area; and two with light oil (condensate) in the Inhassoro area. As far as the gas infrastructure is concerned, gas volumes to South Africa and Mozambique are likely to increase from 100-mil-



A 2017 summary of the gas supply and infrastructure in Southern Africa.



Revised IRP2010 new build assumptions - Net capacity (MW).

lion GJ/year in 2006/2007 to 186-million GJ/year by 2017.

The Rompco Pipeline is 859 km long. The original pipeline from Pande to Secunda was built to bring gas to South Africa and was completed 2004. Its first expansion occurred in 2010 to increase the flow to South Africa whilst its second expansion was completed in December 2014. Loop line (number 1) was built to supply gas to local customers in Mozambique. Loop line 2 (or the third expansion of the Rompco Pipeline) was completed in December 2016 for the purpose of supplying extra gas to South Africa. This loop line has come in under budget, three months early. There are no definite plans as yet for

the third and fourth loop lines.

Referring to LNG pricing, Dr de Pontes explained that Brent-based pricing deals are common in the LNG industry and good for South Africa. One refers to % Brent, with recent contracts being at around 12%-13% Brent.

The Henry Hub (HH) method of pricing is a US-based pricing method that is calculated at the Henry Hub price plus a % of HH.

In closing De Pontes summarises projects that have a high possibility of proceeding, these being:

- Gas drilling in the PSA area in Mozambique (in process now).
- Proposed power plant of 400 MW (planned

to be built at Temane).

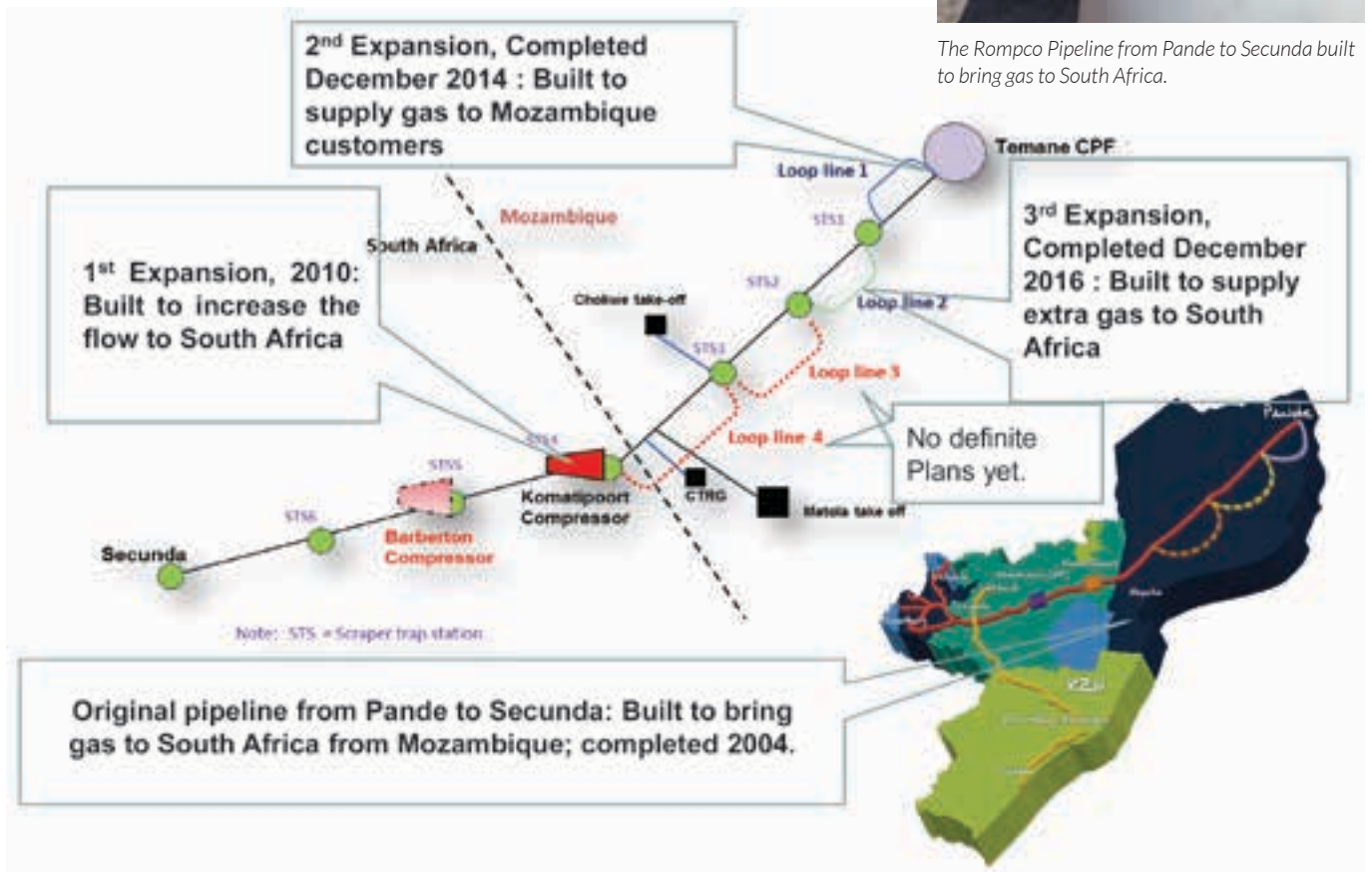
- Further imports of gas from Mozambique (speculative at this stage).
- LNG import into Richards Bay (by about 2023).
- Exploration of shale gas in the Karoo.
- CBM projects in the North West province of SA and in Botswana.

In his closing comments, Dr de Ponte indicated the shifts in landscape in gas and electricity generation, mentioning in particular the start of shale gas exploration in South Africa, questioning the matter of more gas from Mozambique, and drawing attention to the two competing pricing systems for LNG.

In answer to a question from the floor, he concluded by saying that it is important to consider having a balanced supply and that the Mozambican government will be the decision-makers with regards to the competing consortia that are awarded contracts in the future. □



The Rompco Pipeline from Pande to Secunda built to bring gas to South Africa.



CSIR/DST NIDF: Crossing the nano chasm



Says Dr Mike Masukume: The chemical scale-up plant is versatile and can support complex processes that require high-pressure reactors.



Programme manager, Dr Manfred Scriba, says that The NIDF plays an important role in bridging the gap between the laboratory and commercial scale manufacture.



As manager of the Polymer Formulation Facility, I make sure that we have a balance of development and characterisation capabilities required to develop new materials including polymer nanocomposites, says Dr Vincent Ojijo.

The CSIR together with the Department of Science and Technology (DST) have established the Nanomaterials Industrial Development Facility (NIDF) to enable industry, research entities and small, medium and micro enterprises (SMMEs) to develop and scale up high-tech materials.

The NIDF strives to enable industry, research entities and small, medium and micro enterprises (SMMEs) to develop and scale up high-tech materials. The focus at present is on using nanotechnology as a key enabler in polymer, cosmetics and other chemical related products. However, cheap imports and the difficulties involved in taking laboratory developed products to the market, as well as the lack of testing and scale-up facilities, often make it difficult for SMMEs and even large companies to start establishing new products and materials.

The NIDF was thus established to assist researchers and engineers to bridge the gap between materials development and commercialisation. In doing so, it anticipates the creation of additional jobs as one of the critical desired outcome of this programme.

NIDF's objectives and offering

The NIDF offers integrated access to three key research and development components, namely scale-up facilities, well-equipped characterisation laboratories and multi-disciplinary researchers. The facility was specifically designed to enable the transition from

laboratory to industrial scale.

The chemical processing plant is equipped with high temperature and pressure chemical reactors, process tanks, a filter press, dryers and a bag house. In the polymer formulation and processing facility we find a 40 l/day co-rotating twin screw extruder, a 500 kN injection moulding machine, a 5-layer cast sheet and blown film co-extrusion line and other smaller processing equipment.

Finally, the characterisation facilities available to users of the NIDF include all typical polymer characterisation and testing equipment as well as highly specialised instruments such as scanning and transmission electron microscopes, which allow material investigations at the nano-level (one nanometre is a million times smaller than a millimetre).

The NIDF offers support to SMMEs and larger companies alike by assisting with scaling up of operations – including further process/technology optimisation – to produce sufficient quantities of material to enable companies to test and develop the market. In addition, its researchers and engineers can help with the development of material applications as well as their characterisation and testing. It must however be



The development of nanotechnology has the capability to revolutionise advanced manufacturing industries where lighter, smarter, more efficient and greener products depend on advanced modern materials.



Scaling-up is a mandatory step in the commercialisation of scientific research and the NIDF thus plays a key role in the production of products in sufficient quantities for quality and market testing.



The chemical processing plant is equipped with high temperature and pressure chemical reactors, process tanks, a filter press, dryers and a bag house.

emphasised that we are not able to provide SABS certification.

NIDF users benefit substantially

Scaling-up is a mandatory step in the commercialisation of scientific research and the NIDF thus plays a key role in the production of products in sufficient quantities for quality and market testing. It also provides the environment to undertake reliable cost estimation and capital budgeting analysis. In addition, users are able to generate design data for a future commercial plant and mitigate risks relating to their processes and technologies. The NIDF also prides itself on providing training and industry-ready learning to many interns.

Current projects

Some of the current projects include the production of nano-clays such as organophilic bentonite, synthetic hectorite and hydro-talcite, and their application in polymers and cosmetics. We are also assisting two Industry Development Corporation (IDC) -supported start-up companies with the development of nano calcium carbonate and carbon nanotube production processes.

Safety, health and the Environment (SHE)

The NIDF is well aware that nanotechnology and particularly the use of nanostructures in products is something new to the South

CSIR's nanotechnology research facilities: the NCNSM and the NIDF

The National Centre for Nano-Structured Materials (NCNSM) was created in 2007 as part of the implementation of Government's National Nanotechnology Strategy. The NCNSM focuses on the development of new materials using nanotechnology, and on the applications of nanotechnology in the manufacturing, water and health sectors.

The NCNSM also plays an important role in making available expensive and high-tech instrumentation used in nanotechnology research, to other researchers in South Africa, whether from higher education institutions, government institutions or private firms.

The DST-CSIR Nanomaterials Industrial Development Facility (NDIF) bridges the gap between bench-scale developments and industry. The scale-up facility forms part of the NCNSM and supports projects by offering flexible and multi-purpose scale-up plants, access to a skilled workforce, technical support in a well-equipped workshop and state-of-the-art equipment.

DST-CSIR NIDF contacts:

Council for Scientific and Industrial Research
1 Meiring Naude Road, Brummeria, 0184
PO Box 395, Pretoria, 0001
012 841 4738, mrscriba@csir.co.za

African industry. For this reason, we also assist users to identify and mitigate against potential health and safety aspects of a particular nanotechnology, through collaborative efforts with local universities. Being part of the DST-CSIR National Centre for Nanostructured Materials, the NIDF has established a Safety, Health and Environmental (SHE) system that plays a critical role in identifying and successfully managing these issues.

Accessing the NIDF

The NIDF is overseen by an advisory panel and managed by a steering committee, which evaluates proposals on merit and availability of resources. While it is generally expected that users of the facility will contribute towards the costs, the NIDF can give special assistance to SMMEs to access available funding sources.

The NIDF is open to receiving proposals at any time for consideration by the steering committee, which meets quarterly. □

Off-grid energy solutions power Africa

With more than 600 million people in Africa lacking access to lean, affordable, reliable energy, new technological developments such as off-grid solutions are becoming increasingly important. Cummins Power Generation specialises in the design and manufacture of pre-integrated generator sets (gensets) from 8.0 kVA to 3 300 kVA.

Off-grid solutions are based on the specific needs of the operation or application in question,

classified generally as either 'standby' or 'prime'. As the name suggests, 'standby' provides power in the event of grid failure, which means the duty is far lower. A light application, for example, would require a generator designed for around 20 to 40 hours of operation a month.

'Prime' solutions are entirely separate from the national grid, and supply load power on a 24/7 basis. "This option requires considerably better planning and far greater investment, as the entire outcome of the operation

depends on the power supply," Cummins Power Generation's director Kenny Gaynor, comments.

"The genset needs to be specified precisely. This means the most important aspect to take into consideration is the original equipment manufacturer (OEM) or supplier. Product quality, parts availability, aftersales service, and technical capability are paramount to success. If one aspect fails, the entire project fails," Gaynor stresses.

As part of its off-grid offering, Cummins Power Generation provides a full and comprehensive range of services, including conceptualisation, design, construction, installation, commissioning, operation, and maintenance. The complex and intricate nature of such solutions requires that a dedicated Cummins expert is assigned to oversee all aspects of the project, including the training of relevant customer personnel.

Cummins also stocks essential parts on-site to ensure minimal downtime although not all parts can be kept on-site. To ensure minimal disruption, Cummins boasts a comprehensive logistics supply chain to help.

www.cummins.com/southafrica



Cummins Power Generation specialises in pre-integrated gensets from 8.0 kVA to 3 300 kVA. Seen here is its flagship QSK95 'Hedgehog'.

Nano-purification compressed air products

Filcon Filters, one of the leading liquid filtration companies in South Africa, has now been authorised by Nano-Purification Solutions (Nano) to sell and promote their world-class compressed air and gas solution products. Nano Purification Solutions is based in both the USA and the UK.

The company's team is comprised of and supported by individuals spanning

all disciplines from research and development, engineering and manufacturing, marketing and sales and service and support. Nano's background is in air and gas purification and their experience in this field spans a wide range of industries. This knowledge and experience ensures that their products and services are designed and provided to meet the objectives and

expectations of their customers.

The product range is extensive and includes industrial filters, process filters, desiccant dryers, refrigerated dryers, process chillers, nitrogen generators, oil vapour removal systems, breathing air systems, oil water separators and lab gas CO₂ removal modules.



Filcon looks forward to offering to the South African market these world class quality products backed up by quality service provided by Nano-Purifications Solutions.

Filcon Filters was established in June 2000 and has offices in both Johannesburg and Cape Town. In addition to representing numerous international filtration product manufacturers, Filcon Filters has a wide range of filtration products manufactured to its design in Johannesburg, including the Dirt Gobbla (a centrifugal separator), back flushing automatic strainers, purge strainers, and bag and cartridge housings.

filconfilters.co.za

Toyota award for local electrical supplier

Magnet Electrical Supplies Durban has been presented by Toyota SA Motors with a 'Supplier Award for Achievement' in the mate-

rials and facilities (M&F) consumable suppliers category for 2016.

"This coveted award, which is presented annually in recognition of service excellence and integrity, was won thanks to the support of all Magnet divisions in Durban, particularly the internal sales team and projects division," says Kumaran Naidoo, Durban branch manager.

The company, which specialises in the supply, implementation and 24-hour support of electrical equipment, implemented sustainable energy saving solutions at the Toyota Prospecton plant.

Energy efficient lighting systems, heat pumps and turnkey projects, wasted energy at the plant has been significantly reduced.

www.magnetgroup.co.za



Magnet Electrical Supplies has been recognised by Toyota SA Motors for excellence in the 'Supplier Award for Achievement'.



Interactive condition monitoring app

“Ground-breaking”, “highly innovative” and “revolutionary” are some of the reactions to the new interactive customer application (app) pioneered by Durban-based condition monitoring specialists, WearCheck.

Managing director, Neil Robinson, believes WearCheck is one of only a handful of condition monitoring companies in the world, and possibly the first in Africa, to develop and launch an app of this nature. He is confident it will substantially improve customers’ benefits from their condition monitoring programme by allowing them to make virtually instantaneous maintenance decisions based on reliable data, which is highly accessible.

WearCheck customers can now download WearCheck Mobile and, at their fingertips via their mobile device, access a host of critical information pertaining to machinery condition. This data is immediately available even while patrolling the factory floor or inspecting mining machinery on-site.

WearCheck’s IT manager, Eddie Perumal, outlines some of the app’s features.

“Using the app is straightforward as we have designed it to be intuitive and logical, allowing for ease of use. All data is secure and the login process uses the same username/password credentials as our WearCheck Online website. Once the app is downloaded, customers can access reports and view their current samples list. As an optional feature, this keeps track of unread web/app reports, and notifications about items on this list are sent out as reminders.

“Sample reports can be viewed on the mobile device as either one page (concise),

Eddie Perumal with some of the devices that can use WearCheck’s condition monitoring app.



or two page (full) pdf documents. Single or multiple pdf reports can be emailed to different recipients simultaneously. Sample data can be submitted, either via the equipment/component search option (recommended), or via the ‘submit samples’ option, where equipment/component verification is needed for currently-listed machinery. Where applicable, new equipment/components information is created in the WearCheck system. Customers can also view their five-day submission history.

“One of the highlights and unique features of the app is the interactive key, where customers can ask a diagnostician about a specific sample, and receive an emailed reply on their mobile device,” Perumal continues. “Another useful feature is the ability to enter feedback about a sample result, component condition or maintenance event.

“Various search options and filters are available, including sample history and equipment or component searches,” concludes Perumal.

www.wearcheck.co.za

Cut and strip coaxial cable machine

Jasco’s Webb Industries, leading supplier of coaxial cable, connectors and assemblies, has acquired a Schleuniger MultiStrip 9480 RS cut and strip machine.

This fully programmable rotary precision unit allows easy processing of

high precision coaxial cables.

This is an updated version of a machine that Webb has had for some years and is thought to be the only one in South Africa.

Additional features, such as the multi-position cutter head create a nearly endless range of application possibilities. Also, each machine can be easily interfaced with Schleuniger’s vast line of integrated accessories to create a fully automatic coaxial cable processing production line.

One of the accessories Webb uses is a printing unit, which automatically labels the coaxial cable assembly according to customers’ specs. The Schleuniger RS can cut and strip a wide range of diameters from RG214 down to 2 mm shielded coax.



Eric Sithole, Webb Cable assembly department supervisor, with Schleuniger’s RS unit.

SAIMEchE awards SKF Training Solutions accreditation

SKF South Africa Training Solutions is proud to have obtained accreditation through the South African Institute of Mechanical Engineers (SAIMEchE) on five of its training courses.

SKF South Africa is the first bearing manufacturer to receive SAIMEchE accreditation, which is mandated by the Engineering Council of South Africa (ECSA). It also complements the company’s two other accreditations – BINDT (British Institute of Non-destructive Testing) for SKF Vibration Analysis training, and MerSeta for SKF bearings and lubrication training.

The value adds of training are maximised bearing reliability and lifecycle and increased uptime and production. This mindset initiated the establishment of SKF Training Solutions a number of years ago. SKF Training Solutions trains approximately 500 delegates on its various programmes annually. “Accreditation of our training programmes enables us to offer our customers, Authorised Distributors and delegates several important advantages,” states Steve Parkinson, training solutions manager for SKF South Africa.

“Registered professional engineers are required to obtain a minimum of 25 Continuing Professional Development (CPD) points every five years in order to keep their registration status. Some engineers who need points but are limited by time, opt for a general seminar, which has CPD points, rather than attend SKF training. Our accredited courses now enable engineers to claim their attendance and CPD credits as part of their development.”

As the first business unit within the global SKF Group to accredit regional SKF training centres, SKF South Africa currently boasts two accredited regional training centres in Cape Town and Durban respectively: West Cape Bearings (SKF Authorised Distributor), and Shukela (a division of the SA Sugar Association). Currently approximately 70% of the training being conducted by SKF is onsite at customer premises.

SKF Training Solutions has a basket of over 40 training courses available of which 20 are product-specific.

www.skf.com

“In preparing coaxial assemblies there is a very high premium on accuracy and the Schleuniger has no peer in this regard,” says Webb MD, Paul Richards.

“For example we can programme it to cut antenna cable to different depths – braided shield, foil shield or dialectic – at different distances along the cable according to specifications. The task is performed fast and precisely producing a world class quality product,” he concludes.

www.webb.co.za

Valve reduces air consumption by up to 40%

The recent introduction of SMC's new valves in the AS-R and AS-Q series, highlights the automation specialist's commitment to energy savings. Customers achieve a cut in internal air consumption by up to 25% when using the AS-R pressure valve and an AS-Q flow valve on their cylinders.

Product manager for SMC Pneumatics, Brian Abbott, explains some benefits of using these valves in applications, for example that the use of these valves helps shorten the response time of the return stroke and harmonises stroke movements to prevent a harsh jerky start.

In pressing applications, these valves enable a rapid supply of compressed air at the end of the stroke, and the valve bodies and plug-and-socket connections

can rotate 360° to ensure fast and easy installation, he says.

SMC's range of pressure and flow valves includes six AS-R and five AS-Q models: R1/8, R1/4, R3/8 and R1/2 connection sizes and for hose diameters ranging from 6 to 12 mm.

"Customers are able to choose between the new AS-R series with its fixed 2 bar supply pressure and the older ASR valves with fixed or variable set pressures depending on the application where pressures are adjusted manually using a handle with a three-part scale," explains Abbott.

The pressure valve and flow valve is mounted together on cylinders. The AS-Q

flow valve is installed on the working stroke side and the AS-R pressure valve on the return stroke side. "The two valve series have similar designs: the pressure valves consist of regulator, with a check valve and a throttle check valve. The flow valves in the AS-Q series contain a quick supply valve, an exhaust valve and a throttle check valve."

AS-R/AS-Q valves are recommended for cylinders with a diameter of 32 mm up to 125 mm bore, and an inlet pressure of at least 3 bar, which means that savings actually increase with bigger cylinders or higher air consumption levels and larger pressure differences between the working and return strokes.

www.smc-pneumatics.co.za

SMC's AS-R and AS-Q valves cut internal air consumption by up to 25% when used on cylinders.



Gravico's strategy for the new economy

In response to ongoing changes in South Africa's heavy engineering industry, the DCD Group is consolidating aspects of its manufacturing capacity and expertise into its Gravico Heavy Engineering joint venture. According to DCD chief executive officer Digby Glover, the move comes after detailed market studies and follows years of depressed market conditions.

Louw Kriel, managing director of Gravico, adds: "The manufacturing industry is changing and manufacturers are re-evaluating and developing new ways to do business. Gravico's strategy for the

new economy is focused on developing and applying value-adding technologies, rather than relying on a market upswing or short-term cost containment measures."

"Gravico is instituting a long-term cost management and operational improvement culture by investing in technology," Kriel says. "We will offer our own products instead of just manufacturing capacity, and will concentrate on the expansion of sales territories and coverage. We will also prospect and exploit new market niches on a continuous basis," he reveals.

www.dcd.co.za

Cable reeling solutions like no other from Powermite

Cable reeling systems are used to lay down and retrieve cable in applications where a predetermined length of travel and a fixed amount of cable is connected to a fixed point while a moving point travels over a fixed line, rail, ground or height at a set speed.

The materials handling division of me-

chanical and electrical engineering specialist, Powermite, a division of Hudaco, supplies superior quality, rugged, reliable, and economical cable reeling systems and accessories to a wide spectrum of Southern African industries, including medium voltage, low voltage and milli-power, control, fibre optic/data and composite cables, and more.

"Our cable reeling systems deliver numerous cost- and time-saving benefits for end-users," says Powermite marketing director, Donovan Marks. "Their extremely rugged design ensures reliable operation for optimised uptime and productivity. Manufactured in a variety of materials including painted steel, stainless steel and hot dip galvanized surfaces, the cable reeling equipment is suitable for a wide range of indoor and outdoor applications."

By utilising the anti-runback bearing/braking resistive-based drive systems, Powermite achieves tremendous success with system reliability. "Our systems contin-

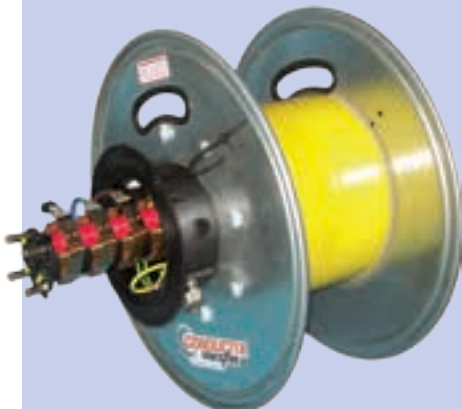
ue to operate over several years in extremely dusty and corrosive environments.

"In addition, the greased-for-life bearings ensure a maintenance-free cable reeling solution. With no stoppages for maintenance and no maintenance costs, our reeling systems deliver significant cost savings for end-users," notes Marks.

These systems are also extremely versatile and can be applied to low speeds (5 m/min) or high speeds (120 m/min) over distances ranging from 1m to over a 1 000 m and the length can be increased or decreased to meet end-users' requirements.

Powermite drives are supplemented with Variable Speed Drive (VSD) technology. "Our VSD technology enables all the drives to provide a constant torque to keep the correct tension at all times which is crucial to preventing damage by protecting the cable and keeping it out of harm's way during winding and un-winding functions."

www.powermite.co.za



Powermite's rugged cable reeling systems deliver reliable operation for optimised uptime and productivity.



Complete range of electric and pneumatic vibrators available

A complete range of electric and pneumatic internal and external vibrators from OLI is available locally from leading supplier, Bearings International (BI). "OLI is the world's top-selling manufacturer of electric and pneumatic vibrators," BI product manager, Lewis Hiepner, comments.

OLI has three main divisions offering optimal solutions for all requirements. Industrial Vibrators focuses on vibrating equipment, Flow Aids looks at problems of flowability, and Concrete Consolidation specialises in reliable and efficient concrete compaction.

With a centrifugal force of up to 26 000 kg, and with multiple voltage options, the OLI range is suited for a range of applications, from food and beverage to mining, foundries and recycling. Motor bodies, bearing flanges and shafts are designed using Failure Modes and Effects Analysis (FMEA), a step-by-step approach for identifying all possible failures in a design, manufacturing or assembly process.

The use of premium-grade aluminium alloy, cast iron and steel alloy means that the OLI range is ideal for heavy-duty applications, with safe operation guaranteed in any conditions. Vacuum-impregnated windings and Class F insulating materials enhance reliability and durability.



The OLI range is suited for a range of applications, from food and beverage to mining, foundries and recycling.

Top-quality bearings and an efficient grease-retaining system assure long-lasting performance and a low noise level during operation. Easy fine-tuning of the maximum centrifugal force provided by the motor is made possible by adjustable eccentric masses. The OLI range includes several certifications for use in hazardous environments, thereby matching the most demanding specifications worldwide.

"It is part of our strategy of being a total solutions partner for our customers in stocking some of the best products and brands from around the world, and OLI definitely falls into this category," adds BI business unit head: product and engineering, Ross Trevelyan.

www.bearings.co.za

CDE Combo sand washing at ConMin

Leading wet processing company CDE showcased 25 years of international expertise to Nigerian and other West African mine and quarry operators at the ConMin West Africa trade show in Abuja from 13 to 15 June.

The global company introduced the significant benefits of materials washing technology to the sand and aggregates industry, demonstrating how businesses can expand by increasing both their range of products and production levels, as well

as make profits and a quick returns on investment.

Globally, CDE boasts the successful completion of over 1 000 sand and aggregates wet processing projects, including the largest sand washing plant in the world in Qatar, which processes 1 200 t of dune sand per hour.

Nicolan Govender, regional manager Africa at CDE, says: "Whilst washing basically comes as a result of crushing and screening, it is a specialised and niche market. Wet processing is much more specific than crushing and screening because it entails getting from millimetre to micron sizes.

"With the respective successes delivered by CDE's EvoWash and AquaCycle products, more operators are now choosing the CDE Combo, which comprises both plants. The Combo, with a capacity range from 30 to 200 t, boasts a unique modular design to combine feeding, grading, washing, water recycling and stockpiling onto one compact chassis.



Dar es Salaam-based Estim Construction installed a CDE Combo x70 in 2014, which produces 40 t per hour of quality washed sand, whilst recycling up to 90% of the wastewater.

Victaulic pipe joining: an alternative to pipe welding

The demand for skilled welders in South Africa is much higher than the number of welders who are available and this often forces the industry to make use of imported skills.

The shortage also continues to hamper large-scale capital expansion projects such as Eskom's Medupi power station.

Boiler piping is very specialised and we need to use the best boilermakers to do those welding jobs, but new technology means that welding is not the only technology suitable for utility piping. Victaulic trains workers to join utility piping, using bolted mechanical couplings.

Mechanical pipe joining was born from the idea of replacing welding with a cleaner and safer alternative. Most demanding industries still hold the perception that pipe-coupling technology can be used only on a temporary basis, but this not the case. Victaulic offers a permanent, safe, and cost-effective alternative to using flanges or welding. The systems are accessible simply by removing two bolts from a coupling, making it easier to maintain efficient system performance. This reduces labour costs, pollution, energy usage, potential health and safety risks as well as drastically reducing the time necessary to install and maintain these connections.

Further, the design allows for controlled pipe movement within the couplings, while maintaining a positive seal and a self-restrained joint. The design allows for expansion, contraction and deflection generated by thermal changes, building or ground settlement and seismic activity. Additionally, since Victaulic couplings are designed to provide engineered movement at the joint – unlike welded, flanged or threaded joints – the couplings minimise noise and vibration transmission generated by pumps or other equipment to the piping system.

The Victaulic system allows for training and up-skilling to the extent that these skills in local workers could eventually satisfy local demand and even be exported. In an era when skills development and job creation remain of crucial importance to our economy, we need to start thinking innovatively and challenge old mind-sets if we want to succeed in genuine empowerment and job creation.

www.victaulic.com

"The Combo is so efficient that the final product is ready to be sold directly from the belt, so Combo customers have never looked back," Govender reports.

www.cdeglobal.com

Producing plant-based drinking bottles from FDCA

VTT Technical Research Centre of Finland has developed an environmentally sound and economical method for producing furandicarboxylic acid (FDCA) from plant sugars for the production of drinking bottles, paints and industrial resins, for example. This technology enables production of plant-based products.

The main production material of drinking bottles is still oil-based PET, although there has been news on alternatives based on renewable materials during the last few years. VTT's new method provides a route for the packaging and beverage industries to expand the use of renewable materials in their production.

VTT has patented a method for producing furan dicarboxylic acid (FDCA), the monomer for PEF (polyethylene furanoate) polymers, from sugar or sugar waste. Thanks to the solid acid catalyst and bio-based solvent with short reaction time, the method provides a considerable reduction of toxic waste compared to traditional methods. The method can be scaled-up to industrial purposes without substantial investments, and it has already raised a lot of interest in industry. The R&D work was funded by VTT and Tekes.

Green plastics from citrus fruit peels and sugar

The need for bio-plastics is growing. Brand owners are looking for sustainable solutions for packaging, fibres, paints, inks and plastics. This creates a need for high-performance bio-plastics such as polyamides (PA) and polyesters (PET).

The total global production of PET poly-

mers was over 50 Mt and that of polyamides (PA) over 10 Mt in 2015. Furan dicarboxylic acid (FDCA) -based polyethylene furanoate (PEF) polymers offer a bio-based alternative to petroleum-based PET polymers. Polyamides are used in applications calling for high durability and strength. Muconic acid is a versatile monomer, which can be converted to multiple PA monomers such as adipic acid, terephthalic acid, hexamethylene diamine, caprolactam, caprolactone and 1,6-hexanediol. PAs are used as engineering plastics, for example in automobiles.

New prospects for the use of pectin

VTT has developed a process to convert pectin biochemically to an aldaric acid, which in turn can be chemically converted to monomers for bio-based polyesters and polyamides. Pectin is a side stream obtained from citrus fruit peels or from sugar beet pulp.

Sugar beet pulp is currently used as animal feed, but the goal is to use the pulp for higher-value applications. Pectin is currently underutilised as the production is only about 40 000 t/a, with the potential of several tens of million tonnes available annually. Its current use is in the food and beverage industry as, for example, a gelling agent. In addition to pectin, wood- or plant-based glucose can be used in the production of aldaric acid.



VTT Bioplastics' David Thomas.

Competitive new technology

VTT has patented a technology combining biotechnical and chemical reaction steps to produce FDCA and muconic acid from aldaric acids. The first step consists of the oxidation of galacturonic acid, a constituent of pectin, to galactaric acid with a fungal biocatalyst. The conversion efficiency is high and this step has been scaled up to pilot scale (300 l) delivering kilogramme amounts of galactaric acid for the second step conversion.

The second step converts the aldaric acid into furan carboxylic acid (FCA) and FDCA or muconic acid depending on the reaction conditions. FDCA is a monomer for polyethylene furanoate (PEF), a bio-based alternative for polyethylene terephthalate (PET). Muconic acid is a precursor for polyamide monomers.

The techno-economic analysis shows competitive pricing and the life cycle analysis shows that the carbon footprint is lower compared to petroleum-based alternatives for both monomers.

FDCA and muconic acid transforming the industry

Plastics have revolutionised our lives in every aspect, yet only 2% of the yearly production of 300 Megatons are renewable. A 10% growth rate per annum is now being proposed for bio-based drop-in PET and PLA.

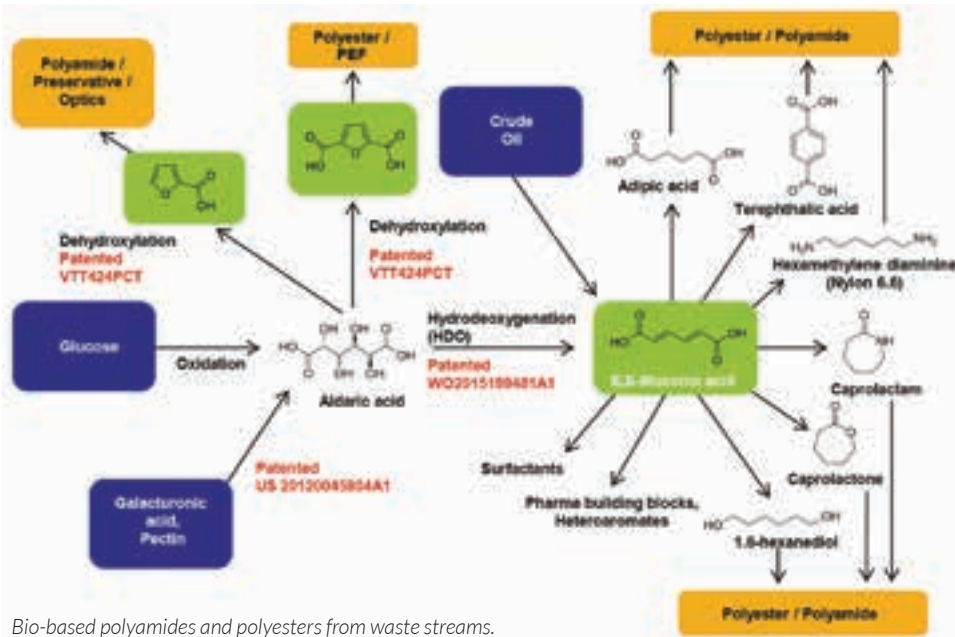
Furandicarboxylic acid (FDCA) and muconic acids are also changing the face of the bio-based plastics industry. It is often assumed that these bio-based plastics will be somehow flawed and not be as good as crude-oil based products, or that they have a higher price. This misconception leads to the presumption that they cannot be produced to the same markets cost as existing materials. These bio-based plastics can actually be superior to those crude-oil products.

Using pectin and sugar, it is possible to prepare high quality materials that can be made into, for example, plastics for everyday applications, skin care, packaging materials and resins.

This industry transformation will be discussed in a Webinar to be held on Wednesday, September 27, 2017 and entitled: *FDCA and muconic acid transforming the industry: Green plastics without the bio-premium.*



Parr Häkkinen van Strien of VTT.



Bio-based polyamides and polyesters from waste streams.

In this webinar, VTT will be releasing its latest results in bio-based plastics development. Join us to learn about how furandicarboxylic acid (FDCA) and muconic acid are transforming the industry.

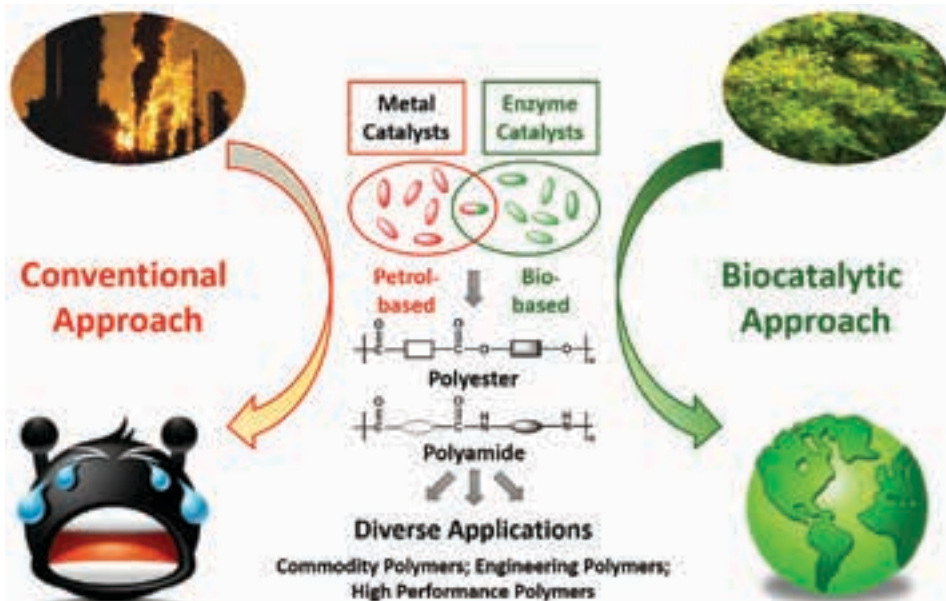
Key topics include:

- The patent landscape and the direction of R&D trends for these bio-based plastics.
 - Why we are still using crude oil and why is this a problem.
 - Why bio-based plastics are better with respect to both cost and properties.
 - How FDCA and muconic acid can transform the bio-based plastics industry.
- Presenters include:
- Dr Ali Harlin, DrSc(Tech), Research Professor in bioeconomy at VTT, who has experience from petrochemical, machinery and forest industries. He is active in research on novel

and added value chemical and material applications of biomass, especially wood-based lignocellulosics.

- Dr Juha Linnekoski, DSc (Tech), principal scientist and principal investigator with 18 years' experience in development of various catalytic processes for the production of bio-based fuels and chemicals from biomass. Linnekoski has expertise in heterogeneous catalysis and in catalytic processes to convert bio-based raw materials into chemicals and monomers for bio-plastics.
- Dr David Thomas, a Senior Scientist with 13 years' experience in industrial, custom and polymer synthesis along with process optimisation. Thomas is currently actively working on bio-based platform chemicals derived from sugars and sugar acids.

For further information about the webinar, contact info@vtt.fi or phone +358 20 722 7070



Synthesis of renewable polymers via enzymatic polymerizations of bio-based monomers provides an opportunity for achieving green polymers and a future sustainable polymer industry.

Ref: Jiang Y; Loos K: Enzymatic Synthesis of Bio-based Polyesters and Polyamides. *Polymers* 2016, 8, 243.

SMC Pneumatics – Leaders in Innovation

Sustainable engineering today for a better tomorrow

#SMCRaisesTheBar


Worldwide leading experts in pneumatics and industrial automation
www.smc-pneumatics.co.za

Contact us on
+27 11 100 5866 or
sales@smc-pneumatics.co.za

Join the conversation
 SMC Pneumatics (South Africa)
 SMC Pneumatics – South Africa

Benchmark Green Star building in Namibia

WSP | Parsons Brinckerhoff, Africa, one of the largest multi-disciplinary engineering consultancies in Africa, achieved the first 4-Star Green Star rating in Namibia for the FNB Namibia Holdings' @Parkside building – which is also well on track for its 'As Built' rating.

Located in Freedom Square, Windhoek, @Parkside is the first building in Namibia to achieve a Green Star rating and – with its innovative, environmentally friendly design, and sustainable operational energy management – the building sets a benchmark for building sustainably for the future.

The building was awarded its 4-Star Green Star Office SA-Namibia 'Design Rating' from the Green Building Council of South Africa in 2014. Since completion and being fully operational, the project is aiming towards an 'As Built Rating' by demonstrating that the sustainability initiatives designed into the building are installed and operating to their full efficiency potential.

As market leading sustainability consultants, WSP's GREEN by DESIGN team has been involved with this project from conceptualisation through every phase of design and construction – consulting with the project team on sustainability and Green



The @Parkside building in Freedom Square, Windhoek, is the first building in Namibia to achieve a Green Star rating, having been awarded its 4-Star Green Star Office SA-Namibia 'Design Rating' from the Green Building Council of South Africa.

Star requirements – and now reviewing the operations of the building for the 'As Built' rating submission.

Greg Rice, Sustainability Consultant, WSP | Parsons Brinckerhoff, Building Services, Africa, says: "There are a variety of innovative and sustainable factors evident in the morphology of the building that have all contributed to this building receiving its Green Star rating.

We are also confident that the building will receive its 'As Built' rating, as the initial energy modelling has already shown a 40% reduction in operational energy compared to a building constructed according to minimum building regulations. This saving amounts to an estimated R1-million kWh reduction per year in operational energy."

A few of the keenly innovative and sustainable features of this building include:

- The sophisticated HVAC system that allows vast amounts of fresh outside air into the building so as to reduce the build-up of indoor pollutants. Occupants experience a high level of thermal comfort as a result of the materials selected for the outer skin of the building and the air conditioning system. The building also contains dedicated exhausts to extract printing and photocopy pollutants, which have an effect on internal air quality.
- A combination of water fixtures and low-flow fittings are installed. The design of the roof and podium levels allow for rainwater harvesting for reuse within the building. With recycling the grey water collection and a magnificent advanced filtration

system, the building has been designed to surpass the most water-efficient benchmark yet set by the Green Building Council of South Africa (GBCSA). The advanced water system is also a contextual response to the water stricken environment.

- The project comes complete with a full and smart building management system (BMS), which has the ability to identify energy-use trends and monitor any anomalies. The BMS will notify the building manager of any irregularities in terms of power consumption, ensuring that appropriate remedial actions can be initiated if necessary.

www.wsp-pb.com

Industry diary

July

NACE Level 1 (CIP 1) Coating Inspection Course

Corrosion Institute Southern Africa

3 to 8 July

The CORE, Midrand, South Africa

Linda Hinrichsen, Course Administrator

+27 10 224 0761

courses@corrisa.org.za

Wearcheck 2017 Oil Analysis Training Oil Analysis 1 – Understanding oil and its analysis

11 – 12 July 2017

Oil Analysis 2 – Report interpretation

13 July 2017

Bloemfontein

Kay Meyrick

+2731 700 5460

training@wearcheck.co.za

POWER-GEN & DistribuTECH Africa 2017 Conference & Exhibition 18-20 July 2017

Sandton Convention Centre

Leigh Angelo – marketing director, ITP

Communications

+27 11 869 9153

Index to advertisers

Atlas Copco.....	13
Bearings International.....	26
CSIR.....	IFC
Donaldson Filtration.....	18
Festo.....	OFC
Mather+Platt.....	3
SAM Engineering.....	OBC
SKF.....	12
Skyriders.....	29
SMC Pneumatics.....	39
Weir Minerals Africa.....	IBC
Zest WEG Group.....	17

The KwaZulu-Natal Industrial Technology Exhibition (KITE)

26 to 28 July 2017, Durban Exhibition Centre

With a history spanning over 36 years, KITE, the definitive interactive platform for industrial technology solutions, has been the launchpad for a number of best practice technologies and services over the years and has provided a diverse market with a multitude of solutions. This year, KITE has a line-up of new and updated technologies for all industrial sectors in the province, all under one roof. A snapshot of some key exhibitors includes: Klüber Lubrication; A R Industrial; Watson-Marlow Fluid Technology; Omron; RS Components; Schneider Electric; Modena Design Centres; Klüber Lubrication; and AZ-Armaturen, to name but a few.

This year's event includes the addition of the Propak Africa Pavilion and other visitor attractions, geared around maximising visitors' time at the show, the free-to-attend SAIMEchE Seminar Theatre, the MESA (Manufacturing Enterprise Solutions Association) special interest group, and the Lifting Equipment Association of South Africa (LEEASA) conference.

www.kznindustrial.co.za



Reliable Solutions

Serving the Oil & Gas industry for more than 60 years, Weir Floway manufactures engineered to order vertical turbine pumps. Floway™ Pumps are recognised worldwide for low vibration, long service life, and withstanding the demands of the oil and gas process. Floway™ Pumps are applied in pipeline transportation, booster, tank farms, boiler feed, cooling water, and sea water lift applications. Weir Floway is committed to delivering market leading products and services which meet API 610 standards, along with UL/FM approved Fire protection pumps. As a part of the Weir Group, our reach of service is endless and our support network is quick to respond to our customers' needs.

For more information contact us on +27 (0)11 9292600.

FLOWAY® PUMPS

Minerals

www.minerals.weir

www.weirafricastore.com

SAMengineering



SABS
ISO 9001 2008

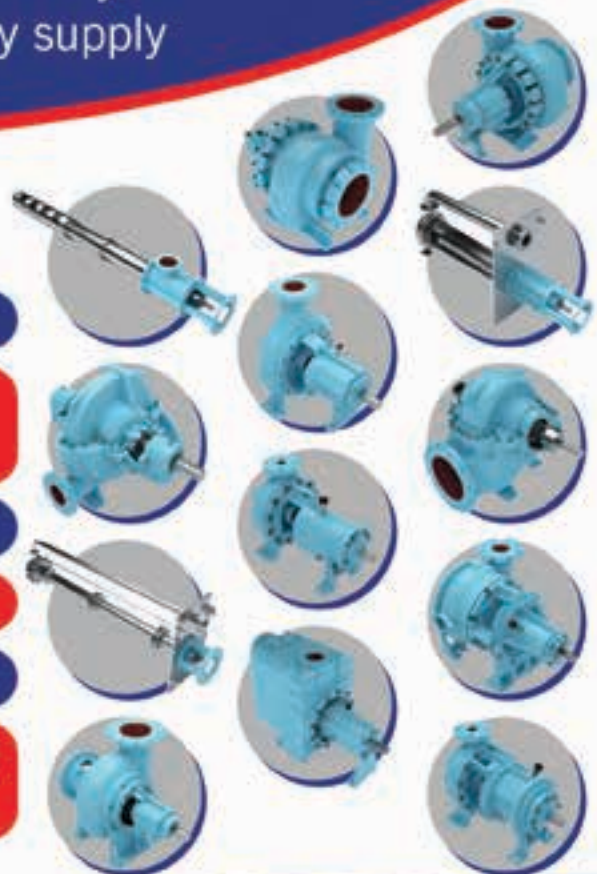
Customised Pump Solutions

Over 20 000 SAMCO® pumps installed into industry over the past 30 years

- ✓ Water reticulation
- ✓ Wastewater
- ✓ Irrigation
- ✓ Pulp and paper
- ✓ Food and beverage
- ✓ Fertilizer
- ✓ Chemical
- ✓ Base metal refining - cobalt, copper, manganese, nickel & zinc
- ✓ Platinum refining
- ✓ Uranium refining
- ✓ Steel manufacture
- ✓ Motor industry
- ✓ Electricity supply

TYPES OF PUMPS:

- Process pumps
- Light, medium & heavy duty water pumps
- Self-priming pumps
- Spit case pumps
- Vertical Turbines
- Extensive range of OEM spares and components readily available



www.sameng.co.za

sales@sameng.co.za | +27 11 823 4250

24 Duncan Road, Lilianton, Boksburg, South Africa