

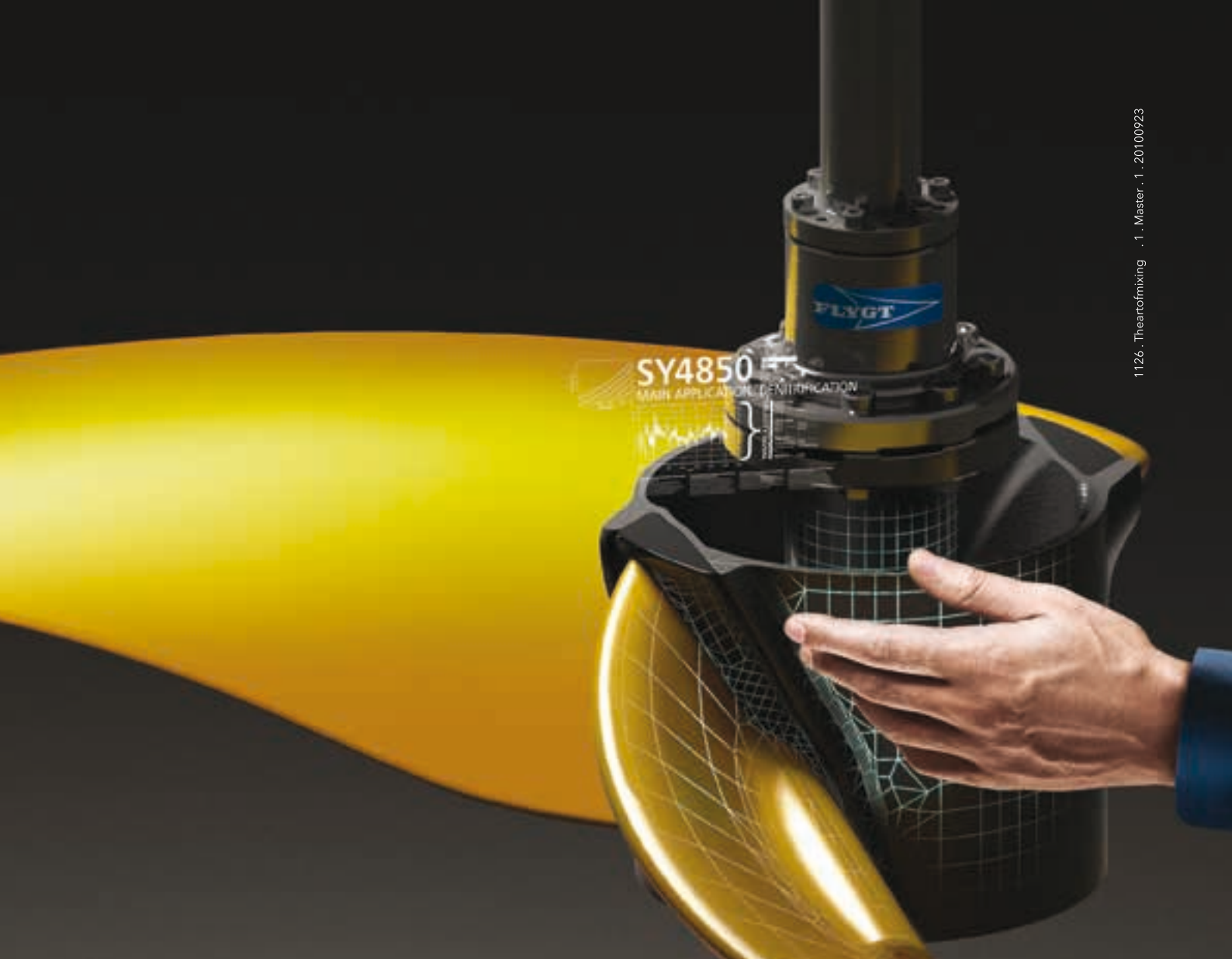
THIS MONTH:

- Efficient agitators optimised for thrust
- Power in southern Africa: a positive outlook
- Industry 4 – towards integrated automation
- Pedestrian detection systems (PDS) for surface mining

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Towards mining and manufacturing partnerships

Not many South African manufacturers seem positive this year. I hear of a heavy engineering company in the Vaal triangle laying off hundreds of skilled workers and of fabrication companies in the region having to downsize significantly to survive.

The most recent Manufacturing Circle survey confirms this trend, reporting that producers are increasingly pessimistic about business conditions for 2015 and until the end of 2016. Manufacturers cite regulatory hurdles, electricity shortages and a faltering global economy as reasons. *“The fact that increasingly more respondents feel that conditions in the longer term will be depressed does not bode well for the sector’s revival,”* the survey notes.

Iraj Abedian, the review presenter is reported as saying that, to deal with high labour costs, producers are reducing working hours, retrenching people, encouraging workers to go on early retirement and adopting automation. What is not explicitly highlighted is the devastating affect these strategies can have on manufacturing-dependent communities.

The lack of clarity over the government’s beneficiation strategy was also raised as negative factor for manufacturing.

A post Marikana article produced in 2013 by the European Centre for Development Policy Management (ECDPM) – a think-tank to broker effective development partnerships between the EU and Africa – suggests that *“mining in South Africa has always been an enclave industry, albeit with substantial impact on the rest of the economy”*. [Turok, B. 2013. Problems in the mining industry in South Africa]

The article argues that in South Africa, minerals are extracted from deep levels, subjected to some basic processing and then exported as ores *“without a great deal of beneficiation or fabrication”*.

In a chapter entitled *the gap between mining and manufacturing* it argues *“manufacturing has been subjected to extraordinarily high prices for raw material inputs such as steel, making our manufacturers uncompetitive internationally and even in the home market. The value chain and linkages so necessary for efficient and competitive production of finished goods have been seriously undermined. So has the flexibility of production needed to cope with shifts in global supply and demand, due to rigidities arising from the separation of the production of minerals and manufacturing”*.

According to the ECDPM, this separation of mining and manufacturing is supported by the Chamber of Mines, which argues *“mining is driven by inherited comparative advantages, such as mineral deposits or natural beauty, while manufacturing depends on competitive advantages”*. Hence *“a mineral resource endowment does not necessarily translate into manufacturing beneficiation”*.

In addition, the Chamber of Mines states *“the mining industry should not be required to subsidise manufacturing beneficiation or to provide minerals below internationally determined prices.”*

So, not only do South African manufacturers have to pay global market prices for input materials, but they also have to be price-competitive with better-subsidised, low-cost manufacturing countries such as India and China. And as champions of the open market, the mining industry is inclined towards favouring cheaper imports over supporting local manufacturing.

The end result is South African manufacturers can only really be successful in niche markets requiring high levels of skill, experience and customisation.

On the labour side, the isolation of mining from the total industrial value chain also has consequences. Redundant miners cannot easily switch to employment in other sectors due to the lack of transferable skills – and any mining downturn has a compounding impact on manufacturing sector jobs.

The Department of Mineral Resources’ 2011 beneficiation strategy was an attempt to leverage the mineral wealth of the country by creating a higher value chain for our locally mined minerals. Its release was, unfortunately, coupled with the term *“resource nationalism”* which was reported to be *“the pattern across Africa to ensure greater benefits from natural resources”*.

Unsurprisingly, the Chamber of Mines at the time was quick to reject many of these provisions on the grounds that mining is a *“specialised activity quite distinct from manufacturing”* – a position that the ECDPM argues, best suits foreign owners with vested interests in exporting raw ores.

The ECDPM case for an increased role for manufacturing in the beneficiation of minerals is compelling, now more than ever. It is surely in the national interest for manufacturers supplying to the mining industry to be favoured, via tax incentives, subsidies or legislated localisation thresholds. We should be encouraging all stakeholders – labour unions, global mining bosses and government departments – to champion the local manufacturing industry. And buyers should have to rigorously defend decisions to import systems at the expense of an equivalent local product.

This can never be achieved, however, while government, mining and manufacturing associations, labour unions and overseas investors pursue conflicting policies based on their own vested interests. We need to unite behind a bigger picture and develop partnerships to optimise the long-term returns for all concerned.

The alternative will require very high fences to protect the silos.

Peter Middleton



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ON THE COVER



Innovative pump products for improved mining efficiencies

Weir Minerals Africa is turning its attention to helping its customers improve their processes and optimise their plants. "The question now is how can we make improvements within a defined operational environment, where each plant has an installed base of pumps and equipment with fixed dimensional tolerances," says Rob Fawcett, sales, marketing and engineering director: Weir Minerals Africa and the Middle East.

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With the Department of Mineral Resources (DMR) unveiling its draft of the mandatory Code of Practice for Trackless Mobile Machinery (TMM), detection systems pioneer, Booyco Electronics is unveiling its very low frequency pedestrian detection system for surface mining machinery. Anton Lourens reveals more.

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The term 'Industry 4' originates from Germany and has been adopted by Festo to signify a holistic production automation revolution embracing the full suite of modern technologies. *Peter Middleton* talks to Russell Schwulst, business development manager for Festo South Africa, about this fourth industrial revolution.

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Innovative pump products for improved

Weir Minerals Africa is turning its attention to helping its customers improve their processes and optimise their plants. “The question now is how can we make improvements within a defined operational environment, where each plant has an installed base of pumps and equipment with fixed dimensional tolerances,” says Rob Fawcett, sales, marketing and engineering director: Weir Minerals Africa and the Middle East.



Rob Fawcett, sales, marketing and engineering director at Weir Minerals Africa and the Middle East.

Weir Minerals Africa not only offers the most innovative pump products, but also gives existing customers the opportunity to update their older pumps in order to take advantage of the latest developments. “While we make ongoing improvements in terms of using the latest construction materials and improving the performance of our products, we continue to service and support the large base of our tried-and-tested older technology products throughout Africa,” Fawcett says.

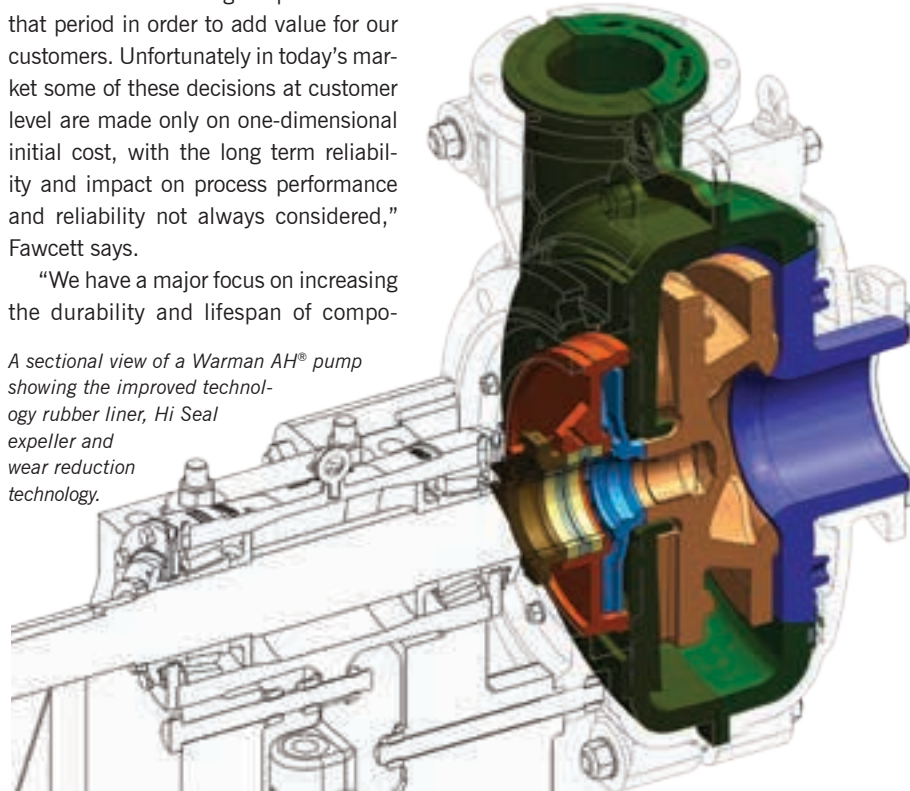
While the Warman® AH® pumps are well-known on the African continent, he says that Weir Minerals Africa is turning its attention to helping its customers improve their processes and optimise their plants. “The question now is how can we make improvements within a defined operational environment, where each plant has an installed base of pumps and equipment with fixed dimensional tolerances.”

Constant support and a rapid response time are more important than ever before. “Within the context of the currently constrained economic environment, few min-

ing operations have the capex available to replace an entire fleet of equipment. Typically, return on investment periods used to be three to five years, but that horizon is now a maximum of 12 months. Therefore, products have to be able to demonstrate the savings required within that period in order to add value for our customers. Unfortunately in today’s market some of these decisions at customer level are made only on one-dimensional initial cost, with the long term reliability and impact on process performance and reliability not always considered,” Fawcett says.

“We have a major focus on increasing the durability and lifespan of compo-

A sectional view of a Warman AH® pump showing the improved technology rubber liner, Hi Seal expeller and wear reduction technology.



nents, which translates into less downtime and reduced spares usage. This has proven successful in the marketplace, and forms part of our standard offering for all new pumps. Over the last three to four years, through our retrofit programme, these improvements have been and are being made available to the existing installed base,” Fawcett says.

These improvements range from the hydraulic design within the pump unit itself to complete pump range redesign. As a slurry pump differs from its clear water counterpart, there is

a need to strike a balance between efficiency and excellent wear performance. We have been able to demonstrate a dual benefit in terms of energy savings as well as improved performance,” Fawcett adds.

This philosophy of combining energy savings with improved performance is at the heart of the Weir Minerals Africa market strategy, and was applied when reviewing the entire mill circuit. It resulted in solutions being developed that combine Enduron® high-pressure grinding mills with KHD technology, Warman® slurry pumps, Linatex® rubber products, Trio® comminution equipment, Vulco® wear-resistant linings, Cavex®



The new Warman WBH® slurry pump installed in a sand and aggregate application.

mining efficiencies



Above: Assembly of a 750 rubber-lined mill circuit pump at the Weir heavy bay foundry.

Left: Weir Minerals offers a range of equipment solutions including hydrocyclones, rubber lining, hoses and slurry valves.

hydrocyclones and Isogate® valves.

“The market has definitely changed. What is vital is the duration of any shut-downs and improving intervals between these shutdowns. Equally critical are the health and safety considerations around handling and repairing equipment.” Weir Minerals Africa has ISO 9001, ISO 14001 and OHSAS 18001 accreditation, and considers these factors in product development decisions and holistically in terms of repeatability and reliability.

“Another major consideration is the environmental impact of the products we produce. A good example is being able to reclaim scrap metal from our customers and to reprocess that at our Heavy Bay Foundry (HBF) in Port Elizabeth and at our Isando foundry facility to limit the impact on raw materials usage and improve costs. The quality of our raw material stock is a major factor in ensuring our products meet stringent quality and performance standards,” Fawcett says.

“We have sophisticated design packages that allow us to optimise both performance and materials of construction, which means employing the right material where it is required. In addition, we investigate the root causes of wear occurring in specific areas and use this data for product and future product enhancements,” Fawcett says.

Such enhancements flow through to the existing Warman AH® range in order to increase efficiency and wear

performance. “The new Warman WRT® impeller and throatbush upgrade kit has been used to make significant improvement to the design of the component combination,” Fawcett explains. These are integral components of the pump that impact on its hydraulic and wear performance.

The Warman WBH® slurry pump offers more than a dozen enhancements to the already state-of-the-art Warman slurry pump range. Here the main focus is on meeting the productivity and cost demands of Weir Minerals Africa’s customers in different operating environments. “This pump is destined to set a new benchmark in slurry pumping standards, as the Warman AH range is widely accepted as the benchmark for many applications over the last few decades,” Fawcett says.

The Warman SLR® pump is designed specifically for medium-duty slurry handling where conditions are not arduous enough to justify a heavy-duty slurry pump. “We revisited the way our pumps are put together from a maintenance perspective. Traditionally, components were split radially, which was the easiest way to strip a pump down and then reassemble it. Our particular innovation in this regard is to split the pump axially and fit it with a one-piece volute that reduces the assembly and risk of any potential component mismatch. The overall outcome is a pump unit with a significantly smaller footprint

to what is currently in the market.”

Looking at general sump applications, Fawcett says the Warman WBV® ultra heavy-duty range of vertical cantilevered slurry pumps has been launched and he believes that this too will be set to redefine these applications. The new design features internal agitation as opposed to a mechanical agitator attached to the impeller. The impeller has specialised vanes that take up a certain amount of the flow and divert it back into the sump to produce the agitation required. This feature is proving far more successful than the traditional mechanical or water assisted agitation mechanisms.

Several of these next generation sump pumps are being trialed. “We have completed the test periods and have removed the pump units to evaluate the wear performance. The result has exceeded our expectations and it will be a game changer for our customers,” Fawcett says.

“This development is emblematic of our approach to develop products for specific applications, rolling them out across our entire product offering and then standardising at a higher level. This means that all design changes are incorporated into subsequent improvements and then finally in the standard product offerings. This, in turn, means that these improvements are passed on to all of our customers. Thus, as replacement components are purchased, the full benefits are realised,” Fawcett concludes. □

Pump distributor conference in Johannesburg



Integrated Pump Technology's distributor conference in Johannesburg focused on understanding the needs of its mining customers and equipping its distributor base accordingly.

Integrated Pump Technology of South Africa recently held a highly successful distributor conference in Johannesburg. "The conference allowed us to understand our customers' mining needs in particular. This will enable us to equip our distributor base accordingly," Graham Russell, chief executive officer, Integrated Pump Technology, says.

Deon Joubert, managing director of distributor Babata Pumps, which has

branches in Steelpoort and Barberton, says the distributor conference was "a great initiative" that identified additional business opportunities for Integrated Pump Technology.

The conference was attended by delegates from all over Africa and included a presentation on project 'hot spots' in South Africa by Paul Runge from Africa Project Access. "Our growth strategy includes growing our footprint in sub-Saharan Africa," Russell says, adding that the response from the distributor network has been "hugely positive".

"We look forward to building on this in 2015. Although conditions remain challenging in the South African mining environment, we believe there are growth opportunities both locally and in Africa. It is companies such as Integrated Pump Technology that will make the most headway in this regard due to our flexibility in being able to respond to our customers' needs quickly," comments Russell.

Joubert says the event gave distributors the opportunity "to hear first hand

about the exciting plans that Integrated Pump Technology has to continue to promote the Grindex brand". It also revealed the latest incentives and products on offer to customers.

Babata Pumps' Steelpoort branch in Limpopo Province is well established with the Grindex brand in terms of mine dewatering applications. "We service and maintain a number of 3.7 kW Minor H pumps and 5.6 kW Major H pumps, all working underground. From our Barberton branch in Mpumalanga, we have a Mega N pump operating in a river in Swaziland for a water harvesting application. We have also sold a Magnum pump to Mozambique for a seawater application," says Joubert.

Integrated Pump Technology is the sole importer and principal distributor for the Grindex range of dewatering, slurry and sludge pumps for southern Africa and has a network of 16 strategically located, specialised pump distributors, supported by dedicated account managers, ensuring effective service and customer support.

pump-technology.com

Dust and SO₂ reduction systems for Polish power plant

The Clyde Bergemann Power Group Europe (CBPG) has been awarded a contract to design, supply and commission SO₂ and dust reduction systems for the cogeneration plant in Będzin, Poland. CBPG's scope for the project includes a circulating dry scrubber (CDS), a pulse jet fabric filter (PJFF) system and associated materials handling systems to reduce SO₂

to 130 µg/m³ and dust to 15 mg/m³.

CBPG's customer is SBB Energy, a Polish engineering company and the engineering, procurement and construction (EPC) contractor providing the full package of DeNO_x and DeSO_x control for the Będzin cogeneration plant.

The operator, Elektrociepłownia Będzin SA, saw the need to adopt the

plant to meet newly defined emission limit values (ELVs) that are part of the European Industrial Emissions Directive (IED). The IED entered into force in June 2011 and requires existing large combustion plants to meet minimum standards for the emissions of toxic air pollutants such as acid gases and particulate matter within a short time period.

The Będzin project ties together the expertise of three Clyde Bergemann subsidiaries to offer an optimal solution: Clyde Bergemann Polska coordinates the project close to the customer and is responsible for the local fabrication and services. They are supported by Clyde Bergemann Doncaster (UK) for all associated materials handling systems. The CDS and PJFF technology is provided by Clyde Bergemann Hanover, part of the Clyde Bergemann Power Group Americas and the core competence centre for air pollution control solutions.

"This order clearly shows the benefits we can offer our customers through collaboration within the Group," says Franz Bartels, president and CEO of the Clyde Bergemann Power Group.

Design work for the project has already begun with implementation scheduled to start in the first half of 2015.

www@cbpg.com

New appointments to the Hytec Group board

Two longstanding senior directors of the International Bosch Group have joined the Hytec Group of Companies board as part of the new joint venture into Africa. Roland Keller (left) and Andrew Castle (right) represent a combined 39 years of service to the Bosch Group across numerous international management posts, bringing a wealth of experience not only to the Hytec Group, but to the African hydraulics and automation market as well.

Keller joins the Hytec Group as deputy chief executive officer. Originally from Germany, his 22 years of service to Bosch Rexroth have included various positions in Germany and the United States, with the most recent as senior director, Excavator Centre, Mobile Applications, in China.

Castle has been appointed chief finance officer. Castle has held numerous senior financial positions in his 17 years of service with Bosch in the United Kingdom, India, South Africa and the United States. His most recent position was as vice-president, finance and administration, Robert Bosch Ltd, in the United Kingdom.

The reconstituted board also comprises John Wingrove, CEO, previously Hytec group MD, and John Dunmow, group finance controller.



www.hytegroup.co.za

Lab boosts capacity with new equipment



WearCheck MD,
Neil Robinson.

WearCheck, Africa's leading condition monitoring company, recently invested over R2-million on new cutting-edge laboratory equipment. The shopping list included a gas chromatograph (GC), an inductively coupled plasma spectrometer (ICP) and a high performance liquid chromatograph (HPLC).

All the new equipment uses top of the range technology to ensure WearCheck's legacy of accuracy and reliability for sample results and diagnoses. While the company has already invested extensively in GC, ICP and HPLC technology over many years, laboratory capacity has been significantly boosted with the addition of the latest testing equipment.

ICP spectrometry analysis provides high-speed detection and identification of trace elements at very low concentrations in oil to determine the levels of wear metals, contaminants and oil additives in lubricating oils. The ICP has been installed

in WearCheck's Middelburg laboratory.

The HPLC separates compounds within transformer oil samples, revealing the presence and quantity of trace degradation products, which provide information on the operation of the transformer and whether there has been any breakdown of insulating material.

The GC separates and analyses compounds that can be vaporised without decomposition, revealing critical information about the presence of contaminants via the composition of the oil sample. The new GC and the HPLC are in operation in WearCheck's speciality laboratory (WSL) in Johannesburg and have enabled more samples to be processed in faster turnaround times.

Managing director, Neil Robinson, explains, "The concept of analysing oil samples from a machine or component is similar to that of taking a blood sample from a person – the results determine the health status of the unit. WearCheck's highly skilled diagnostic team analyses the results and recommends how to rectify any abnormal findings."

www.wearcheck.co.za

Aquatronics showcased at WorldSkills in Cape Town

The WorldSkills SA (WSSA) National Competition took place at the Cape Town International Convention Centre (CTICC) between 28 January and 01 February 2015. Participants competed in various skills areas from various sectors, ranging from manufacturing technology, social and professional services to IT and business administration. Winners stand a chance of participating in the international competition in Sao Paulo, Brazil later this year. WorldSkills is a global organisation that promotes vocational, technological and service oriented education and training.

Festo is a proud global sponsor of WorldSkills International and a WSSA partner. As part of WorldSkills 2015 held at the CTICC, Festo demonstrated three skills – mechatronics, mobile robotics and a new skill, aquatronics – one of 'try-a-skill' disciplines. "Our mechatronics DJ robots, Mobile Robotics Robotino® and the aquatronics water rig were all on display and attendees were able to engage with them. The purpose of 'try-a-skill' is to interest young people in choosing engineering as a career – that is why the competition was open to the public for three days and large numbers of schools visited," explains

Daniel Gauch from the product management group of Festo Didactic GmbH & Co KG. He was in South Africa to promote the aquatronics skills and to participate in the WorldSkills conference.

Aquatronics is a new global skill. It was showcased as a demonstrator skill at WorldSkills in Leipzig in 2013. "The skill is based on the EDS® training rig developed through the GIZ and Festo Didactic here in South Africa. This new discipline will contribute to promoting vocational training and education in a field that presents major challenges around the world: the provision of stable and sustainable water supplies," continues Gauch. "To be able to showcase this new skill in South Africa is very exciting and ties in with the innovation and promotion of new skills that WorldSkills seeks to foster."

At the conference, Gauch presented a talk entitled 'An industry perspective' that highlighted the impact of WorldSkills on improving the level of vocational education, updating curricula and making them more industry-relevant – improving the employability of technical graduates and the global competitiveness of industries.

www.festo.co.za

In brief

In order to provide its predictable power solutions to a wider range of industries, **Atlas Copco** and industrial generator brand **Gesan** are joining forces. A brand within the Atlas Copco group since 2011, Gesan will now become a dedicated Atlas Copco product line.

At its recently celebrated 10-year anniversary, Barend Niemand was appointed CEO of the **Comtest** Group of Companies. He succeeds Peter Verwer, who retired in March 2015. Comest won Fluke's best newcomer and best distributor award in 2005, the first start-up company ever to have done so.

DCD Protected Mobility, a division of DCD Group has announced that the Iraqi Ministry of Defence has purchased its Husky 2G as its improvised explosive device (IED) and mine clearing vehicle. Known worldwide for its survivability and capability, the Husky 2G is equipped with the NIITEK MMDS ground penetrating radar and the FASCAN interrogation arm used to interrogate suspected mines and IEDs.

Diesel Electric Services has taken the proactive step of installing a permanent, high-pressure gas connection from Egoli Gas to enable demonstration testing and certification of natural gas powered engines. Compared to the old method of using compressed natural gas from banks of cylinders, the testing procedure is now a far more convenient and cost-effective process.

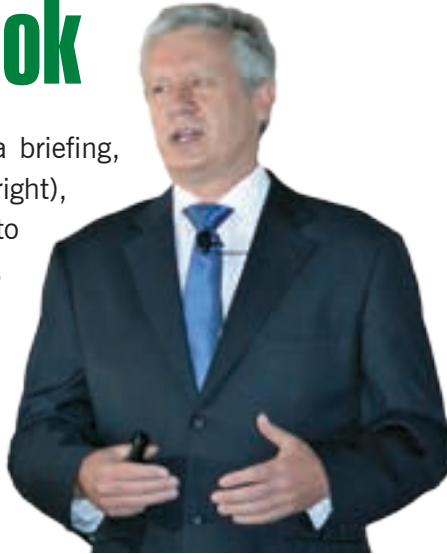
EDF Energies Nouvelles has announced the commissioning of the Grassridge wind farm in South Africa by InnoWind, its local subsidiary. The R1-billion plus construction was established at PPC Cement's Grassridge quarry in Port Elizabeth.

Energy expert Paul Fitzsimons, GM of **GIBB Consulting Engineers, Power & Energy** sector, is warning against adopting overseas energy models to resolve South Africa's current challenges. "Power and energy supply is an extremely complex business and to simply hold up one nation's apparent solution as a one size fits all solution for South Africa is a gross oversimplification of the facts and indicates a lack of understanding," he says.

Power Engineering, the oldest energy journal in the USA, announced the **Rosatom**-linked Russian nuclear power plant (NPP) projects **Bushehr NPP (Iran)** and Unit 1 of **Kudankulam NPP (India)** as its 2014 projects of the year in the Nuclear Power category.

Power in southern Africa: a positive outlook

On the occasion of ABB's annual media briefing, *Peter Middleton* interviews Leon Viljoen (right), ABB South Africa's managing director, to find out more about his outlook for ABB, and the power industry in South Africa and across the continent.



Opening ABB's annual press briefing, southern Africa managing director, Leon Viljoen, says in spite of negative impacts of the mining strike followed by the wage strike by the metalworkers: "We are pleased with our performance in the past year, which was achieved against a very tough trading environment in Southern Africa."

The negative impact was reflected in a R1-billion drop in South African revenue, from R5.9-billion in 2013 to R4.9-billion in 2014. "However, we were still able to grow our base orders by 8.0 %," Viljoen reveals. "South Africa and a number of the countries in the region where we operate continue to face energy supply challenges, and ABB is well positioned to supply state-of-the-art technology and customised solutions to alleviate the strain on the grid," he adds.

"Eskom is facing breakdowns at power stations on a regular basis," he continues, "but it is a little unfair to say they have been neglecting maintenance totally. The key reason for the current difficulties is the system is at its limit with respect to capacity, which leaves little time to proactively respond to reduce the risks of sporadic breakdowns," he explains.

ABB has ongoing service contracts with Eskom and is in the process of signing a further equipment upgrade contract. "We don't see a pull back in terms of maintenance upgrades. In fact, we see the opposite. We are currently executing a substantial contract for replacing motors at power stations, for example. As part of the contract we assessed the remaining life of the motors and, based on that assessment, we are replacing motors. We are currently seeing a much greater maintenance focus than we did, say, five years ago," Viljoen tells *MechTech*.

Responding to the shortage of maintenance skills, Viljoen does not believe that South Africa has serious maintenance capacity issues: "Between Eskom and the service providers to the power industry, servicing capacity is available. We need to do more to overcome skills shortages, though. If you look at the skills base, we have a lot of highly skilled people in the 50 to 60 age group, but below that, there is a generation gap, people did not want to become artisans. We are seeing a shift in attitudes from our younger people, who now recognise that the demand is there and they can see career paths for technically skilled artisans," he says. "Young people are migrating towards the trades, but it is very important that we act quickly to get these people properly trained and experienced before the older generation leaves the system."

In response, ABB has kicked off a project to build an internationally benchmarked training centre at its head office in Longmeadow. "This 'Centre of Excellence' will be an interactive training centre that showcases ABB's ability to deliver learning solutions to employees and customers as a holistic endeavour," Viljoen says. Sophisticated learning aids, such as simulators, product cut-outs and demonstration units will be added to appeal to the young modern learner.

The new facility will deliver learning programmes for all five ABB divisions. The strategy emphasises business involvement and the development of training infrastructure, which will be expanded to offer high, medium and low voltage training.



"Training is the central pillar of the service side of our business. The new programmes will be used to upskill our own staff and for customer training. I have not spoken to one utility that does not require training to upskill their service people, so this is a huge opportunity," Viljoen says.

In response to the adoption of proactive/preventative approaches to maintenance, Viljoen says that a lot of people have been very sceptical. "Now, though, there is better acceptance. Contracts such as Eskom's motor replacement project were based on a modern analysis system that can determine the remaining life of an electric motor. People are now much more willing to act and invest, based on predictive techniques such as these, because the cost and consequences of unscheduled breakdowns have become obvious," he notes.

"Monitoring is also becoming accepted on remote sites in Africa. More and more customers want to know the status and condition of their equipment at all times, so we are seeing a move to much smarter equipment, even on the distribution side of our business. We have recently installed substations with remote switching and information status capability that gives operators immediate fault alarms and allows circuits to be shut off remotely. These smarter systems are now available



Above: ABB was responsible for the installation of an energy efficiency and building management system for the DEA head office building in Pretoria, South Africa, which is targeting a six star Green Star rating.

Far left: New outdoor HVDC valves for the Apollo Upgrade of the Cahora Bassa HVDC link.

Left: An ABB-installed PV system on the roof of the new DEA building. Viljoen sees its Microgrid technology being used to help very large buildings and small villages become self-sufficient in terms of electricity.

and being specified by more and more municipalities and industrial clients," Viljoen says, adding that this is also "a step in the right direction towards smart grids".

Turning attention back to overcoming Eskom's current difficulties, he is confident that Medupi's Unit 6 will be brought fully online during 2015, "probably by June". "And once the first unit is successfully proven, confidence will rise and the other units will follow relatively quickly and successfully. Together, Medupi and Kusile will add some 9 600 MW of generation to the grid, which should take Eskom into an area where thorough maintenance of existing power stations is again possible," he predicts.

"But this is not the ultimate solution. If South Africa grows as it ought to, then power shortages are sure to hit us again. People are so focused on resolving the current crisis that we are in danger of forgetting about the long-term future," he warns.

Discussing the long-term possibility of a line coming into South Africa from hydro-electric projects such as Grand Inga in the DRC, Viljoen cites the historic success of the Cahora Bassa transmission line from Mozambique. ABB is busy upgrading the HVDC substation in Tsonga, Mozambique, a converter station on the Cahora Bassa HVDC transmission line. "Outside of war and flooding

incidents, the Cahora Bassa line has been a fairly reliable source of power to South Africa, and I see no reason why a link from the DRC should be any less reliable," he says.

Proposed as a NEPAD project for regional integration, a transmission line from the DRC is planned to bring power into South Africa from the Grand Inga project, which, ultimately, could generate 40 000 MW from the Congo river, which drops 96 m over the Inga falls. "With political stability in the region, the political will to make this project happen is emerging. It's sounding very positive and if it does happen in the long term, the additional capacity could result in significant improvements in power stability across the region," Viljoen believes.

Another 2014 highlight for ABB was the installation of a full building management system including PV on the roof of the new DEA building, which is targeting a six Star Green rating. "The key reason for installing PV on rooftops is to make sure that the building is as energy efficient as it can possibly be. These systems do not put electricity into the grid. Instead, they reduce peak and net draw off the grid. No storage is involved in this case, so the idea is to use the energy while the sun is shining," Viljoen explains.

Microgrids are identified as one of

ABB's global 1 000-day programmes in the company's 2014 'Next level strategy' report, Viljoen sees such technology being used where villages and very large buildings can be made self-sufficient in terms of electricity. "We expect to see strong growth of self-contained systems across Africa. Microgrid solutions are about mixing efficiency and management and control system technologies with PV panels, generators and battery storage to best meet the electrical energy needs of a defined area or business," he explains, adding that ABB has started to look at the business case for making its own Longmeadow facility into a microgrid.

"While still active in the renewable energy sector, we have refocused during 2014 on the things we are best at, such as the electrical balance of plant (eBoP) and the grid connection side. We see ourselves as a supplier to EPC companies rather than a developer in our own right," he adds. "For the Kathu PV plant in the Northern Cape, for example, we successfully supplied and installed all of the electrical and control systems equipment.

He concludes: "As a power and automation service provider, South and southern Africa are, by far, the best places in the world to be. I would choose my current position above any ABB posting anywhere else in the world," says Viljoen. "The growth potential and opportunities for power generation, transmission, distribution, rail, gas, municipal and mining infrastructure make for a very positive outlook." □

Efficient agitators optimised for thrust



MechTech talks to Ryan Mitchell (left), applications engineer for mixers at Xylem Water Solutions, South Africa, about the Flygt range of mixers and agitators, which are optimised for bulk flow and sized and tested based on thrust rather than W/m^3 .

All mixing applications require varying degrees of low-level turbulence and bulk flow. Good bulk flow puts the contents of the entire tank into motion so that all parts of the tank are involved in the mixing.

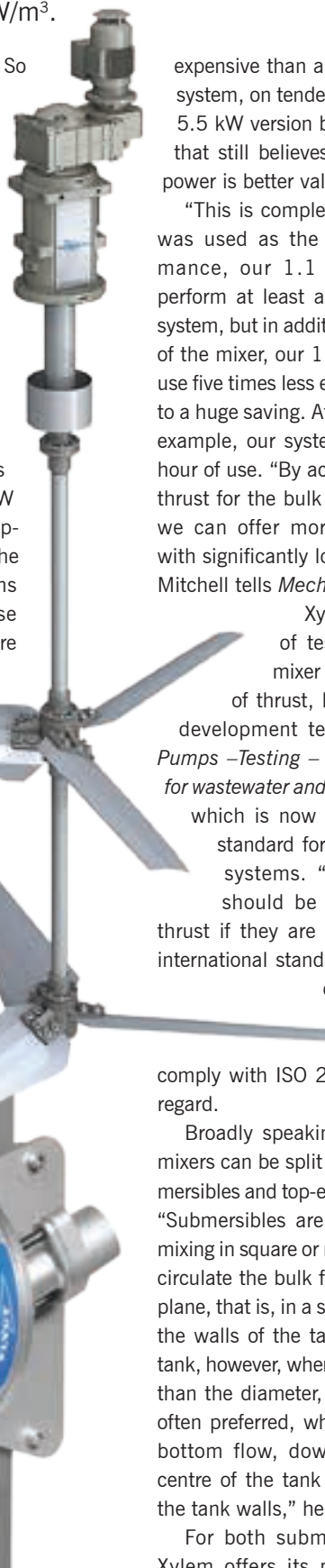
“But the amount of bulk flow achieved by a mixer is directly dependent on the total thrust delivered by the mixer blades,” begins Mitchell. “Xylem has pioneered the use of thrust as the main performance parameter for mixing. And every day, we put more than 50 years of R&D expertise and practical experience to work to determine the right technology, mixer size and installation for individual application requirements,” he says.

In South Africa, however, the tradition has been to size and select mixers based on a simple empirical relationship between the volume to be mixed and the installed power. Mitchell explains: “To use W/m^3 to size a mixer system, one determines the volume of the tank and, using a pre-established W/m^3 ratio for the chosen medium, the output power of the mixer is calculated. While different ratios are available for the different mixing applications, this is a very simplistic approach that does not take into account the design of the mixing blade. A simple change of propeller angle, without changing the motor power or speed, can completely change the performance of a mixer. On a boat, for example, a change of propeller blade angle can be used to directly

control torque and thrust. So the degree of optimisation that goes into the propeller makes a huge difference to the mixing efficiency and performance of a system,” he argues.

As an example, he cites a comparison between a typical locally manufactured mixer unit sized at 5.5 kW. “We found we could achieve the same performance as this system using a 1.1 kW motor and one of our optimised mixer blades. The price of the two systems was similar, but because our 1.1 kW solution is more

Xylem top-entry systems use bigger shafts to minimising flexing and vibration on cantilevered systems. “For very deep tanks with long shafts and multiple impellers, we can install a bottom support called a shaft stabiliser,” says Mitchell.



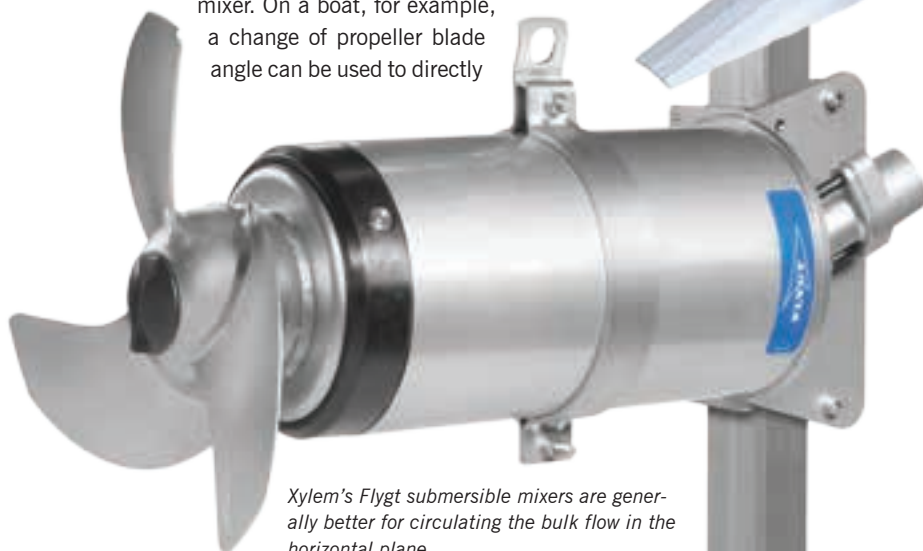
expensive than a locally built 1.1 kW system, on tender the client chose the 5.5 kW version because of a mindset that still believes that higher system power is better value for money.

“This is completely untrue. If thrust was used as the measure of performance, our 1.1 kW system would perform at least as well as a 5.5 kW system, but in addition, over the lifecycle of the mixer, our 1.1 kW system would use five times less energy. That amounts to a huge saving. At R1.00 per kWh, for example, our system saves R4.40 per hour of use. “By accurately sizing using thrust for the bulk flow value required, we can offer more efficient systems with significantly lower lifecycle costs,” Mitchell tells *MechTech*.

Xylem, a global pioneer of testing and recording mixer performance in terms of thrust, has been part of the development team of ISO 21630: *Pumps – Testing – Submersible mixers for wastewater and similar applications*, which is now the accepted global standard for mixing and agitator systems. “All mixing systems should be specified based on thrust if they are to comply with this international standard,” Mitchell points out, adding that all Flygt mixers and agitators already comply with ISO 21630: 2007 in this regard.

Broadly speaking, he explains that mixers can be split onto two types: submersibles and top-entry agitators (TEAs). “Submersibles are generally better for mixing in square or rectangular tanks and circulate the bulk flow in the horizontal plane, that is, in a stirring motion around the walls of the tank. For a cylindrical tank, however, where the depth is greater than the diameter, a top entry mixer is often preferred, which creates a top to bottom flow, downward through the centre of the tank and upward around the tank walls,” he explains.

For both submersibles and TEAs, Xylem offers its proprietary ‘banana



Xylem’s Flygt submersible mixers are generally better for circulating the bulk flow in the horizontal plane.

blade', which is a two-bladed impeller/propeller made out of polyurethane. Developed for non-abrasive sewage applications, this signature Flygt propeller has a large diameter and a backswept self-cleaning design for non-clog performance. "For submersible mixers in the mining industry we offer our three-bladed stainless steel propellers or, for highly abrasive applications, these are also available in high chrome, a material that has made us a leader in South Africa for submersible mixers for the mining industry," Mitchell claims.

Sizing mixing systems based on thrust offers significantly more design flexibility. "Because



Above: Xylem SA offers full service support, via the local Total Care and mobile servicing offerings.
Left: Xylem's signature Flygt 'banana blade' propeller has a large diameter and a backswept self-cleaning design for non-clog performance.

we can offer different blade designs depending on the applications and bulk flow required, we can achieve far better mixing and energy efficiency. We have six sets of propellers with different blade angles, which enable us to customise solutions to best suit the specific application," he adds. "Simply put: by choosing the most appropriate propeller design, it becomes possible to get more mixing out of a less powerful motor."

Comparative tests done on top-entry agitators in Xylem's Swedish test facility have shown that a Flygt mixer achieved 40% better energy efficiency under controlled test conditions than its Swedish competitor. "And better efficiency also results in better reliability. Reliability is about right-sizing, – matching the right mixer to the application," he notes.

Mixers are used wherever agitation is required to deal with solids in suspension. In wastewater treatment plants for activated sludge treatments and digester mixing, for example, and for mixing settled solids in sumps before pumping the contents away. "In the mining indus-

try, solids in underground dams need to be prevented from settling so they can be easily pumped away as slurries. There are also a variety of applications in the minerals processing plants," Mitchell says.

"Our comprehensive portfolio of mixers and agitators cover virtually every requirement. Hundreds of thousands of Flygt mixers and agitators are in service worldwide, delivering efficient mixing performance. Our top-entry agitators are used when deep tank mixing is required and Flygt TEAs deliver outstanding cost-effective performance for applications that involve all types of fluids, including fibrous sludge with high dry-solid content.

"Our solutions are engineered for energy efficiency, hygienic handling and ease of installation and service. These agitators combine dry-installed drives with submersible shafts and impellers, which can have multiple impellers in deep tanks.

Xylem's top-entry systems use bigger

shafts to minimise flexing and vibration on cantilevered systems. "We also have a patented levelling flange, which makes it easy to adjust the shaft to its true vertical position," says Mitchell. "For very deep tanks with long shafts and multiple impellers, we can install a bottom support called a shaft stabiliser. This prevents shaft runoff by fixing the shaft end to the bottom of the tank with a swivel coupling assembly." He adds that full service support, via the local Total Care and mobile servicing offerings, is available for mixing installations, as are the necessary spare parts.

"Ours are engineered solutions," concludes Mitchell. "Our recommendations result from the use of specially developed and validated computational fluid dynamics (CFD) software, based on carefully selected, relevant models. Our own testing facilities, as well as field-testing and measurement of actual on-site performance, has given us keen insight into what works. Using this knowledge and expertise, we are in a position to install and maintain mixing installations of any size and complexity," he says. □



The pump guy: Booster pumps?

In the March Pump Guy column, Larry Bachus responds to a query from Sushil Mannan, a process engineer at a steel mill in India. Mannam has a problem with the pumps on the cooling tower circuit, which generate a maximum pressure of 9.0 bar (gauge), but this is not enough to pump water into the outlet header. Bachus proposes adding booster pumps to solve the problem.

Adding a booster pump is technically viable when the system demands it. But more information is needed to determine whether this is in fact the case. Is your cooling tower pipe loop under construction? Is your cooling tower pipe loop recently commissioned? If your cooling tower pipe loop is not new, then how old is it? If your cooling tower pipe loop has existed for many years, do the original engineering drawings match the existing pipe scheme?

The schematics Mannam sent don't show the necessary information to answer the principle question. They don't show clogged filters and strainers in the loop, normally throttled control valves or pipe scale. A 200 mm internal diameter water pipe eventually becomes a 170 mm pipe and then a 140 mm diameter. The additional friction and velocity losses may be the real energy-consuming culprits leading you to consider a booster pump.

We can't see long-lost pipe wrenches and 'come-alongs' lodged in the piping system elbows. Drawings don't show new equipment (probes, flow meters, equipment substitutions, etc.) added since the cooling water system was designed and commissioned. We can't see the 'spring load' or 'weighted arm'

on check valves. The drawings don't show if the loads were altered or changed.

We can't see the NPSH available to the pump suction nozzle. This can be measured with a gauge. The schematics don't show the actual installed impeller diameters or the actual motor speeds for comparison with the original specs. The impeller diameter, wear-ring tolerance and speed are big factors in determining if the pump can meet the demands of the system.

If the original cooling tower loop required 8.5 or 9 bars (gauge) of energy, the cooling tower pumps should have been chosen to develop 9-bars (gauge) at best efficiency pressure. If a recent system modification (new filters, valves, heat exchanger, longer pipe runs, etc.) consumes additional energy, then a booster pump is a potential solution.

But let me offer some thoughts about other possible directions to pursue.

The main pump may require a 300 mm (diameter) impeller. But, after many years of service and erosion, the impeller diameter can be less than 300 mm. This will affect the main pump's developed head.

India has 50 Hz electricity. The original pump might have been put into service with a 4-pole motor rated at 1 485 rpm. Motors are frequently switched in a maintenance function. If the current motor speed is only 1,420-rpm, the main pump's discharge head is reduced by the square of the reduction in the speed. This may lead you to install booster pumps, but it might be easier and cheaper to correct the motor speed.

Where is your pump operating on its performance curve? Head (discharge pressure) normally decreases as flow increases on a cooling tower pump. Any of the above conditions and/or alterations can make you think you need booster pumps.

Think of it this way: your car has a fuel filter between the fuel pump and the carburettor. If the fuel filter clogs with debris, the fuel pump's energy is lost into the fuel filter. The petrol never reaches the carburettor. The starved engine will spit, sputter and stall. Your car won't accelerate or perform properly.

Do you need a larger fuel pump with more power? No! Do you need a booster fuel pump? This won't resolve the problem. Change the clogged fuel filter and enjoy your car's performance.

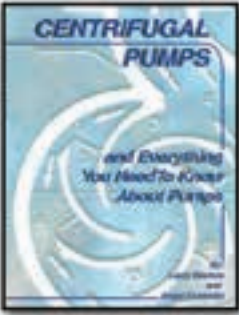
Now, think about your cooling tower pumps. Is it easier to install booster pumps? Or, is it easier to locate and correct the energy thief? The problem is likely in the system (pipes and fittings), unless the main pumps were altered in some way, or were never adequate for the system.

Locating the problem is relatively easy. Review the following scenarios. These will suggest a course of action.

Scenario 1: If your cooling tower is new, with new pumps under factory warranty, and the loop is completely new, meaning new pipes with no scale, clean filters and strainers, totally open valves with no additional intrusions or invasions into the piping integrity, and the pumps won't deliver the proper flow

Do You Know & Understand Your Pumps?

Larry Bachus (The Pump Guy) is the co-author of "Everything You Need to Know About Pumps", one of the best selling technical books on pump systems in the world. This book is written exclusively for people who must maintain pumps. Whereas other pump books are written from a design point of view, this book is written with maintenance in mind. While most technical books sit on a reference shelf gathering dust, this book gathers dirt smudges. Its pages get creased and folded when mashed by the lid of a photocopy machine. It gets sneezed on and soaked with leaking oil, grease, and coffee. Basically, it gets used... because it's tremendously useful. The straightforward guidance it provides will help you ensure the efficiency and lifespan of your pumping systems.



To order your copy of "Everything you Need to Know About Pumps"

2
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and head, this is a problem for the cooling system manufacturer. Something is out of control.

Suggested action: Make them solve the problem. Contact the tower manufacturer and the pump company. Get a lawyer and threaten a malpractice lawsuit if you must.

Scenario 2: If your relatively new cooling water system is out of warranty and the pumps never properly delivered head and flow, then it's your problem but it is easy to fix.

Suggested action: Contract a pump specialist in your city and work with him. Or, read Chapter 8 of my pump book, which shows you how to trace the energy through a pipe system. It will show you where energy is consumed in the pipe system.

Scenario 3: If your cooling water system has been functioning correctly for many years, and suddenly has new demands on it, such as increased load or production, or newly installed process devices that consume energy, then you may be able to upgrade your existing main pumps, or consider the booster pumps as proposed.

Suggested Action: Decide if you need more head or more flow, or more head and more flow to meet the new demands on the system. Get quotes on a pump upgrade. Get quotes on larger pumps. Get quotes on higher speed drives. Compare the cost and installation of the booster

pumps to the cost and installation of the other options and choose the most cost-effective solution.

Scenario 4: If your existing cooling water system has performed correctly for a number of years, but has mysteriously stopped functioning correctly, you must locate that mystery and correct it. It's not really a mystery. The mystery will reveal itself with some well-placed pressure gauges and a clip-on flow meter.

Suggested Action: Contact a local pump specialist, or me or read Chapter 8 of my book. Start with the pump (performance curve, gauges, flow meter) and confirm that the pump is either correct or incor-

rect. This is relatively easy and fast. If the problem is not in the pump, it is in the system.

The pump will do what the system makes it do. The energy (head) designed into the pump should be the same as (or very close to) the energy contained in the system.

Installing booster pumps may be the correct route to solve this pump or system problem. But the performance curves of the main cooling tower pumps with the system curve and the duty coordinates, along with sufficient suction pressure must all be established before boosting pump pressure. □

ATEX product and service range extended

Following recent ATEX certification of the LabTecta bearing protection product range, AESSEAL has announced ATEX certification of all its standard mechanical seals.

The products are certified to comply with ATEX directive 94/9/EC, and are backed by an ATEX assessment and support service included at no additional charge to the customer. ATEX is the certification that allows product installation in environments with potentially explosive atmospheres. It is extensively specified in applications throughout South Africa and Europe.

Compliance was achieved after considerable investment in developing the necessary technical expertise, experience and know-

how to assess ATEX applications and ensure compliance with this standard as well as ISO 29001.

AESSEAL is actively involved with various industry bodies to ensure that the mechanical seal industry properly advises its users in hazardous area applications. The AESSEAL range of mechanical seals and seal support systems is suitable for a wide range of industries including oil and gas, mining, water and wastewater, power generation, pharmaceuticals, chemicals, and food and beverage. □



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Modified API 618 sealless compressors arrive in SA

The acquisition of Sundyne Corporation by Pressure Products Industries (PPI) means that PPI's sealless reciprocating diaphragm compressors have been launched in South Africa and are now available locally from AESPUMP.

The PPI range of sealless reciprocating diaphragm compressors has launched in South Africa. Well-known worldwide, and with a reputation for very high levels of service and support, the PPI machines have become available locally through the recent acquisition by Sundyne Corporation of Pressure Products Industries (PPI).

Sundyne products are marketed, serviced and supported in South Africa by AESPUMP.

PPI's pedigree in the manufacture of sealless reciprocating diaphragm compressors goes back 60 years, and the company's installed base in the refining, petrochemical, chemical, LNG and semiconductor markets exceeds 3 500 machines.

Built to comply with modified API 618 standards, PPI compressors are exceptionally durable and reliable, with each unit being load tested at the USA-based factory to ensure that it meets stringent performance benchmarks for leak-free performance in the non-contaminating compression of critical gases.

PPI sealless diaphragm compressors are available in single- and multi-stage packages with displacements up to 255 m³/h; pressures to 1 170 bar; and up to 187 kW of power. They are ideal for cylinder filling, fuel cell technology, handling dangerous or corrosive gases under pressure, and transfer applications that require high purity.

In South Africa, target markets will comprise the petrochemical, oil and gas markets, where machine modularity will allow customisation to the unique needs of each application. Crankcase and motor size will be determined by duty, while instrumentation, protective equipment, gasket materials and materials for O-rings and other components will be determined by the details of the customer specification.

"Users of other makes of sealless diaphragm compressors have become accustomed to an expensive, non-PPI product with very poor after sales service,



The PPI-1500 compressor.

and that is where I see the market gap," says AESPUMP sales and marketing director, Neil Britz.

"The Sundyne PPI machines are supported by an established service network staffed by fully-trained technicians. These compressors are designed to safely operate in the most demanding applications," Britz says.

Sundyne PPI sealless diaphragm compressors deliver total assurance of



The Series 7000 PPI compressor.

non-contaminating gas compression. Boasting a leak tight mechanism that features static seals that do not need to be purged or vented, they present an absolutely zero leakage threat to the atmosphere, providing an ideal solution for safely handling ultra-pure, corrosive and volatile gases.

Additionally, a set of metallic diaphragms in each machine isolates the process media from the piston or piston rings, completely eliminating the risk of cross contamination. □

Piping technology for beverage plants

The further developed version of the proven Eco-Matrix concept for manual piping technology was presented at BrauBeviale 2014 held in Nürnberg, Germany during November last year. Eco-Fence is a "superior alternative to conventional piping with pipe fence or swing bend panels" for new brewery installations and beverage plants as well as for upgrades. The innovation is an alternative to conventional piping and offers customers no oxygen uptake, lowered costs and environmental protection.

The system provides roughly the same technological benefits and cleaning advantages as Eco-Matrix and is also based on a compact tank outlet tree. The short vertical pipe in combination with double-seal valves as well as T-smart mix-proof butterfly valves and air panel guarantees very good cleaning conditions, minimum losses and maximum product safety. An essential aspect of the Eco-Fence design is the direct connection of the valves for tank filling and emptying and their inlet and outlet connections.

Conventional pipe fence and swing bend systems have the disadvantage that the piping system has to be opened for change-

over. Opening of the system means oxygen uptake and the risk of contamination by microorganisms. This is avoided with the Eco-Fence solution.

The valves are operated via an air panel. After the operator has set the desired transfer path on the air panel, all program steps are performed automatically. The system can be operated either from next to the Eco-Fence or from a remote location.

Compared to conventional solutions, operator safety is significantly improved – no operating activities required in the working area, where cleaning and similar processes take place. The air panel facilitates operation, and in countries with extreme climatic conditions, it can be inexpensively placed in an air-conditioned room.

Eco-Fence is a cost-effective alternative to pipe fence solutions. Compared to the conventional design with long pipes between the actual tank connection and the valve matrix, Eco-Fence is an ideal solution in terms of process technology and hygiene.

Eco-Fence is patented in Germany with international patents pending. EHEDG certified components are used. □

Pump test tank facility gives customers peace of mind

The commissioning of a new 18 000 litre 90 kW test tank facility in Bartlett, Johannesburg, means that customers can get test pump curves for repaired pumps, says Lester Fine, managing director at Integrated Pump Technology.

Integrated Pump Technology of South Africa has commissioned its new 90 kW test tank facility at its 1 200 m² premises in Bartlett, Johannesburg, which include a warehouse, rental division and full service and repair

capability. "More and more customers are demanding test curves for their repaired pumps, which is critical for reliability. The issue is that while a pump can be repaired, you can only determine if it is operating at optimum efficiency by

testing it," says Lester Fine, managing director.

Integrated Pump Technology is the exclusive distributor in southern Africa for Grindex of Sweden, the world's third largest submersible pump manufacturer. The main innovation of the Grindex dewatering product family is the capability of the sub-18 kW range to run dry. This is due to a unique air valve integrated into the pump that allows the impeller to pass air instead of water past the motor in a dry run condition. In addition, a patented smart motor protector ensures thermal overload, phase loss and phase rotation protection.

The Grindex sludge range has all the advantages of the dewatering range, coupled with recessed vortex impeller and split hydraulics with replaceable rubber linings. This makes the sludge units capable of greater solids handling, with increased abrasion resistance. Lightweight aluminium construction means that these highly portable and robust pumps are ideal for underground face dewatering.

Grindex dewatering and sludge pumps are available in 316 stainless steel, with a pH handling capability of between 2 and 13, which means they are ideal for process applications. Grindex also manufactures a range of pedigree slurry pumps. Boasting a total hard chrome construction, these units are designed to move medium to heavy slurries with high abrasive content without sacrificing efficiency, abrasion resistance or production downtime.

"Our rental pumps are tested as soon as they are returned, and if they do not pump at above 90% of expected performance, they are stripped, serviced and repaired," Fine explains. The new test facility is therefore essential to Integrated Pump Technology's rental offering, which is a growing trend in the market. In terms of general pump repairs, Fine says that the main benefit for the customer is receiving a pump back that is guaranteed to meet the original specifications. "All our repaired pumps are issued with a warranty certifying that they have been repaired to original standards," Fine says.

He adds that Integrated Pump Technology has qualified technicians on hand to carry out any repairs that are needed. "We have invested significantly in skilled personnel and have a high staff retention rate. A particular skill set is required for pump repairs, which



The 18 000 litre test tank measures 3.6 m by 2.4 m and is fully automated, with different programs for specific Grindex pumps, which are tested according to the OEM's pump curve.

are not only about the hydraulics, but increasingly involve electrics as well, especially with submersible pumps.” Fine says that while pump technology is advancing steadily in the pursuit of improved efficiencies, Grindex pumps are characterised by their ruggedness, ‘plug-and-play’ ease of operation and low maintenance requirements.

The 18 000 litre test tank, which measures 3.6 m by 2.4 m, is fully automated with different programs for specific Grindex pumps. “You set it and it automatically runs through a sequence to test the pump according to the original equipment manufacturer’s pump curve. It is connected to a computer but can also be operated manually, if need be,” Fine explains. The above-ground test tank was designed specifically for Integrated Pump Technology’s new facility, and represents “a considerable investment”.

Fine adds that the pump sector is highly competitive. “There are a large number of players at the moment. As a result, one has to focus on customer service. Turnaround time is definitely critical when it comes to repairs, as downtime impacts not only the bottom line, but also has health and safety implications for dewatering applications at mines,” Fine says.

Integrated Pump Technology has just launched a campaign to gain a detailed understanding of the dewatering requirements of the South African mining industry. “Together with our new test facility, this will really give us an edge in the market. We believe that there is still untapped potential locally, which companies are overlooking in their efforts to focus on Africa. The reality is that the local mining industry is still huge – and is alive and well,” Fine concludes. □



The first test run at Integrated Pump Technology’s new 90 kW test tank facility, carried out on a Grindex Bravo 800 pump.

Robust slurry pumps for copper mine

Integrated Pump Technology of South Africa has supplied 20 Bravo 900 submersible slurry pumps and 20 M20 control panels to Kamoto Copper Company (a subsidiary of Katanga Mining) of the Democratic Republic of the Congo (DRC). These heavy duty electrical submersible slurry pumps are the largest of their kind in the Grindex product family, says Klint Bawden, general manager: sales and marketing, Integrated Pump Technology.

Chris Heunes, export sales manager at Integrated Pump Technology says the Bravo range of Grindex submersible slurry pumps has been used at Katanga Mining’s operations in the Democratic Republic of the Congo for three years and the range has proved to be “particularly successful”; and about 300 pumps are currently in operation. “The company’s products are being deployed at three different areas of Katanga Mining’s operations in the DRC,” he explains. “These are the Luilu Metallurgical Plant, the Kamoto Concentrator (KTC) and KOV Open Pit Mine (KOV).”

Heunes says that EC Mining has been formally appointed as the distributor for Integrated Pump Technology for the DRC

and “is in the process of establishing a fully-fledged service and repair workshop at Kamoto Copper Company to cater for its aftermarket needs”.

“Pumping slurry is one of the most demanding applications for any pump, due to issues such as sediment build-up leading to costly downtime and repair costs,” Bawden explains. “The Bravo range from Grindex is robust and hard-working enough to result in reduced operating and maintenance costs.” These pumps, with a maximum submersible depth of 20 m, do not require any support superstructure, which makes for quick and easy installation and less space needed for their operation.

The cartridge seal is preassembled for quicker and easier mounting, while the Hard-iron impeller and pump housing feature high wear resistance, which is critical in slurry applications. The large throughlet means that the pump can handle solids of varying sizes. A leakage sensor allows for early detection of any problems, while the single adjustment screw makes it easy to tweak the impeller for optimal performance. The agitator has been designed specifically for coarser slurries, and is able to stir



Integrated Pump Technology is the sole importer and principal distributor for the Grindex range of dewatering, slurry and sludge pumps for southern Africa.

up and pump sand, sludge and solids in suspension.

Integrated Pump Technology has also supplied about 50 stainless steel Inox pumps over the last six months. “These are specialised electrical submersible drainage and sludge pumps that can handle acidic operating conditions,” Bawden explains. Features include zinc anodes for added protection, with all cast parts made from acid-proof stainless steel. □

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Several firsts for Mondi's 48 MW cogen plant

Zest Energy has applied its experience in electrical infrastructure, substations and power generation to install a 48 MW steam turbo generator set for Mondi in Richards Bay, with all the electrical integration scope carried out inhouse."

The Zest WEG Group, through subsidiary company Zest Energy and its technology providers has successfully completed a benchmark steam turbo generator set contract at Mondi Richards Bay that showcases the Group's value addition, innovation and customer focus. The original contract was awarded in May 2012 and partially handed over in December 2013, with final hand over in March 2014. This contract has been followed by a five year Long Term Service Agreement (LTSA), where Zest Energy will be responsible for the overall maintenance of the steam turbo generator set.

Coenraad Vrey, managing director at Zest Energy, explains: "Essentially for the duration of the 24-month warranty period we have had to guarantee a minimum 98% availability, which has been linked to the execution of the LTSA. This means Zest Energy will co-ordinate the actual servicing under the supervision of our technology provider's international service technicians. The agreement also includes the supply of all the necessary replacement parts and consumables."

The scope of work included the design, manufacture and delivery as well as complete installation and commissioning of the steam turbo generator set and associated equipment. Original equipment manufacturer (OEM) supervision services were also provided during installation and commissioning, with 24/7 on call support for a period of four weeks following handover. The flagship project achieved a number of records: the largest ever steam turbine manufactured by technology provider TGM Turbinas. "Not only was this the first project to utilise a combination of a TGM turbine with a WEG EM alternator, it was also a first reference for both equipment manufacturers in South Africa," Vrey says.

"Throughout the execution of this project, the Zest WEG Group has proved its ability to be involved in large scale

projects, not only from a standalone product supply perspective, but also from an integrated solutions point of view. This is an important achievement that will drive sustainable growth within the Group," says Alastair Gerrard, general manager at Zest Energy.

Zest Energy supplied the turbo generator set equipment and took the overall lead on the package, which included steam technology from TGM Turbinas of Brazil and generator technology from WEG Electric Machinery of the United States. Local subcontractor TGS (Turbine Generator Services) undertook the mechanical installation portion of the scope. Bosch Projects was appointed by Mondi as the official engineering, procurement and construction management (EPCM) contractor on the project. However, the steam turbo generator set was not only the system supplied by the Zest WEG Group to Mondi for this project.

Zest WEG Group power division supplied two 132 kV/11 kV, 35/50 MVA ONAF power transformers; two 11 kV/550 V, 2.5 MVA transformers; one 11 kV/400 V, 1 MVA transformer; and an 11 kV, 300 A for 10s NEC/NER (neutral earthing compensator/resistor) for protection against earth faults. Zest WEG Group motors division supplied two 1.2 MW, two pole 11 kV compressor motors and two 560 kW, 12 pole 525 V booster pump motors, while Zest WEG Group subsidiary, EnI Electrical, completed the Mondi upgrade project on the electrical, instrumentation and control installation side.

Mondi already had a 38 MW extraction back pressure steam turbine and a 34.3 MW extraction condensing steam turbine and required a new 48 MW multi-extraction condensing steam turbine to take up the additional high pressure steam from the plant at full load. The power generated is used on site with the excess being exported to the national grid.



The beginning of 2013 saw the design and engineering phase of the project under full swing, with close scrutiny of the finer design details to ensure that no crucial element had been overlooked. Major long lead items such as the turbine casings and forged rotor shaft had already been delivered to turbine manufacturer TGM Turbinas, while WEG Electric Machinery clocked up similar progress.

The Zest Energy project team was then faced with the formidable task of transporting the completely manufactured and assembled pieces of equipment to their final destination in Richards Bay, a task complicated by weather conditions and road transport restrictions. The process was finally completed in August 2013.

Once on site, professional rigging sub-contractor Lovemore Brothers, under the supervision of TGS, was tasked with lifting and positioning the equipment in



Above: The steam turbo generator equipment during installation on-site. All major equipment had already been installed, with the thermal blankets just fitted around the turbine casing and the thermal acoustic hood in the process of being erected.

Above right: The 48 MW multi-extraction condensing steam generator set upon project completion. The machine accommodates both the dynamic process steam and power requirements at the mill. Excess power generated is exported to the national grid.

Left: The steam turbine during the rigging and lifting process. Due to height constraints within the power house building, the steel support stages shown underneath were required to support the equipment when the hydraulic gantry system had to be stopped and reset during lifting.

areas with constrained access and onto the reinforced concrete floor of the power house, which was extended off the existing floor and designed specifically to be able to accommodate the heavy payload and vibration characteristics associated with the machinery.

"There was an existing power house building that had to be extended in order to be able to accommodate the new turbo generator set. We had to work closely with Bosch Projects during the design of the building to ensure we could get the equipment into position as the turbine and generator are installed on the upper most level of the power house. We also had to take future maintenance requirements into consideration as certain components need to be removed and overhauled after five years."

Vrey says that a 220 t hydraulic jacking system was ultimately used to position the equipment. "We considered ordinary cranes. However, due to project time constraints, the building had to be built as quickly as possible. If we had deployed mobile cranes, portions of the building would have had to be left open



for access, which was not feasible. We actually built and assembled the hydraulic jacking system inside the power house in order to lift the machinery up onto the operating floor. Once the lift had been completed, we moved the equipment along a rail type system into its final position. The entire logistics exercise was a mini project in itself."

Full scale installation commenced after all the equipment was positioned correctly, which meant that the Zest Energy team had to liaise continuously with the various sub-contractors to plan all the project tasks. Together with the vast array of sub systems and components required to ensure the safe operation of the turbo generator set, this resulted in many challenges during the installation phase.

"It was an operating power plant and we had to work around the fact that the Mondi mill was also a production driven environment. Downtime was limited and everything had to be coordinated carefully with the client. Our project formed part of a larger upgrade, which meant that there were numerous sub-contractors on site at any given time and this posed a challenge in terms of the health and safety requirements because a significant portion of our work was done at height," Gerrard says.

Installation was completed successfully towards the end of November 2013. Vrey says that the turbine control system had to be integrated to operate in conjunction with the Metso steam management system developed for the entire mill, including the power plant. Vrey adds: "As this system had to integrate and operate with the complete steam management system, we had to optimise the design to ensure proper and safe operation with the rest of the equipment. It was a learning curve for us and the client in terms of developing

the control system to ensure that it was a fully integrated and optimised system on final handover."

Due to the project's time constraints, there was a well-structured project schedule in addition to regular inspections and tests conducted throughout the manufacturing process. "A lot of emphasis was placed on cold commissioning of all the hardware and components to facilitate interfacing on site and to reduce site commissioning time." In addition to this, all pressure vessels required as part of the package had to be inspected by an independent and authorised inspection authority, which added yet another dynamic to the project.

Another challenge was posed by the connection to the national grid, which calls for high fault ratings for electrical equipment and also stringent standards. "Since the equipment supplied was sourced from different countries in the world where different standards are followed, all design standards and equipment specifications had to be checked for conformance to local requirements. A lot of emphasis was placed on ensuring that the equipment could handle the demanding conditions associated with being connected to the national grid and the ever changing process demands of the Mondi mill," Gerrard explains.

"Being an Independent Power Producer project, we had to ensure that our electrical designs would comply with the national grid code. Synchronisation control on the turbine was also critical in terms of the existing two steam turbines as well as the existing gas turbine and then, of course, with the grid. We also had to analyse the load rejection requirements to ensure that the turbine would continue operating without tripping when suddenly disconnected from the grid," he concludes. □

EIAs and the R5-billion Bokpoort CSP plant

The ACWA Power Solafrica's new Bokpoort Concentrated Solar Power (CSP) Plant is being built to supply renewable solar energy into Eskom's grid to alleviate the country's power crisis. At the same time, it will satisfy one of the National Development Plan's most crucial agendas: job creation in impoverished areas.

Royal HaskoningDHV was appointed in 2010 to carry out the environmental impact assessment (EIA) for the R5-billion ACWA Power Solafrica Bokpoort Concentrated Solar Power Plant to be situated at Bokpoort, 25 km north of Groblershoop in the Northern Cape.

Royal HaskoningDHV was also appointed to carry out two basic assessment processes for the water supply pipeline from the Orange River. The position of the first extraction point was deemed to be unsuitable due to the Orange River's flood patterns and this necessitated the selection of a second extraction point and a 3.0 km pipeline extension. In 2013, Royal HaskoningDHV was appointed as the environmental control officer (ECO) at the start of project construction, a process that concludes in December 2015.

The approved EIA is for a 75 MW CSP Plant and currently a 50 MW plant is being constructed utilising parabolic trough technology, which is the more suitable CSP technology option for the environment, especially avifauna (bird-life). Malcolm Roods, market segment



CSP parabolic trough technology is the more suitable CSP technology option for the environment, especially avifauna.

leader, environmental services at Royal HaskoningDHV says when applying for an EIA it is important to ensure that the application is for a large enough area; and that the maximum capacity, together with all relevant EIA listed activities, are applied for. "This allows for phased development should it be adopted, as with the Bokpoort development where another 25 MW generating capacity could be added at a later stage".

He adds that it is crucial to have as much detailed engineering information as possible when conducting the EIA process. "It is also important to listen to local knowledge," he advises, adding that the environmental assessment took 11 months to complete while the basic as-

essment process took only four months.

Roods believes that these good timeframes were only achieved with the help of the National Department of Environmental Affairs, which assisted in achieving a much faster turnaround time, and that they should be commended for this.

"It is also important to involve all the relevant and affected stakeholders during the public participation process: Transnet and Eskom, among others."

Elton Julies, HSEQ manager ACWA Power Africa Holdings, says, "Bokpoort is different from other solar projects in that we can generate electricity from the solar power system during the night. We have 9.3 hours of storage capacity suitable for base load generation. The heat from the huge salt storage tanks is used to generate electricity for up to 9.3 hours at night."

Some of the project challenges include a 25 km dirt road to the site, which is subject to increased traffic volumes during construction. By far the greatest challenge is waste management during construction – both hazardous and general waste – which is exacerbated by the remoteness of the site and the limited number of licensed waste sites in the Northern Cape.

Acting as environmental control officer for the project, Roods, says, "The main purpose of the monthly compliance audits is to ensure that all relevant environmental conditions prescribed



The Bokpoort CSP plant is suitable for base load generation because huge molten salt storage tanks are used to generate electricity for up to 9.3 hours during the night.



in the project's environmental authorisations (EAs) and approved environmental management plan (EMP) and programmes (EMPRs) are appropriately and adequately considered by ACWA Power Africa and its contractors during the construction phase."

Roods adds: "ACWA Power is achieving a monthly compliance of above 90%, which is highly commendable considering the remote location of the site."

Julies says that ACWA Power Africa Holdings has a "strong commitment" to the environment with its zero harm policy in terms of health, safety and environmental compliance on all its facilities. "External audits are carried out on all our facilities in compliance with World Bank IFC guidelines and standards, ensuring international compliance."

During the construction phase of Bokpoort, ACWA Power allocated R5-million for local community development projects for the !Kheis Municipality. This includes business skills development; the provision of solar lighting system; a water reticulation project; and the upgrading of the high school computer laboratory with the provision of internet access. Julies says, "As part of our social responsibility programme we recently donated 100 indigenous trees to schools and the community in the area. In addition to this, ACWA Power has established an aloe nursery as part of a relocation programme for the aloes that were removed from the project site. □

Optimising rooftop infrastructure

The masts, antennae, satellite dishes, security cameras and communication transceivers on rooftops must be managed effectively, however property owners and managers usually do not have the time or core skills needed to manage the complexities of telecommunications' infrastructure. Jasco Property Technology Management's Rooftop Solutions help property owners with these challenges.

The rooftops of multi-tenant buildings such as malls and office towers are typically home to a wide variety of different telecommunications infrastructure, from masts and antennae to satellite dishes, security cameras and communication transceivers.

Managing this complex landscape to ensure optimal space utilisation, compliance with health and safety requirements and revenue generation can be a challenging task. Jasco Property Technology Management's Rooftop Solution helps property owners to address these challenges head on by providing "a complete managed solution and service through a single point of contact" says Mark Swemmer, business manager for Jasco Property Technology Management.

"Property owners and managers are typically not telecommunication or technology infrastructure experts and do not have the time or core skills required to manage the often-complex rooftop tenant landscape on their buildings. Without this expertise to understand exactly what infrastructure is installed and for what purpose, it becomes impossible to adequately manage this piece of real estate.

Jasco Rooftop Solutions is one of the products of the Jasco Property Technology Management portfolio, which offers a full solution to help property owners and telecoms operators make the most of their rooftops, increasing utilisation, ensuring compliance with health and safety and preventing unauthorised access, among other benefits," says Swemmer.

"Some of the issues with unmanaged rooftops include unauthorised access, lack of access control procedures, inefficient space utilisation, equipment interference and potentially hazardous, non-compliant installations," he warns. "In addition, building owners may be unaware of what equipment is hosted on their rooftops without a comprehensive database of equipment, and cannot effectively manage this space. Using Jasco Rooftop Solutions, building owners can leverage added value through

improved aesthetics, increased space utilisation, improved standards of installation and more controlled access for enhanced security. Furthermore, with the addition of metered energy, it is also possible to accurately measure electricity consumption per piece of equipment and charge this back to the lessee," he explains.

Jasco Rooftop Solutions offers three levels of service: audit, professional advice, and active management. Rooftop audits deliver a comprehensive on-site infrastructure report to accurately establish the quantity and type of equipment that is located on the property owner's rooftop. Professional advice can then be offered to property owners with recommendations based on the technical findings of the audit report. Jasco's Active Management offering is a full service solution that outsources the entire rooftop management function, enabling property owners to optimise their rooftop while focusing on their core business.

Swemmer continues: "The offering includes lease management, with lease renewal notifications and on-going benchmarking as well as design, review and acceptance for all new and existing installation requests, standardisation of authorisation and access control procedures, and a single point of contact between landlord and lessees. In addition, this service offers complete asset tracking, including labelling, naming and numbering of all rooftop equipment and the creation and on-going management of a full equipment database."

"With Jasco Property Technology Management, property owners can leverage professional management and the standardisation of rooftop standards across the entire property portfolio, with adherence to international best practices to ensure compliance with health and safety regulations, as well as the optimisation of revenue streams. Our extensive experience ensures that your potential revenue streams are identified and delivers optimal utilisation of the rooftops," Swemmer concludes. □

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Renewable energy benefits exceed costs



The 96 MW Jasper photovoltaic solar power project near Kimberley is the largest on the continent and can produce 180 000 MWh of energy per year. The CSIR has found that that renewable energy generation created net positive benefits of R0.8-billion during 2014.

In July 2014, the CSIR started a process to streamline its offerings in the energy field through the establishment of an integrated energy research centre. This centre focuses on the key energy challenges of the country and the region, and consolidates the energy-related research currently taking place across the CSIR. It has a strong focus on technology integration, policy support as well as technical and economic modelling of the energy sector. Dr Tobias Bischof-Niemz heads up the centre.

An independent study by the Council for Scientific and Industrial Research (CSIR) found that renewable energy from South Africa's first wind and solar (photovoltaic) projects created R0.8-billion more financial benefits to the country than they cost during 2014.

The benefits earned were two-fold. The first benefit, derived from diesel and coal fuel cost savings, is pinned at R3.7-billion. This is because 2.2 TWh (terawatt-hours) of wind and solar energy replaced the electricity that would have otherwise been generated from diesel and coal – 1.07 TWh from diesel-fired open-cycled gas turbines and 1.12 TWh from coal power stations.

The second benefit of R1.6-billion, is a saving to the economy derived from almost 120 hours of so-called 'unserved energy' that were avoided thanks to the contribution of the wind and solar projects. During these hours the supply situation was so tight that some customers' energy supplies would have had to be curtailed ('unserved') if it had not been for the renewables.

Therefore, renewables contributed

benefits of R5.3-billion in total – R2.42 per kWh of renewable energy – while the tariff payments to independent power producers of the first wind and photovoltaic (PV) projects were only R4.5-billion – R2.08 per kWh of renewable energy – leaving a net benefit of R0.8-billion.

Dr Tobias Bischof-Niemz, who heads up the CSIR's Energy Centre, explains: "The study was based on actual hourly production data for the different supply categories of the South African power system (for example, coal, diesel, wind and PV). We've developed a methodology at the CSIR Energy Centre to determine whether at any given hour of the year renewables have replaced coal or diesel generators, or whether they have prevented so-called 'unserved energy'.

This CSIR methodology was fed with cost assumptions from publicly available sources, such as Eskom's interim financial results 2014 for coal and diesel costs, or the Department of Energy's publications on the average tariffs of the first renewables projects, or the Integrated Resource Plan on the cost of unserved energy.

Because the study is an 'outside-in'

analysis of the system operations, conservative assumptions for the system effects and for the costs of coal were chosen. The actual cost savings that renewable energy sources brought during 2014 are therefore presumably higher than shown by the study.

"Our study shows that in 2014, renewable energy provided a net financial benefit to the country. Without the first solar and wind projects, we would have spent significant additional amounts on diesel, and energy would have had to be "unserved" during approximately 120 additional hours in 2014," Bischof-Niemz says.

"What is more, the cost per kWh of renewable energy for new projects is now well below R1.00 for solar PV and between 60c and 80c for wind projects. That will keep the net financial benefits of renewables positive, even in a future with a less constrained power system."

The CSIR intends to continue to monitor the fuel-saving and security-of-supply benefits of renewable energy.

More information and study results have been added to the CSIR website at www.csir.co.za. □

WEC Issues Monitor 2014

Energy leaders see energy price volatility and the future of a climate framework as their top critical uncertainties, according to the latest research by the World Energy Council.

The seventh annual edition of the World Energy Council's Global Issues Monitor, *'Energy price volatility: the new normal'*, is a barometer of the top issues set to shape the energy sector for the year ahead. This year the report has gathered the views of more than 1 000 energy leaders, including ministers and chief executives from nearly 80 countries.

The Africa Energy Indaba, held annually in Johannesburg, is the African regional event of the World Energy Council – and 2015 is the Council's *'Year of Africa'*, which kicked off at the Sandton Convention Centre when the Indaba took place during the week of 17 February.

The report was presented and debated in detail during the Indaba, with the Chair of the World Energy Council, Marie-José Nadeau and secretary-general, Christoph Frei, as well as a number of global energy luminaries attending the event in South Africa, placing the nation's critical energy future in the global spotlight.

In Africa, market-distorting energy subsidies and difficult access to capital

markets are key issues. In South Africa, energy leaders recognise the potential impact that unconventional gas (shale gas, for example) could have on the economy but there remains significant uncertainty with regards to the mineral bill and also the geological reality of the resource. This uncertainty is only heightened by the sharp drop of the oil price over the last year.

Christoph Frei, secretary-general of the World Energy Council, commented ahead of the Africa Energy Indaba that "Africa is at the centre of a new energy opportunity. In sub-Saharan Africa alone, about US\$1-trillion will be invested in electricity generation by 2050, while it has already seen almost 30% of global oil and gas discoveries in the last five years. The key challenge for Africa is to ensure that this new energy opportunity is unleashing the local value chain. This is the crucial issue that we will be addressing with ministers and business leaders at the Indaba," said Frei prior to the Indaba.

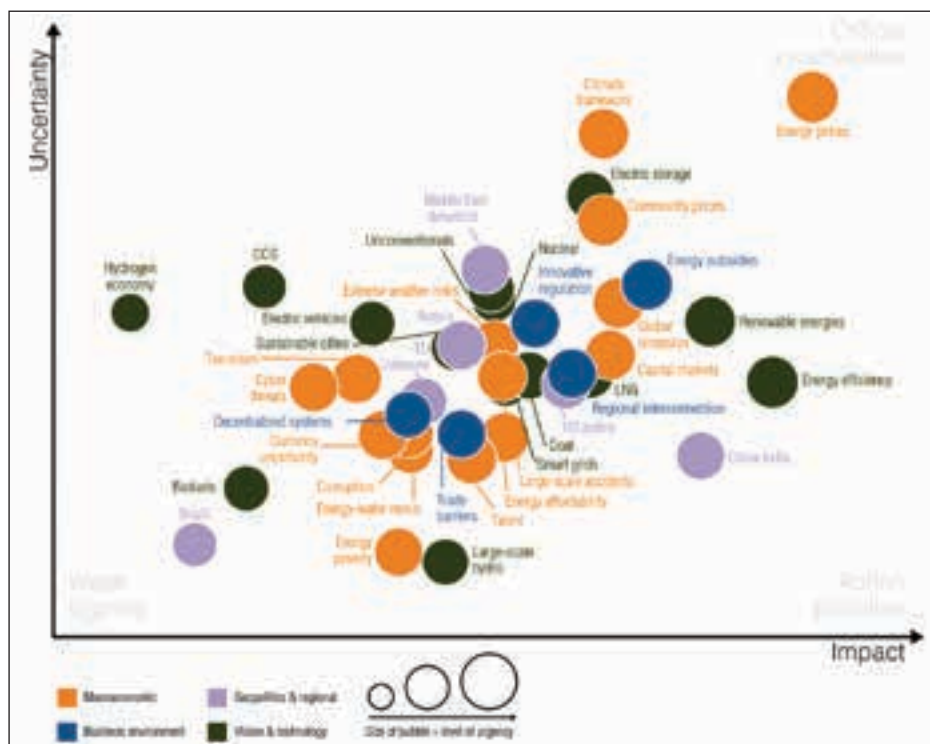
The 2015 World Issues Monitor re-

port highlights the uncertain impact of volatile energy and commodity prices, which has now established itself as the number-one issue for energy leaders worldwide. Energy leaders are worried about the recent sharp plunge in the oil price to its five-year low. They are kept busy by the continual reduction in the cost of renewable energy technologies, which have increased their share in the energy mix, but have also put strains on the energy system. In some parts of the world that do not have viable energy storage solutions, the grid is not yet able to cope with large shares of intermittent forms of energy and lacks effective market signals to deliver back-up capacity or storage.

Frei added that price volatility has become the "new normal" facing energy leaders. "This is the context in which we expect them to take investment decisions at an unprecedented scale. The unprecedented uncertainty, the need to redefine infrastructure resilience in response to emerging risks, the expectation of changing market designs and evolving business models, as well as the changing geopolitical balance have all placed energy among the top strategic issues globally for at least the next decade. The importance of choosing smart policy options and innovation strategies has become greater than ever, and balancing the energy trilemma – energy costs, security of supply and carbon emissions – must be at the very centre of efforts of energy leaders," explained Frei.

After price volatility, the *Issues Monitor* finds that climate framework is perceived as the next most critical global uncertainty ahead of a climate agreement being reached at the Conference of the Parties meeting (COP-21) in Paris at the end of this year. African leaders see the climate framework as "a critical uncertainty" but this issue is considered to have lower impact as they are more worried about the physical impacts of climate change, such as extreme weather events, rather than about the uncertain outcomes of climate negotiations.

The 2015 World Energy Issues Monitor says about Africa: The main contextual observations for this year's *Issues Monitor* in the region demonstrate that Africa's economy is successfully weathering the global recession, and is taking tentative steps towards more sustained growth. The US is showing growing interest in Africa, scaling up the



WEC's Global Energy Issues Monitor 2015: highlighting 40 issues and their perceived impact, uncertainty, and urgency for global energy leaders and experts.

Power Africa Initiative, and endorsing a series of public-private-partnership (PPP) deals to boost trade and investment. Furthermore, Africa's potential and prospects for further oil and gas discoveries remain largely positive and can offer huge opportunities. The Ebola outbreak in three countries in West Africa and the related health crisis are negatively impacting the local social and economic development and could have lasting consequences in affected countries and beyond.

The top critical uncertainties in 2015 are high energy prices and commodity price volatility, energy subsidies and capital markets.

Energy and commodity prices continue to be volatile, adding to the uncertainty of global market behaviour. Budgets of low-income households are affected and energy affordability has become a serious concern. Consequently, governments of some countries, facing growing public pressure, resort to subsidies to mitigate social concerns. Recourse to the capital market is becoming increasingly crucial to finance urgent and growing needs of infrastructure projects.

Large-scale hydro, extreme weather risks and China/India are the most important need-for-action issues to be tackled for the African region; while energy poverty is still looming and remains unsolved.

Africa has always displayed its strong inclination for large-scale hydro, but there is still much to do – only 7% of the potential is developed. Bold actions, sound public policies and an effective business environment are all required in order to finally allow the sustainable development of these infrastructures. The immediate interest of Africans, with regard to climate change, is rather focusing on its visible disastrous consequences including extreme weather events, instead of uncertain and complex global climate negotiations. Furthermore, the mutual interest of the strengthened China-Africa partnership has grown over the years and is beginning to bear fruit for both sides.

Whilst a number of the above issues went through relative change, year-on-year to move towards the top of energy leaders' agendas in Africa, a number of issues did undergo a lower relative change over time. This mostly related to those which remain critically uncertain, such as energy prices, capital markets, energy poverty and energy efficiency – but also, some high impact issues, such as talent, large-scale hydro, trade barriers and an energy-water nexus, along with the role of China and India. There is, therefore, still much to do by energy leaders to push forward bold actions and stronger policy support.

In terms of the overview in the movement of

issues for energy leaders in Africa: renewable energy is more prominent and action-oriented, with less uncertainty. Large-scale hydro, at the top of the African Union's political agenda, is clearly gaining more impact. Energy efficiency maintains its position as an indispensable and critical tool for the energy system, requiring pressing and bold actions. Nuclear: after some positive signs of confidence that emerged during last year, is again moving towards the weak signals area.

Unconventionals continue to deliver weak signals. Due to the absence of sustained achievements in recent years to support their wide deployment, expectations with regards to biofuels are diminishing and they are again relegated into the weak signals.

When comparing the Africa region as a whole to the maps of the non-OECD countries, it appears that there are similar views and a strong correlation with regards to most relevant issues. In comparison to the global perspective there are however stronger differences. Against non-OECD countries, the main differences appear with regards to decentralised systems, climate framework, LNG and sustainable cities.

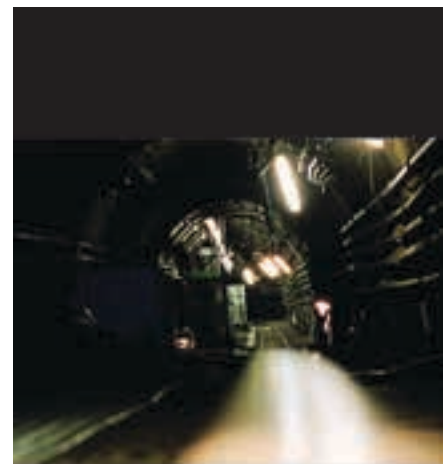
On the geopolitical side, US policy is again gaining ground this year as the US reaffirmed its strong commitments to play a further role and gain an important part in the growing trade opportunities with Africa. Furthermore, Middle East dynamics reflected the positioning that although some MENA countries continue to be affected by political instability and social unrest, there is a general move towards an improvement of economic activities going forward – with the exception in Libya, where a lasting civil war takes its toll.

Climate framework and all the political debates around the search for a global agreement became a less immediate concern for Africans. Rather, extreme weather events/patterns, with severe and frequent growing risks, are tangible and immediate threats, mostly impacting Africa, one of the most vulnerable continents.

Renewable energies, albeit from a low base and still relatively expensive overall, have become an unavoidable option for Africa. Bold actions must be taken to strengthen their place in the energy mix of the continent.

Regional interconnection remains high in the agenda and a key priority of African energy leaders and the African Union. The Programme for Infrastructure Development in Africa (PIDA) has been initiated to facilitate its achievements and to get priority infrastructure projects on track.

Biofuels is again among the weak signals while carbon capture and storage (CCS) continues to see little potential and prospects to be deployed in the near term. □



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10 GW milestone for thin film PV

First Solar has achieved 10 gigawatts (GW) of photovoltaic (PV) solar capacity installed globally, making it the first thin film PV module manufacturer in the world to achieve this milestone.

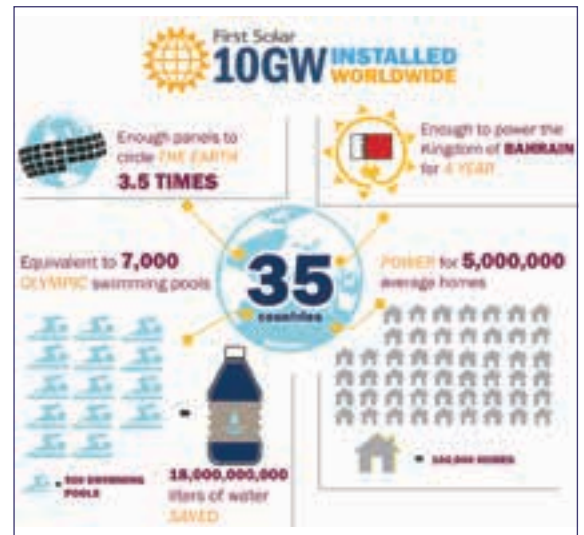
Founded in 1999, First Solar made its first commercial shipment in 2002 and, since then, its advanced thin film modules have been used in a wide range of applications, from kilowatt-scale mini-grid and rooftop applications, to multi-megawatt utility scale solar energy plants. With enough modules installed worldwide to circle the planet three-and-a-half times, First Solar's 10 GW of installed capacity produces an estimated 14 000 GWh a year. This is equivalent to the annual energy consumption of the Kingdom of Bahrain or Washington DC. It is also sufficient to power five million average households and displaces the need for as many as 20 average coal-fired generation units.

"This is much more than just a celebration of First Solar's track record. This milestone is a clear indication that solar is no longer a subsidy-driven extra; it has evolved into a valued component of the

global generation portfolio, able to hold its own in terms of cost competitiveness and energy yield," says James Hughes, CEO, First Solar, Inc. "Thanks to our commitment to continuous improvement, we have been able to contribute towards the global transition to renewables by offering our customers solutions to their very specific energy challenges."

Significantly, with the smallest carbon footprint of all solar technologies, First Solar's installed capacity displaces an estimated seven million metric tons of carbon dioxide per year, or the equivalent of planting 180-million trees. Additionally, with the lowest water use on a lifecycle basis, the use of First Solar's advanced thin film modules helps displace an estimated 18 billion litres of water per year; sufficient to fill 7 000 Olympic-sized swimming pools.

A fully vertically integrated solar energy company, First Solar is the global leader in PV research and development



(R&D), consistently accounting for the industry's largest spend in the area. It was also ranked as the world's largest solar engineering, procurement and construction (EPC) contractor in 2014, and has been entrusted with building some of the world's largest solar power plants such as Agua Caliente (290 MW) and the Topaz Solar Farm (550 MW) in the US and Luz del Norte (141 MW) in Chile. Additionally, with a portfolio of over 2.0 GW, First Solar is also the industry's operations and maintenance (O&M) services leader. □

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Bespoke high-tech pneumatic impactor

Jaco de Beer, project engineer, Tectra Automation, discusses the design and construction of a pneumatic impactor, which he says is “a unique engineering assignment” for the company – from ground-level process research to the design and development of the hi-tech device to client specifications.

Tectra Automation, a Hytec Group company, designed and constructed a pneumatic impactor for the Council for Scientific and Industrial Research (CSIR) in Pretoria. Capable of firing a cylindrical bar at a velocity of up to 50 m per second, the impactor will form an integral part of the institute’s Landward Science Competency Area material research and development studies.

Designed to assess the stress response of materials as part of a Split Hopkinson Bar Test system, the impactor is designed to fire a cylindrical bar of a specified weight and size against instrumented target bars, which encapsulate the test item as well as serve to record the loading stress wave that transmits through the test specimen – comprised of the tested material. The current Landward Science’s material science testing is geared towards the testing of materials at higher strain rates in the region of 102 to 104 Hz.

Given the speciality of the project, Tectra Automation was the most suitable supplier that had the necessary expertise required for the impactor’s design and construction. This project was contracted as a complete turnkey solution, from research and design to manufacture and commissioning.

The impactor – which has a length of 2.6 m, height of 1.5 m and width of 0.7 m – is equipped with an array of specialised pneumatic componentry,

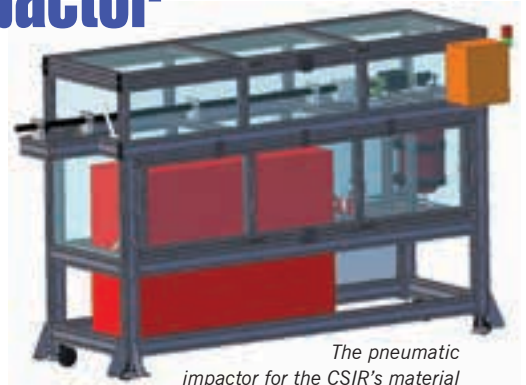
including quick release valves, a pressure intensifier and an accumulator, for achieving the high-specification discharge. The 25 mm internal diameter barrel is comprised of a specialised hydraulic tube capable of bearing pressure up to 300 bar with a 5.0 mm wall thickness and has been designed to be easily changed as required by the research.

Test parameters, including the size, weight and discharge speed of the cylindrical bar, are programmed by the operator through a Bosch Rexroth HMI. Based on these inputs, the internal programmable logic controller automatically calculates the pressure at which to launch the cylindrical bar as required by the material test.

The arming and firing of a cylindrical bar – which occurs through remote activation – is conducted through a controlled initiating sequence, including keyed activations, to ensure a safe operating environment for the use of the machine. The barrel draws a front-loaded cylindrical bar via a specialised vacuum valve, which limits the operator requirements in front of the barrel.

Realised performance accuracy

As Jaco de Beer, project engineer, Tectra Automation, explains, “Our theoretical calculations in the design and conceptualisation of the unit were remarkably close to the physical performance



The pneumatic impactor for the CSIR’s material tests is designed to fire a cylindrical bar of a specified weight and size against instrumented test specimens in order to test their stress response in line with the Split Hopkinson Bar Test.

measurements we determined once the impactor was assembled.”

As illustrated in diagram 1, programmer input speeds of 15, 30, 50 and 60 m/s produced actual corresponding speeds of 11.8, 30.9, 46.4 and 57.1 m/s.

“As a unique engineering assignment for Tectra Automation – which started from ground-level process research – the fact that we could design and develop the hi-tech device to client specifications was a proud accomplishment for the project team.”

Tectra Automation will also be providing maintenance and additional component supply for any future developments the CSIR may wish to implement to the impactor. □

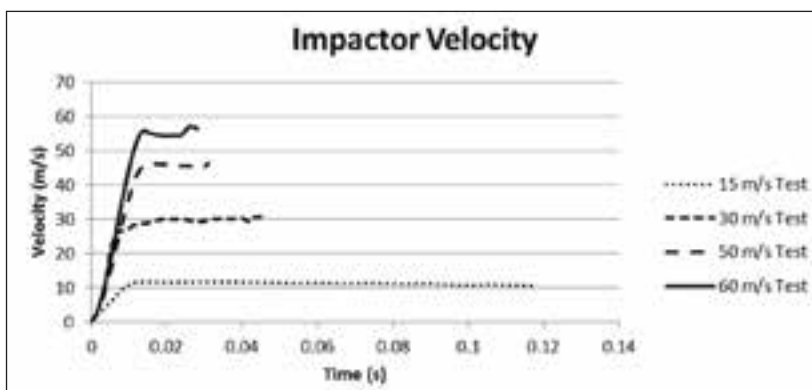


Diagram 1: The impactor’s velocities were highly accurate within a very low tolerance of the input velocity. Source: CSIR.

New generation mini slides

Aventics (formerly Rexroth Pneumatics) has become the first manufacturer to supply mini slides with maintenance-friendly pneumatic cushioning, the MSC mini slides, now available in South Africa.

Because of its functional design and versatile range of configuration options, the MSC is ideal as a universal handling component, including pick-and-place applications.

Pneumatic cushioning in mini slides is unprecedented on the market. The pneumatic cushioning works with the elastic cushioning elements and hydraulic shock absorbers, and its design ensures gentle operation and optimal machine

Taking command of core system functions

Industrial operations in South Africa can remotely control numerous machinery functions without having to invest in large capital-intensive programmable logic controller (PLC) technology, thanks to the innovative new i-Commander control and telemetry device locally manufactured and distributed by Enviropower.

Enviropower chief operating officer Stewart Blanckensee says the control and telemetry device – the i-Commander – is a smaller, more affordable solution to a traditional PLC, allowing the user to control the required equipment or functions from a cell phone. “It is the ideal solution for smaller systems that may not be covered by a PLC, but have certain aspects that need to be monitored, such as temperature, pressure and oil analysis,” he explains.

The i-Commander allows the user to set the parameters, setting off an alarm if the system operates outside of those parameters. “Through 24/7 control of a system through i-Commander, users will be aware of issues within the system before they become bigger problems – providing safety and efficiency benefits,” adds Blanckensee.

The i-Commander is not designed for any specific application, and can be used in a variety of industries, including mining, agriculture and power generation, he explains. “It is best-suited to smaller operations; however, if an operation expands and the user requires a larger system, it is possible to add multiple i-Commanders to the system. In addition, the i-Commander sends alerts directly to any number of cel-

lular phones and not just to a controller in an operations centre.”

Cable theft is a major challenge for farmers and other industries and the cable theft monitor function of the i-Commander allows the user to constantly monitor their cabling. An alarm is set off when any predetermined parameters are breached.

The i-Commander uses a SIM card and can be run off of multiple cellular networks. It allows the user to enter numerous contact numbers for the most effective communication. For example, if there is a power failure where the device is being used, the i-Commander will send selected users a message indicating the time and date of the initial incident, and when the power is restored again.

Predetermined command features also enable more effective communication between the user and the device. Says Blanckensee: “By sending the word ‘status’ to the i-Commander, the user will be instructing the device to check all aspects of the system and send a report. It is also possible to enable or disable certain tasks by sending a message to the device. The user can also set

a pattern of events to take place one after the other, when certain conditions are met.”

In addition, users are able to log the performance of the equipment over an extended period, allowing them to determine if there is a problem in the system, or identify where maintenance needs to be carried out. “Through proper management of the system with the i-Commander, there can be a drastic increase in productivity,” Blanckensee concludes.

Initial set-up of the i-Commander is quick and simple. As part of its value-added service, Enviropower pre-sets the device for its clients, thereby ensuring that the user simply has to select the parameters required for the i-Commander to monitor and/or control. □



The i-Commander, a cost-effective substitute for a PLC for control and telemetry use, can be used in a variety of industries, and is best-suited to smaller operations.

lifecycles. The pneumatic cushioning has the same service life as the piston drive and therefore the same maintenance intervals. Hydraulic shock absorbers can be replaced without readjusting the stroke, reducing machine downtimes. The elastic cushioning elements are maintenance-free.

The new generation of mini slides allows users to individualise the product and determine the desired features online to achieve the required performance. In addition to two guide units and the position of the air connection, users can also decide whether they prefer their MSCs to be equipped with one or two pistons. Customers receive only the components they require, thereby optimising costs. The configuration generates complete documentation, including CAD files, parts lists, own material number, and price information.

In addition, the MSC mini slide's functional design allows for flexible implementation. The symmetrical layout ensures planning flexibility – sensors can be installed or stroke adjustments made on both sides, depending on the installation situation, for example. This enables the parallel assembly of two mini slides, as well as combination with additional handling system components. As a result, rotary modules, rodless cylinders, additional slide units, or grippers can be integrated without the need for extra mounting plates.

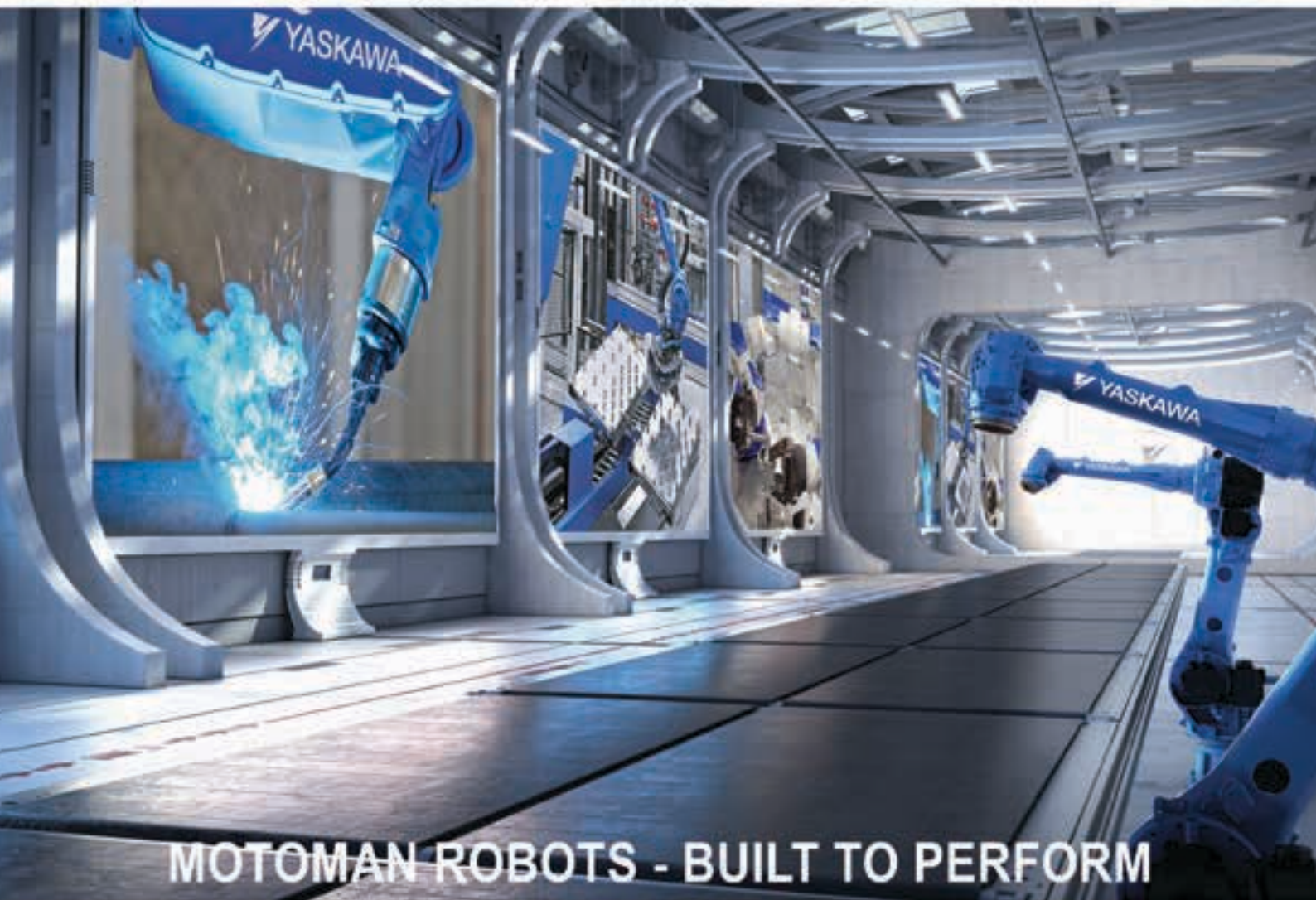
The product has high bearing capacity, drive force, and functionality within a small cross-section. The pre-tensioned guide system without play and one-piece slide table offers maximum stability and reliable precision with minimal tolerance values – even for high torque absorption and load capacities. The symmetrically



Its functional design and versatile range of configuration options makes the Aventics MSC mini slide ideal as a universal handling component.

operating double piston system of the slide unit provides an exceptional load bearing capacity.

Tectra Automation, a Hytec Group company, is the authorised distributor for Aventics in South Africa. □



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Next-generation temperature control

Omron has released a new E5_C family of temperature controllers that enables users to set their own temperature curve via up to 32 different programme profiles that can contain a total of 255 segments.

Setting new standards for user friendliness, precision and performance, products in the E5_C temperature controller family from Omron reduce set-up time and provide process control that is faster, more accurate and more responsive. Key features of the E5_C line-up include Omron's patented high-stability PID control system, and high-contrast displays that can be easily read, even in poor lighting conditions.

The E5_C family is complemented by a programmable T-type controller, which allows users to design their own temperature curve by setting up to 32 different programme profiles that can contain a total of 255 segments. To cater for changing process conditions, auto-tuning can be executed automatically in every sub-segment to optimise control performance. Ramp-up, ramp-down and soak functions make the T-type controllers in the E5_C family a versatile choice for a wide range of process applications.

To satisfy all requirements with conveniently sized products, Omron is offering a full range of controllers in sizes from

1/32 to ¼ DIN, together with a slim DIN rail type that's just 22.5 mm wide.

"A major design goal for controllers in the E5_C range was to make the setting of PID parameters as easy as possible. So our patented 'tune-and-go' PID control algorithm allows users to optimise controller behaviour to suit their specific applications with the aid of a simple software tool, so that overshoot is minimised and maximum stability is achieved," says Victor Marques, general manager Omron Electronics South Africa. The algorithm manages changes in ambient and process conditions, improving both machine availability and product quality.

Purchasers of the Omron E5_C controllers not only get a hardware solution package but also free sales support services and the opportunity to purchase from a single supplier to ensure that almost all of the items needed are acquired for the control loop.

Marques says that this guarantees the right combination of controller and actuators – solid state relay or power relay, power supply, temperature sensors and multifunctional HMI (for DIN-rail mount-



Key features of the E5_C line-up include Omron's patented high-stability PID control system, and high-contrast displays that can be easily read, even in poor lighting conditions.

ing controllers). Web-server functionality makes remote access possible via the Internet for diagnosis and maintenance using Omron NB touch screen terminals, which also support data logging on, for example, a USB stick.

Omron provides web-based parametric selectors that help users to choose the right controllers and temperature sensors for their application, and the Omron sales team provides support at every project stage to ensure that machines are up and running as quickly as possible.

All models are provided with five front panel keys that can be used for routine operations and, in most applications, for set up. For demanding applications where additional flexibility is needed, Omron's intuitive PC-based CX-Thermo software offers fast parameterisation, rapid device adjustment and simplified maintenance. The CX-Thermo software can also be used to capture data from E5_C controllers so that temperature/time curves can be generated. □

Assist software for project information flow

GEA Process Engineering South Africa has introduced GEA-Assist, the Group's browser-based information sharing programme, for its local clients. This online information exchange facilitates streamlined access to project information for all approved individuals, regardless of location. Improved plant performance and increased productivity is acquired through tracking maintenance costs, preventing asset failure and extending asset life.

The programme caters for storage and retrieval of all necessary communication. Project documentation, piping and instrumentation diagrams (P&ID) can be uploaded, as can 3D models, plant layouts and time schedules. Provision for plant operations and maintenance has also been made, in fact, all information pertaining to an entire project, including comprehensive product information, is available to authorised personnel. The service includes email alerts when files are uploaded and

queries answered, drastically reducing the number of necessary phone calls and email correspondence.

Specific categories make the site user-friendly. 'The document hosting service incorporates the most up-to-date plant data, including assets and any current projects, all of which are stored in current status. The online training feature grants access to GEAs online training library, including tailor-made video tutorials so training can be done at clients' convenience. "In addition to this distance training approach," says Rob Allen, head of components and after sales, GEA Process Engineering, "the same training material may be shared through a common client-customised web portal for clients with multinational production facilities."

"Asset management becomes 'your plant's DNA', ultimately reducing overall cost of ownership and increasing productivity through less downtime. It allows clients

to keep abreast of all asset changes, from initial installation to recent services, while still operational. Clients can access their assets' complete historic profile, which is essential for optimum and efficient scheduling and resource management," says Allen.

Budgeting for projected maintenance costs, maintenance and plant performance tracking, and resource planning is made exceptionally easy using the site's reports/analysis option. Preventative maintenance allows the creation of well-timed maintenance schedules, which reduce downtime and improve plant reliability, while the scheduling feature makes visible upcoming maintenance activities and resources needed to complete these activities.

The 'workflow' facility is the artery of all system modules enabling instant and easy interaction between all relevant modules. "This service caters for all exchange control of plant asset critical information. These include client requests to the facility management company and call-out requests, for example," Allen explains. □

Pedestrian detection systems for surface mining

With the Department of Mineral Resources (DMR) unveiling its draft of the mandatory Code of Practice for Trackless Mobile Machinery (TMM), detection systems' pioneer, Booyco Electronics is unveiling its very low frequency pedestrian detection system for surface mining machinery. Anton Lourens, the company's MD reveals more.

Booyco Electronics, which has been at the forefront of Pedestrian Detection Systems (PDS) in the South African mining industry since 2006, is pioneering the technology for surface-mining applications after successfully launching it for underground operations. "We have found that our very low frequency (VLF) technology, which has proved so successful underground, is exceptionally flexible in terms of surface mining operations," says managing director, Anton Lourens.

Whereas underground mining equipment is generally standardised due to space constraints, surface mines feature a much broader range of equipment, from smaller machines to ultra-class dump trucks, for example. "Bigger machines mean bigger exclusion zones, which meant we had to adapt our technology to suit the specific requirements of surface operations," Lourens says.

Booyco Electronics also had to take into account the potential interference from ancillary equipment. "Although our PDS technology complies with EMI and EMC (electromagnetic interference and connectivity) requirements, we had to contend with additional issues such as GPS positioning and vehicle tracker systems, for example. Managing all of

that posed a challenge that we have successfully overcome."

Lourens reveals that Booyco Electronics is currently installing its PDS technology at a surface mining operation. "We have completed the mining operation side and are currently busy with the mineral processing side, wherein lie more challenges and definitely a lot more applications. We have standardised the PDS deployment, i.e. specific zone shaping per vehicle type, which took time analysing the operational requirements."

What this meant was that whereas Booyco Electronics would typically recommend a 10 m wide warning zone, for example, the client would request that this zone be made smaller. "One of the definite advantages of our technology is that it is inherently flexible, enabling us to adapt it according to specific requirements and vehicle type," Lourens explains.

While the main function of PDS technology is to warn miners of any approaching vehicles, it includes two-way communications to warn the operators of any mobile equipment if there are any miners in the vicinity. The PDS is based on VLF as well as radio frequency (RF) technology, with miners equipped with two-way RFID tags. Vehicle or other

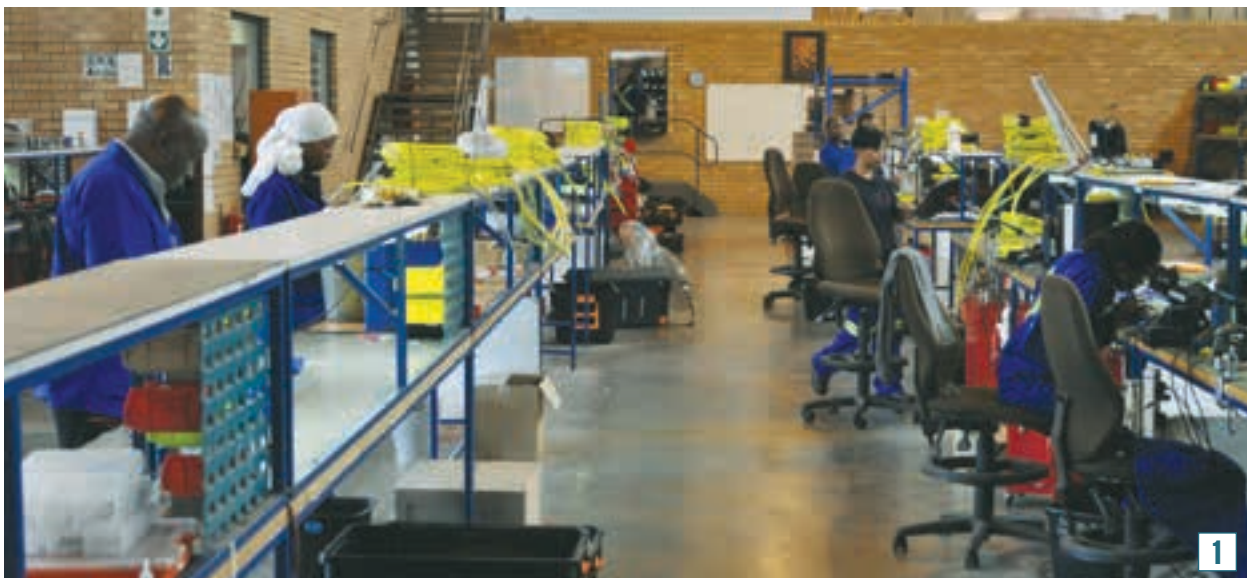


Anton Lourens (left), managing director of Booyco Electronics.

static danger zones have VLF antennae, which generate several stable and pre-determined fields in front of and behind the vehicle in question, although the configuration will differ for surface mining operations. When a miner enters this zone, his tag is activated and a warning signal is triggered. The exclusion zones can be up to 15 m long.

Looking more closely at the hardware, Lourens explains that the unit transmits a VLF signal of less than 15 kHz via ferrite antennae, which creates exclusion zones in both directions of travel. When a driver himself needs to be warned, the control unit then receives a UHF signal from the miner's tag, which in turn activates the relevant alarm. The power requirement for the unit is 12 V dc.

The antenna is mounted in a resin-filled, plastic enclosure. On machinery



longer than 8.0 m, two sets of antennae should be installed, with unit sets on opposite ends. A miner's RFID tag is issued to every person, with such a tag consuming less than 100 μ A and not producing any electromagnetic radiation.

"Booyco Electronics is setting the local standard in PDS technology for surface mining operations. Currently there are quite a few systems out there that look at machine-to-machine interaction, but which are not necessarily applicable on the pedestrian side. While we believe that we have the best solution available on the market, the industry-wide implementation of PDS technology remains an issue."

Lourens says that the Department of Mineral Resources (DMR) has unveiled the draft version of the mandatory Code of Practice for Trackless Mobile Machinery (TMM). "Basically, this is draft legislation that deals with TMMs in terms of what measures are expected by the regulator and where this is going. It is already past draft stage, so we believe that will change the immediate requirements. The DMR has specified additional testing to ensure that all the products out there comply with the same standards."

Lourens comments that the mining industry has adopted a cautious approach to the implementation of PDS technology. "There is quite a lot of work still to be done, as we are not yet at the point where these systems can just be switched on. A major challenge is that there are many stakeholders to deal with, from the mining house and contractor to the vehicle OEM and PDS supplier. Ultimately the client has a specific viewpoint in terms of his operational requirements, so we have

to ensure that all these stakeholders are accommodated."

While Booyco Electronics is engaged in ongoing discussions with OEMs, "the biggest part of our installation work right now is retrofits, as many of our mining customers wish to ensure that they are compliant. That is a challenge in itself, as we often have to relocate existing installed equipment so that the PDS is working properly. The technology is such that it requires a specific solution for each particular application."

While this market sector is highly competitive at the moment, Lourens says that what gives Booyco Electronics its leading edge is its capability to offer a total solutions package. "What we have tried to do is create a total scope of supply so that the client does not have to worry about safety equipment, for example, as we can supply our biometric readers either in conjunction with PDS or as standalone items."

Booyco Electronics has added data capturing or logging functionality to its PDS technology, which is also anticipated to become a DMR requirement in the near future. "We have also increased the level of diagnostics in the equipment to ensure that the system is fully functional at all times and that it can be connected 'fail to safe' on a continuous basis."

Another significant long-term requirement will be the servicing and maintenance of Booyco Electronics' installed PDS base once the technology has been legislated. "There are huge opportunities for us, particularly in how we have positioned our products in terms of functionality and pricing. What gives us a competitive edge is that our products

are designed and manufactured for local conditions and specifications," Lourens says.

"The main factor in favour of our products is definitely the quality, while a related issue is the maturity of our VLF technology due to our experience and expertise. We regard ourselves as probably the most experienced player in this sector. Even as an industry leader, we constantly encounter new challenges and different scenarios and applications, simply due to the fact that this technology does not comprise simple off-the-shelf solutions, but is tailor-made for individual clients and applications," Lourens notes.

Looking to the future, he says that the successful application of PDS technology in underground and surface mining operations will go a long way to reducing the high rate of vehicle accidents in the South African mining industry. "While the various stakeholders have realised that this is now quite a critical issue, there is also the realisation that this is a highly complex and technologically sophisticated sector. This means that a major player such as Booyco Electronics stands to play a critical role in the correct adoption, implementation and application of this technology," he concludes. □

1. Booyco Electronics' manufacturing facility in Jet Park, Johannesburg.

2. Booyco Electronics is a provider of unique electronic products that add value to a mining operation's overall safety, process improvement, production control and efficiency.

3. All products and systems are performance tested by Booyco Electronics and certified to ensure compliance with the relevant specifications.



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First export orders for locally assembled trucks

Six months after going 'on stream' in the Coega Industrial Development Zone (IDZ), FAW South Africa has achieved quality levels, "comparable, if not better" than that of its Chinese parent and has already despatched its first order to Kenya.

FAW Vehicle Manufacturers SA has started the new year with a 'first'. A mere six months after opening its plant in Coega to assemble FAW trucks locally, the company has despatched its first five export units to the FAW dealership in Kenya.

Yusheng Zhang, CEO of FAW Vehicle Manufacturers SA, says this sets "a benchmark for Chinese truck manufacturing locally".

"Not only have we managed to produce the best quality levels, comparable – if not better – than our FAW parent company in China, but we've been able to do so in a very short run-in period for a plant that only came on stream six months ago."

He explains that the African dealers, who traditionally placed their orders with FAW China, are moving their shipments to originate out of South Africa "owing to the shorter lead time for delivery, the high levels of quality that some have come to verify personally at Coega in South Africa, and the reduced cost of sourcing FAW vehicles on the same continent".

He adds, "We are already working on a special order for the FAW Tanzania dealership. What is significant is that the export destinations can readily adjust some specifications to accommodate customers' requirements that are specific to their markets."

"In this way, we anticipate providing African customers with FAW trucks with personalised modifications, as well as provide them with our renowned robust and durable FAW trucks, tipper and mixer ranges."

The FAW J5P 6 by 4 380 hp truck tractor is a stalwart product for African road conditions. The 55 ton GCM vehicle can cope easily with the region's challenging dust and dirt, rough roads and slippery conditions. With its high payload capacity, it will provide a good return on investment for almost any operation, including mining and long haul logging.

From a global perspective, the deci-

sion to build the FAW plant in South Africa was "significant" as it is one of the most important and largest investments made by a Chinese entity

in South Africa to date. The US\$60-million investment needed for the Coega plant was financed by the China FAW Group Corporation and the China-Africa Development Fund (CAD-Fund) together with FAW Africa Investment Company.

"This export milestone, so soon after our inauguration, further cements our presence in South Africa," says Zhang.

The first-phase of the Coega plant, covering 103 000 m² of land and a 28 000 m² plant – complete with training facilities – allows the company's client base to 'buy local' adds Zhang.

The plant will eventually ramp up to



On 16 January, five FAW J5P truck tractor units assembled in South Africa headed off to TransAfrica Motors Limited based in Mombasa, Kenya.

produce 5 000 trucks per annum, supplying trucks to the region, in right-hand and left-hand-drive derivatives with an estimated 40 % of production destined for the South Africa, while 60 % will be exported.

FAW rose internationally as a result of the political dispensation in China, which allowed more free-market enterprise and encouraged overseas exports. "As China grew then, so will Africa grow now, and FAW is ideally placed to benefit from the demand for vehicles on the continent as FAW has established a solid presence, where it counts," concludes Zhang. □

Advanced features make underground trains safer

"Becker Mining's loco management system, which combines all guard and loco signals on the user displays, acts as a driver and guard communications system, to enforce operational procedures for improved safety during operation of underground trains," says Andrew Trentelman, senior general manager: electronics, Becker Mining South Africa. "This LMS system allows the flow of traffic during safe operating conditions and has programmable parameters that automatically intervene in potentially dangerous conditions."

"Although the loco driver is always responsible for controlling the locomotive, the LMS is programmed to check the operator, acting as a driving aid to prevent tramming accidents. This system is equipped with a global emergency stop facility and is able to halt other locomotives within radio range remotely from the guard car, loco or via handheld units. The LMS advises drivers when to slow down, bring the loco to a halt, or do an emergency stop. Parameters, which measure true speed, are programmed for different areas of haulage and for various speed limitations as required."

The LMS also provides reliable proximity detection and collision avoidance warnings between locomotives, trackless machines and pedestrians. Various events during operation and important parameters are logged as real time data and downloaded for analysis and evaluation.

The user interface, which comprises an LCD screen and six function buttons, connects to the main unit via an 'umbilical cord'. A colour display indicates relevant information, including the speed of the locomotive in km/h, battery conditions and proximity detections, as well as errors and events. A battery operated handheld unit mimics the locomotive's user interface.

The LMS determines a locomotive's speed via an encoder, which is embedded in the locomotive's axle to measure wheel rotation. This loco management system, which provides front driven and remote drive technology to underground trains, has an integral stored energy mechanical brake interface and an automated static and dynamic brake testing facility. An integrated Wi-Fi ability enables future surface monitoring and automation. □

Industry 4 – towards integrated automation



The term 'Industry 4' originates in Germany and has been adopted by Festo to signify a holistic production automation revolution embracing the full suite of modern technologies. Peter Middleton talks to Russell Schwulst (left), business development manager for Festo South Africa, about this fourth industrial revolution.

Internet connectivity is creating a host of remote communication and automation possibilities for machines, and several labels have emerged to describe these: *the Internet of things; the Internet of services; Smart factories; Smart manufacturing; and the Industrial Internet*. The term 'Industry 4.0' originates from a project in Germany to promote computerisation in the manufacturing industry. It signifies that a fourth industrial revolution is taking place – the first being mechanisation using water and steam power; followed, second, by the introduction of mass production and electric power; and third, digital automation using electronics and IT.

Festo believes that another fundamental transition is now taking place. The real world and virtual reality continue to merge; and modern information and communications technologies, such as the Internet and wireless communication, are being combined with traditional industrial processes to significantly change various areas of production. This is the trend encapsulated by 'Industry 4.0'.

A common communication protocol

"The first key feature of Industry 4 is about machine to machine communication. This is a fundamental shift and the starting point of the revolution. Modern automaton systems all offer data communication protocols such as Profibus, ProfiNet, Can bus, Open DeviceNet and a host of others, which are used to enable two-way communication between controllers and machines being controlled. Industry 4 enables individual system devices to communicate with each other, while whole production systems and sites communicate with enterprise management systems (EMSs) and other production optimisation management programmes," begins Schwulst.

A key goal of *Industry 4* is, therefore, to develop a standard protocol that will enable all devices and machines from all suppliers to be interconnected and to communicate with each other. "Siemens has its Profibus as a proprietary PLC language, while Alan Bradley's equivalent is DeviceNet. This means that, by



Each terminal block is automatically tested and certificated before leaving the facility.

choosing a PLC supplier or a preferred communication protocol, one is immediately limited in term of connectivity to a set of machines and control equipment that has also adopted that same protocol.

"So the ongoing challenge we have is to create and agree on a common communication protocol and/or communications platform that would allow all components and devices to be addressed and understood by all controllers, PLCs, SCADAs, computers, tablets and cellphones," Schwulst tells *MechTech*.

"Industry 4 cannot reach its full potential for integrated automation with the mix and match communication protocols that are currently available. For pneumatic valves for example, there is an ISO standard required by all automotive OEMs for use in their factories. It means that the manufacturer can physically take one valve off and fit a competitor valve to the production line, and both will fit and work. At component level, every item is interchangeable, because of ISO standardisation," he points out.

"An agreed International standard has yet to be put in place for the control communication side and for wireless communication for Industry 4," he adds.

Intelligent decentralised control

The networking principle, via a combination of automation and control protocols, wireless communication and the Internet, "could allow devices all over the world to be connected", says Schwulst and



Towards Industry 4 and to cater for the increasing demand for customised production solutions, Festo South Africa has installed a new state-of-the-art terminal block assembly facility. Festo valve terminals, servomotors and stepper motors are all now available with embedded controllers.

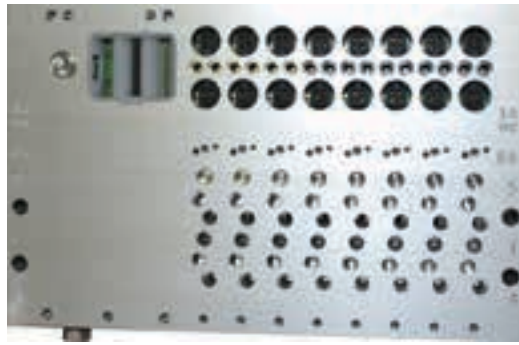
“more information means better informed production decisions. Vacuum forming plants, for example, require humidity control. Instead of a production manager having to alter PLC settings based on a local sensor reading, the PLC can have access to local humidity conditions via the Internet, or directly from an intelligent sensor with built-in wireless communication. Machine settings could then be automatically adjusted to best suit local ambient conditions.

“In addition, the relationships between the settings, the conditions and the resulting product can be stored, sent to a remote production management system and analysed for later use to optimise machine settings at other sites. Industry 4 opens up channels of communications for everything. So any piece of changing data that can be made available to another machine, which can automatically respond,” Schwulst says, adding that these changes can be made autonomously and because of the vast amounts of available information, better optimisation results.

For machines to operate more intelligently, Industry 4 is associated with a moved away from a central processor, – a PLC or CPU – residing in some onsite master control room. “It is now possible to have a remote controller simultaneously overseeing and coordinating operations at several sites. This is decentralised control. It means that all individual devices – valves, sensors, cylinders, motors and VSDs – become armed with intelligence to enable them to quickly respond to remote instructions, but to otherwise operate autonomously,” he explains.

“There will be electronic control chips in every connected component in a system. First, this improves speed and responsiveness, because the ongoing decisions are being made in the device itself. Also, by combining hundreds of intelligent devices, an intelligence multiplying effect comes into play, where the conditions resulting in pockets of success or failure can be automatically analysed and used to globally improve the entire connected system,” Schwulst predicts.

“And we are already quite far down this road,” he continues. “Our valve terminals, servomotors and stepper



Terminal blocks can now be locally assembled using kits of production parts.

motors are all coming out with embedded controllers. Festo in Germany has recently demonstrated an intelligent camera system, which is able to mimic the position of an arrow on a wheel. And the camera, the input wheel and the following wheel are not physically connected to each other in any way. You can imagine the possibilities for a pick and place robot if this intelligent camera communicates with the gripper. The device gives a machine ‘intelligent eyes’, enabling precise and self-adapting control,” Schwulst suggests.

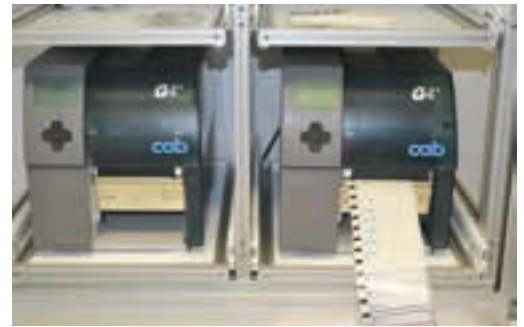
Wireless technology

A third key feature of Industry 4 is the rapid development and deployment of wireless technology: “Wireless communication capability is now more affordable and more compact, while the power requirements are decreasing and the operating range is increasing. Already typical in the production environment is that a machine can wirelessly communicate with a smartphone or a tablet. The machine’s PLC sends production status, machine efficiency information or error alerts directly to a mobile device within wireless range,” Schwulst tells *MechTech*. “These principles are already in place and this same information can be more widely streamed and remotely stored.”

A combination of miniaturisation and networking also allows individual wireless-enabled intelligent devices to act as wireless hubs. An intelligent temperature sensor, for example, will not only send out its own status reports, but can also relay information from other devices. This allows communication distances to be extended more conveniently and at relatively low power.

Blending and packaging

Schwulst tells of a Durban-based automation company that develops equipment for handling, blending, packaging and



Following testing, a labelling system allocates a unique QR (quick response) code to each terminal block design. This is uploaded onto Festo’s global database for use when reordering and/or for rapidly implementing design changes on existing valves.

managing bulk fertilisers: “When blending fertiliser, exact ratios are needed. Hoppers are opened and closed to deposit exact quantities of each ingredient.

“Using an array of intelligent devices, this company is able to record and analyse historical data and automatically adjust its blending accuracy. For example, a hopper might open at an angle of 70° to deposit 5.0 t of product in the allocated time. But powdered products become more fluid or less fluid due to environmental conditions such as humidity. As a consequence of incorporating intelligent scales and ambient data monitoring into the batching programmes controlling the process, it becomes possible to automatically compensate for environmental conditions. The system is able to determine what has historically been produced, compare it with the desired requirement and compensate in real time for the differences,” Schwulst relates.

“Also, at the bag filling station, spillage collects on the scales, gradually increasing offset errors. By subsequently weighing the sealed bag using an intelligent calibration sensor, if any underweight bag emerges on the calibration scale, an instruction is sent to the filling station to compensate, which results in very accurate bag weights. And when the weigh station is swept clean, while one or two bags may emerge as overweight, this will be rectified rapidly and automatically for the following bags,” he adds.

“Industry 4 is about decentralised devices communicating with each at component level to improve productivity,” says Schwulst. “Nowadays, production processes are characterised by growing customer orientation, greater product variety, and more complex material flow. Modern production control needs to be able to cope with this increasing dynamic,” Schwulst concludes. □

Championing the use of engineered replacement parts

The very real danger with replacement parts is that companies produce 'copy-cat' parts by duplicating the look of the original part. In contrast, IPD parts are engineered replacement parts produced under stringent quality control measures to ensure integrity and optimum

performance. "Therefore, they not only resemble parts from the original equipment manufacturer (OEM), but their performance under working conditions is identical to that of the OEM part," says Andrew Yorke, operations director, Metric Automotive Engineering.

As a local distributor of IPD engine parts, Metric Automotive Engineering has access to new part numbers released on a monthly basis to cover the popular Caterpillar® C Series engines. IPD is an international manufacturer of engine parts for Caterpillar engines.

"We are proud to be first to market after-market parts of this quality," York says. Metric Automotive Engineering is one of South Africa's most comprehensively equipped diesel engine and component re-manufacturers.

"Since being appointed as IPD's dis-

tributor in South Africa in 2008, we have been servicing an increasing number of customers who have recognised and experienced the significant cost savings associated with world-class quality replacement parts," Yorke says.

"The focus of both Metric Automotive Engineering and IPD has been on helping equipment owners to save money without risk to reliability. Essentially IPD products are Caterpillar replacement parts but, unlike parts being sourced from the East, IPD parts are manufactured in a Lloyds accredited ISO 9001:2000 quality controlled environment."

"The major advantage for our customers is that they are able to source engine parts from an engineering company – the very parts that we use in the re-manufacture of our own engines," Yorke assures.

www.metricauto.co.za



IPD is an international manufacturer of engine parts for Caterpillar® engines and Metric Automotive Engineering has distributed IPD parts locally since 2008.

Strip curtains and doors contribute to energy efficiency

With a dwindling supply of natural resources, it is incumbent upon all businesses to adopt more energy efficient ways of operating. Decreasing reliance on air conditioning and other energy-hungry forms of controlling temperature is a good starting point.

Wim Dessing, managing director of Apex Strip Curtains & Doors, points out that the use of general purpose strip curtains provides a cost-effective alternative to traditional environmental control

methods." Not only does the installation of Apex general purpose strip curtains result in decreased energy demand, but it also contributes to a cleaner working environment, with a reduced quantity of dust, insects and airborne contaminants. In addition to being quick and easy to install, the strip curtains are also easy to clean and allow unimpeded access by both people and vehicles," says Dessing.

Apex Strip Curtains & Doors has devised a specially formulated PVC



Apex general-purpose strip curtains contribute towards energy efficiency and a cleaner working environment.

material, which is rustproof, durable, heat- and chemical-resistant. It also provides a powerful sound barrier, blocking the diffusion of noise from one place to another. The very low thermal conductivity of PVC strips makes them a key component in locking cold or warm air in a room, compartment, or enclosed area.

"Our patented Balledge® design provides an effective thermal seal that parts easily under pressure to allow people and goods to move through unhindered. The design has a reinforced edge on the border of each strip that prevents snagging or scratching of goods or people and provides extended strip life, irrespective of the application.

"Being able to control the environmental conditions in terms of heat and humidity plays a large role in ensuring that employees are comfortable and thus, more productive. All these benefits will add substantially to the bottom line of businesses," he concludes.

www.apexstrip.co.za

VicFlex brackets for cold storage applications



Victaulic, the leading global producer of mechanical pipe joining and fire protection systems, has introduced the new VicFlex™ Style AB6 bracket for cold storage applications, which reduces hands-on installation time by as much as 75 %.

The new bracket is part of the VicFlex range of innovative flexible drops and patented fitting brackets designed to be installed more easily than traditional rigid piping systems, whilst delivering more durable performance. VicFlex offers a convenient and safe solution, requires fewer man-hours to install, is cost effective for maintenance and retrofit applications, and lowers shipping costs due to its more compact form.

"The new VicFlex Style AB6 bracket for cold storage applications is going to revolutionise the way cold storage units are protected, installing up to four times faster than rigid pipe," says Barry van Jaarsveld, Victaulic regional manager Africa. "With this new technology you will no longer have to wrestle with rubber boots or messy foam sprays, or wait for glue to dry – and there is no need to cut and measure hard pipe, saving contractors precious time," he says.

www.victaulic.com/vicflex

Latest retro reflective sensors

The new RK 46C.DXL VarOS retro reflective sensor from Leuze of Germany, distributed locally by Countapulse Controls, features a wide light band to reliably detect small and large objects, even with gaps.

"A handy 'teach me' function allows the sensor to be adapted easily between two object sizes greater than 8.0 mm at the touch of a button," says Gerry Bryant, managing director, Countapulse Controls. These Leuze sensors are ideal for when the objects to be detected or the associated environmental conditions deviate from the norm.

The objects can be round, angular or both, with glossy surfaces, have transparent shrink-wrapped film or they can even be totally black with gaps or with high ambient light levels. "Depending on the application, Leuze can bring a range of technologies to bear to ensure reliable detection of such objects," Bryant says.

The new Leuze RK 46C.DXL VarOS retro-reflective sensor is particularly effective in this regard as it responds to objects using the entire width of its light band, which gives it the capability to handle interruptions. The wide light band



The new Leuze RK 46C.DXL VarOS retro-reflective sensor features a wide light band to reliably detect both small and large objects.

allows for detection over a 45 mm to 60 mm area.

The sensitivity and/or resolution of the sensor can be adjusted easily by means of a button located on the rear housing. "The use of this sensor does away with the need for expensive light barriers or multiple individual sensors," Bryant adds.

Countapulse Controls is the leading southern African supplier of sensing, measurement, counting, switching, monitoring and positioning instrumentation for automotive and other branches of engineering.

www.countapulse.co.za

Ex-stock split-case pumps

Mather+Platt's new horizontal split-case centrifugal pumps, launched last year at Electra Mining, are soon to be held in stock to eliminate the lead time on new orders, which are currently taking between six and eight weeks to deliver. The planned stockholding will result in immediate delivery throughout central and southern Africa of several popular models within the range, which consist of more than 150 pumps.

The new split-case range is tightly niched, comprising single-stage and two-stage models delivering duties up to 15 000 m³/h.

Mather+Platt's two-stage U-series is designed for lower duties, and features a single suction, twin volute casing design to transfer flow medium at between 20 m³/h and 600 m³/h.

For the high duty market, the single-stage double suction LR-series features a closed type impeller to deliver duties from 10 m³/h to 2 200 m³/h in either horizontal or vertical execution. A sister single-stage series, the larger LN-range, delivers duties of between 400 m³/h and 15 000 m³/h.

Pump casings can be manufactured in cast iron and stainless steel, or cast in exotic materials such as super duplex. Impellers can be supplied in cast iron, stainless steel or bronze.

Horizontal split-case pumps carry the significant advantage of allowing maintenance without having to disconnect the pump and remove it from the pipeline.

www.matherandplatt.com

Two new diesel-generators available for rent

Renttech South Africa has recently launched two new ranges of diesel-driven generators, and has plans for introducing gas-driven generators.

The new ranges of diesel-driven generators include a heavy-duty range covering 10 to 30 kVA in both single and three phase sound-attenuated models, and an extra heavy-duty 'rental spec' series for extreme conditions.

"The smaller units are popular for domestic and small business use, whereas our standard units are ideal for larger businesses and site use. The 'rental spec' units are aimed at heavy-duty on-site applications," explains Martiens Opperman,

Renttech SA's operations manager.

Opperman emphasises that the company is constantly striving to improve the quality and efficiency of its products, many of which are sourced internationally, with the overall aim of supplying top-quality, versatile products at affordable prices.

The 10-30 kVA range is small and compact, 1 500 rpm, sound-attenuated and fitted with a Kubota/Newage Stamford power pack and offered at

relatively competitive prices.

The heavy-duty 'rental spec' units can be double-stacked, painted to marine container specifications and come with a standard five-year rust-proof warranty. These can be supplied with either Perkins/Newage Stamford or Cummins/Newage Stamford power packs and they can handle ambient temperatures of up to 50 °C. The units of 800 kVA and above are installed inside converted soundproof marine containers. www.renttechsa.co.za



The heavy-duty 'rental spec' units of 800 kVA and above are installed inside converted soundproof marine containers, which are ideal for site use.

Compact vortex flowmeter for low viscosity liquids

KOBOLD Instrumentation, represented in South Africa by Instrotech, a Comtest Group company, has on offer the compact KOBOLD Vortex flow meter Model DVZ for measuring and monitoring smaller and medium-sized flow of low viscosity liquids, such a water-like liquids in pipes. The device works using the vortex principle, making it virtually maintenance-free. This involves the installation of a sharp-edged object (the vortex generator) in the flow duct. Vortices are created behind the object whose frequency is proportional to the velocity of flow of the

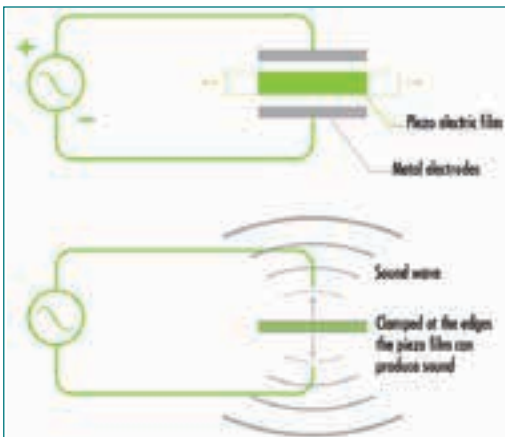
liquid. The flow volume can be determined with a high degree of accuracy by measuring the vortex frequency. The result is a very high linearity over the whole measuring range – 0.5-4.5 or 10-100 l/min – with an accuracy of +2.5 % of full scale.

The device can be fitted with switching, frequency or analogue outputs. There is also an optional compact electronics package that includes a digital display, and both a switching and analogue output. Dosing and metering electronics are also currently being developed. www.instrotech.co.za

Thin film piezo speaker material



Kickstarter specialist Richard Haberkern demonstrates PVDF, a thin plastic polymer sheet with converse piezoelectric properties that make it ideal for use in audio speakers.



When an electrical current from a sound source is applied to opposing sides of the material, a converse piezoelectric effect causes the PVDF film to distort and vibrate.

Sustainability Week

23 to 28 June, CSIR, Pretoria.

This year's Sustainability Week is set to accelerate the total number of sustainability projects, under the theme 'Get ready to put ideas in motion.' Thought leaders, policy makers, practitioners and producers within the country and beyond will share their knowledge. International Convention Centre in Pretoria – undoubtedly a highlight in the annual environmental calendar.

An exciting addition to the programme, African Capital Cities Sustainability Forum, hosted by the City of Tshwane, will seek to lay the foundation for African cooperation at city level and urban scale. In addition to the extended Green Building and Sustainable Energy programmes, three new seminars on mining, manufacturing and infrastructure have been introduced.

Sustainability Week takes place at the CSIR ICC from 23 to 28 June 2015.

www.sustainabilityweek.co.za

Polyvinylidene fluoride piezoelectric film (PVDF) is a relatively new class of piezo-electric device. PVDF is a thin plastic polymer sheet with its molecules aligned in a uniform pattern. It has an electrically conductive coating (eg, graphene) deposited on each side of the sheet. When an electrical current from a sound source is applied to opposing sides of the material, a converse piezoelectric effect causes the PVDF film to distort and vibrate. This vibration is transferred to the air as a sound wave.

To use PVDF material, an electrical connection to these conductive coatings is needed. Soldering directly to the film is not possible because the heat would destroy the underlying plastic PVDF material. This limitation is overcome by printing a conductive layer of ink around the edge of each side of the speaker film.

The material resembles thick sandwich wrap but has much more interesting properties. Piezo film has an extremely high output potential, about 10 times greater than ceramic piezo materials. Since the material is a thin, lightweight, flexible film it can be glued onto shaped designs. It also has a high mechanical strength and good impact resistance.

Other attributes include:

- Wide frequency range. (0.001 Hz to 10 GHz).
- Low acoustic impedance (matching water or human tissue).
- High dielectric strength.
- Good mechanical durability.
- Moisture resistance.
- It is resistant to many chemicals.

While speakers made from PVDF can behave similarly to electrostatic speakers, thin film piezo speakers do not need the high voltages or complex electronics associated with electrostatic discharge to produce sound. Any standard audio amplifier can be used with a small matching transformer to create quality sound. This means that PVDF material is perfect for installing in tight spaces where audio is needed. It can be formed and cut into different shapes leaving its uses up to the imagination.

Committed to developing this technology is a team called Soundlazer, which specialises in acoustic technology. The company is seeking Kickstarter funding of US\$73 500 in order to develop the specialised manufacturing processes necessary to use this material in the

manufacture of low-cost high-quality miniature speakers and headphones.

"We are determined to develop a low cost kit, with the Soundlazer brand name," says Soundlazer's Richard Haberkern. "We want this technology in the hands of as many experimenters and makers as possible. Our kit had to include both the speaker film and the electronics needed to produce good quality sound. By working with manufacturers from around the world, I think we have more than surpassed this goal. Now the only thing needed is backing to help produce these kits in large enough quantities to make truly thin speakers a reality," he says. □

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