wattnow

SAIEE SUPPORTS SKILLS DEVELOPMENT AND PROFESSIONALISATION OF ELECTRICAL ENGINEERS

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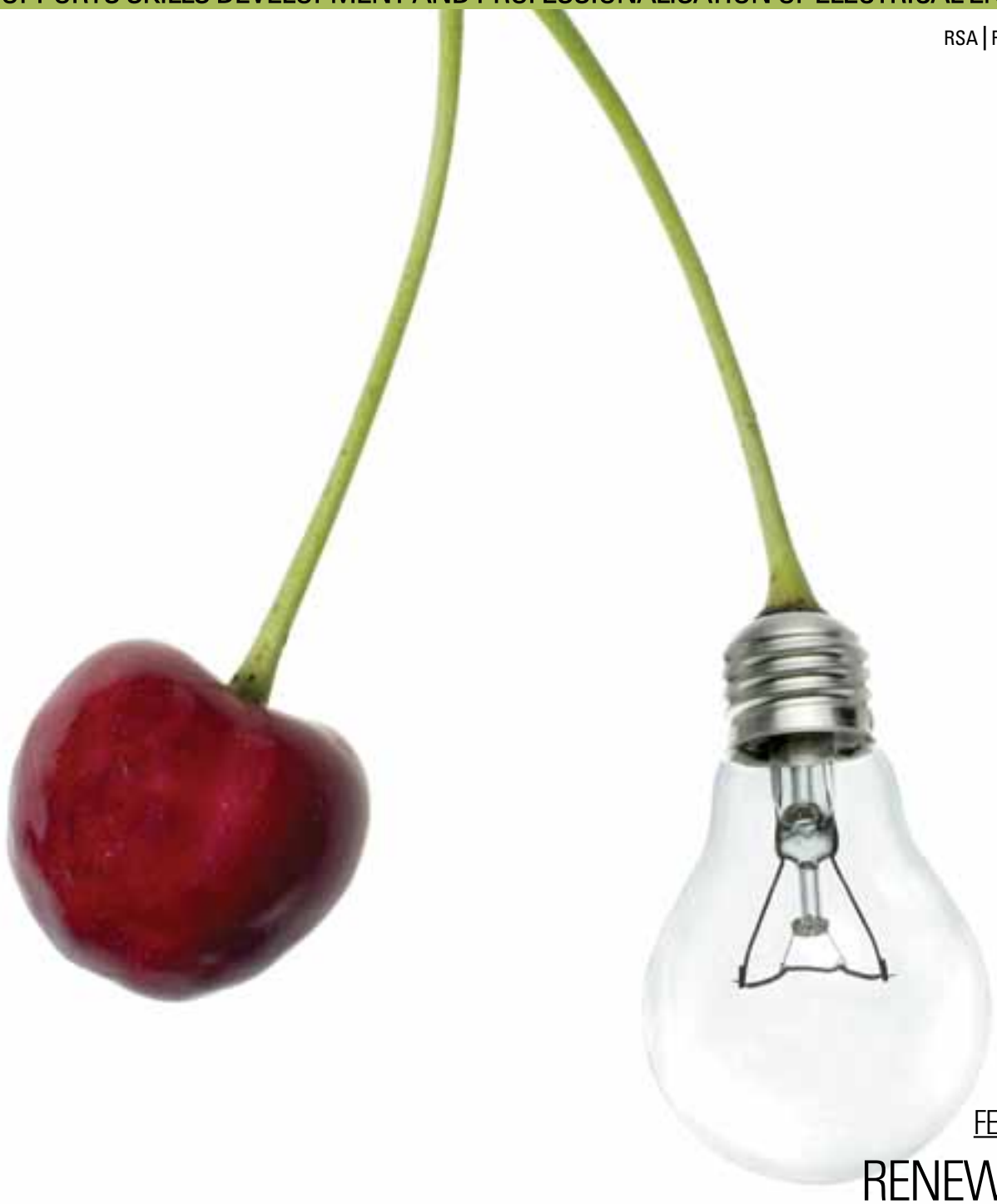

FEATURING

RENEWABLE ENERGY

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wattnow magazine

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ISSN: 1991-0452

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February is around the corner and I have genuinely hit the ground running this year.

Renewable Energy is on the cards in this issue of the **watt**now magazine.

Our feature article on page 26 argues strongly that if the target of the emission of greenhouse gasses is not met, as per the Kyoto Protocol, it will lead to failure unless Active Energy Efficiency becomes compulsory.

The Technology section takes a look at what 2014 has in store for us regarding data economy. It makes for a very interesting read.

The Power Section on page 36, showcases an in depth discussion on Lightning and Power frequency performance of MV pole mounted transformers.

Bev Lawrence wrote a beautiful "Reminiscence" article on how his career took off with Allan Meyer as his first boss. Read his tribute on page 44.

I've received numerous papers/articles since my last request in the January issue of **watt**now. I wish to thank those who made the effort in sending me their papers - I really appreciate it. Once again, before you get too busy, please go through your dusty bookshelves, or archive folders on your PC and see if you don't have a paper/article in storage that you always wanted to publish, but never got round to sending it out. Please send it to me – I will gladly share your knowledge with our readers. You also earn 1 CPD credit if your paper/article is published in the **watt**now magazine.

We've opened a new SAIEE Centre in the Vaal, and you will find the contact details of the new chairman, Danver Jacobs, on page 66.

In line with our feature this month, I'll be visiting the Africa Energy Indaba at the Sandton Convention Centre on 18-20 February.
I hope to see you there!

Minx

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*Visit www.**watt**now.co.za to answer the questions related to these articles to earn your CPD points.*

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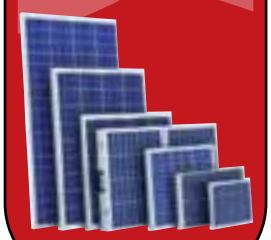

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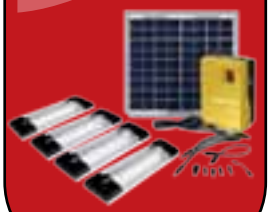

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Greetings to everybody.

I have avidly been following the news to hear the matric results for 2013, to determine improvements in Maths and Science results for the first intake of the so called 'born free' generation, and have been rather disappointed to learn that there had been no discernable improvement in the numbers, and quality of learners that pass maths and science.

While the SAIEE shares in celebrating the increasing number of young South Africans who pass the National Senior Certificate (NSC), we remain concerned about the standard of the examinations, and we are concerned about the performance, particularly in the important engineering gateway subjects of mathematics and physical science.

To quote Gail Campbell of the Zenex Foundation, *"We are particularly concerned that the number of learners who sit for examinations in these subjects at grade 12 and the number getting a good pass at NSC level – which provides a gateway into maths-related and science-related tertiary study – is falling."* The basic education department's reports indicate a 17% decline in the number of candidates who wrote mathematics between 2009 and 2013 (from about 290 400 to 241 400). At the same time, the number of candidates writing mathematics literacy rose sharply to 58% of the 2013 cohort.

Likewise, the number of candidates who wrote physical science has also fallen by 17% over the same period (from about 220 900 to 184 300). Critically, as the number selecting to do mathematics is dropping, the overall number of learners who are achieving an NSC pass with more than 40% in mathematics has been falling over the same period to 17% of the class of 2013.

This means the national pool of students eligible to do an Engineering degree is very limited.

International studies and the Annual National Assessment (ANA) results indicate that the problem with mathematics has its roots in primary school, where many learners fail to gain basic mathematical skills. The 2013 ANA results saw only 39% of grade six learners and 2% of grade nine learners scoring more than 50% in mathematics.

In a recent Mail & Guardian article the Stellenbosch University researcher Nic Spaull questioned the validity of the ANA results *("Assessment results don't make sense", December 11 2013)*. Even so, however, we can already see a pattern emerging – less than half the learners in each cohort show foundational competence in mathematics, as indicated by the 61% of grade six learners who failed to score 50%.

It is evident that the teachers in upper primary and lower secondary levels need further training both in teaching basic mathematics and physical science, and the relationship between the two subjects.

In addition, struggling learners need to be provided with formally structured remedial assistance to deal with backlogs.

The NSC results should therefore be considered with a tinge of reality, and only used as guide to improve teaching methods. Primarily, we require properly remunerated professional teachers in these subjects who have a good ' feel' for the practical implementation of applied mathematics.

However, I am particularly encouraged by independent projects such as the Bergville Community Builders (BCB) programme which is supported by the SAIEE, this independent project has produced some marvellous results as is evident by the results of their top achiever Sphesihle Dlamini shown in the photo.

It is clear that the legacy of sagging performance will be with us for a while. We know that provincial education departments have put in place various programmes to support foundation phase education. Some are starting to bear fruit as evidenced in improved performance in the grade three Annual National Assessments (ANAs).

It may still be several years before South Africa has sufficient registered Engineers to achieve its growth and development goals as required by the National Development Plan .

Hence, there is a growing need for the SAIEE to provide mentorship and support for young Engineers and indeed we should even consider a programme of executive coaching of more senior Engineers in decision making positions .

Early January 2014, the Public Works Minister Thulas Nxesi suggested that if the Department of Public Works (DPW) had maintained an adequate complement of professional and technical staff, much of the irregularities, scandals and overspending witnessed in the past year, could have been prevented.

This is an admission that adds support to the SAIEE initiative of mentoring Engineers.

The Minister went on to say that the DPW was currently gaining traction in boosting and developing critical and scarce skills, while rebuilding its skills capacity through technical and professional training programmes in the built environment.

The department has handed out 50 full built-environment bursaries for studies towards a career in the construction sector – two months after awarding certificates to 26 young professionals after they attained professional registration status in the built environment.

Forty-five potential built environment professionals had completed the young professionals programme since 2010.

The DPW and the Construction Education and Training Authority (CETA) equally sponsored bursaries valued at R120 000 each to 50 matriculants of 2013 who wished to study towards careers in the built environment. This bodes well for the SAIEE mentoring initiative for 2014.

I look forward to yet another exciting year with our institute.

Until next month

Paul van Niekerk | Pr. Eng | FSAIEE
SAIEE President 2013

Sphesihle Dlamini from Tabhane High School receiving the SAIEE top achiever prize from Paul van Niekerk President of SAIEE for2013 award in September last year in Bergville.

Sphesihle managed to get 8 distinctions in his final results with 97% in higher level Mathematics, and 95% Science.In addition, he won the BCB/SAIEE Maths and Science Olympiads in September last year, and thereafter went to the KZN provincial Olympiads for Maths and Science where he was also the top achiever in the KwaZulu Natal province.

WATTSHOT

14 February, the romantic-at-heart will celebrate Valentine's Day and what better than spoiling your loved one with a romantic experience.
This is where action speaks louder than mere words!

Vaal River Buffet Cruise for 2

Experience something completely extraordinary and whisk yourself and your partner off to enjoy a truly remarkable dining experience on the water.
Price: R799.00 (incl. VAT)

Hot Balloon Flight for 2

Turn a dream into a reality and treat someone to the ultimate experience of hot air ballooning. Soar above the trees and feel overwhelmed by the breathtaking beauty below. Price: R3,915.00 (incl. VAT)

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In Cape Town you will be treated to a luxury catamaran and the crystal waters around Cape Town Harbour to Camps Bay.
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Experience this truly unique beauty spa, let yourself be pampered amongst sheer decadence. Leave feeling rejuvenated, relaxed and ready to face the world.
Price: R2,495.00 (incl. VAT)

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Get up late one glorious Sunday and venture to enjoy a stunning Jazz Brunch. Your private table awaits you where you'll enjoy a scrumptious buffet breakfast whilst listening to live jazz music. R699.00 (incl.).

Champagne Picnic for 2

This is a novel experience for those who enjoy the outdoors as well as the "finer things in life". Make a date of it and enjoy the relaxing drive.
Price: R620.00 (incl.)

All the products featured on pages 8 & 9 are available from www.mantality.co.za unless specified differently.

Private Dinner & Fire Dance for 2

This very special and truly private, romantic dinner for two is served on the deck, overlooking the Crocodile River.
Price: R1,890.00 (incl.)

Horse Riding with Picnic for Two

This breathtaking ride will take you alongside the river and through the hills leading to an idyllic picnic site in a secluded valley in Hazyview. Price: R1,050.00 (incl.)

Constantia Off-Road Wine Tasting for Two

Enjoy an extraordinary off-road wine tour starting at Beau Constantia.
Price: R779.00 (incl.)

Night Game Drive & Dinner for 2

The night drive offers guests a combination evening with a traditional braai in the lapa around a boma fire and to view feeding lions after dinner. Price: R880.00 (incl.)

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Experience the ultimate romantic, thrilling, adventurous helicopter experience of a lifetime! Price on request.
Visit www.mantality.co.za

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Whether a beginner or just rusty. Invest in your future. Learn the fabulous skill of dance.
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Cooking together can be fun especially when you're using all your senses to try out new recipes and creating "something new and exotic." Price: R765.00 (incl.)

Sushi Lesson for Two

Learn the fine art of Sushi making with one of South Africa's best Sushi chefs. This is not a skill that can be learnt by reading a book or watching T.V. Price: R875.00 (incl.)

Elephant Encounter for 2

You will be introduced to the elephants in a forest area, and here you will be able to touch and interact with the elephants.
Price: R1,399.00 (incl.)

WATTSUP

Africa Energy Indaba invests in energy leaders

In its bid to support Africa's energy leaders of tomorrow, the Africa Energy Indaba - the Continent's leading energy event - is giving candidates of the World Energy Council's Future Energy Leader's Programme (WEC FELP) complimentary access to its 2014 event. The World Energy Council is an endorsing partner of the annual Africa Energy Indaba, and the February event is an official regional event of WEC Africa.

"We are thrilled to offer WEC's Future Energy Leaders the unique opportunity of attending the Africa Energy Indaba. Most of the FEL's are coming from Africa and some from around the world. The purpose of this investment is to grow future energy leaders and we look forward to rich engagement with the continent's inspiring young energy leaders," says Liz Hart, Managing Director of Siyenza, the organisers of the Africa Energy Indaba.

The World Energy Council is the principal impartial network of leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all. Formed in 1923, WEC is the UN-accredited global energy body, representing the entire energy spectrum, with more than 3000 member organisations located in over 90 countries.

WEC's Future Energy Leaders Programme was formed in an effort to identify and encourage the next generation of energy leaders.

"According to our latest World Energy Issues Monitor, to be released at the Indaba, the Future Energy Leaders appear to be much more confident in the role that renewables will play in the future energy mix. More than the global energy community, young leaders believe in the power of innovation and new technologies as sustainable energy solutions. In a time of unprecedented uncertainty and complexity, it is vital to incorporate such fresh thinking, innovative ideas and approaches to address the challenges of tomorrow's energy," says Christoph Frei, Secretary General of the World Energy Council.

"Our Future Energy Leaders have already proved that they have the vision and ability to step up and together with the wider WEC leadership community we will have a strong programme of action at the Africa Energy Indaba."

The Future Energy Leaders Programme selects exceptional young individuals with a commitment to shaping the global energy future. They are young leaders from all regions of the world and from diverse sectors such as government, industry, academia, civil society and social entrepreneurship.

Successful applicants serve a three-year term as a "WEC Global FEL". In addition to attending the World Energy Council's triennial World Energy Congress, they have the opportunity to participate in WEC's work programme and attend other select events such as the Africa Energy Indaba.

At the end of their 3-year tenure, individuals can join the FEL-Alumni community and remain part of the WEC network. ***Visit Africa Energy Indaba on 18-20 February in Sandton, JHB.***

ACTOM MV Switchgear's Rhett Kelly (left), Technology Development Specialist, and Greg Whyte, Design & Development Manager, pose in front of the new AMV12 1250 A panel and (on the right) 2500 A panel after the successful completion of tests on the new products at the KEMA high power laboratory in Holland.

ACTOM MV Switchgear wins 'Olympic Gold' at KEMA with new range of switchgear

ACTOM MV Switchgear, the leading manufacturer of medium-voltage air-insulated switchgear in South Africa, has been successful in achieving an "Olympic Gold Medal" at KEMA for a new range of switchgear.

The "Olympic Gold Medal" is complete KEMA certification of the new AMV12 range of air-insulated switchgear with ratings of 800 A, 1250 A and 2500 A at 31.5 kA in accordance with IEC 62271-200.

ACTOM MV Switchgear is well known for the SBV range of switchgear manufactured at its factory in Knights, Germiston. The SBV range has dominated the South African market for many years, having an installed base of over 42 000 panels.

Hatch Honoured With Service Excellence Award By Canadian Solar Industry

Consulting engineering and project implementation firm, Hatch, was honoured with the Service Excellence Game Changer Award at an awards ceremony on December 9 during the Canadian Solar Industries Association's Solar Canada 2013 conference, during which a panel of judges recognised the firm's outstanding services to the Canadian solar industry.

Hatch was nominated for the award by its client, Recurrent Energy - a leading solar project developer providing clean electricity.

Hatch's Solar Power Service offering has grown substantially over the past few years, with the solar team having worked more than 116 000 hours in the last three years. Hatch has a strong presence in the Ontario solar power market, having undertaken 40% of Renewable Energy Approvals (REA) completed in the province.

Hatch provides engineering and environmental services such as Renewable Energy Approval (REA) and other permitting assistance, environmental site assessments, due diligence assessments, construction environmental monitoring, and preliminary and detailed engineering assignments.

Hatch staff with CanSIA representatives. From left: Kathryn Klement, Noel Boucher and Andrew McLean.

Movember 2013

Back, l-r: Andre Grobler, Rikus le Roux, Christo van der Merwe, Jan Jansen van Rensburg, Piet van Huyssteen, Alwyn Hoffman, Gerhard Human.
Middle: Christiaan Martinson, Henri Marais, Henri Neser
Front: Gert Kruger, Kabanda Lusanga, Gerhard de Klerk.

2013 was the second year that the post-graduate students and personnel of the School for Electrical, Electronic and Computer Engineering at the North-West University supported the Movember campaign. They did their own fund raising for CANSA by letting the razors gather dust during the month of November. The support for this worthy cause was well received and they challenge others tertiary educational institutions in the Electrical / Electronic Engineering fraternity to do the same in November this year and to send their photos to **watt**now. A few prizes were sponsored by Roots Lifestyle Centre and Wimpy. The two top growers of 2013 is Piet van Huyssteen and Jan Jansen van Rensburg.

Royal HaskoningDHV Boosts Global Rankings

AUTHORITATIVE Engineering News-Record (ENR) has placed international engineering consultants Royal HaskoningDHV in 9th position in Africa, confirming the company's global expertise and capabilities.

ENR compiles and publishes rankings of the largest construction and engineering firms annually, measured by gross revenues. It also provides news, analysis, data and opinion for the construction industry worldwide. ENR released its latest Global Sourcebook in December 2012.

Royal HaskoningDHV, which has a Level 2 B-BBEE Status, is involved in some of the biggest projects on the continent. The recent rankings are recognition of the company's sustainable and innovative solutions in Africa.

The group's global rankings improved from 50 in 2012 to 39 in 2013. The local business spurred the group's improved ranking in, among others, transmission lines and cabling (5th) and education (10th). Of Royal HaskoningDHV's €15m international revenue (revenue outside of Netherlands) earned from the education market, local operations contributed €13.9m.

Its contribution to the group's €2.5m international revenue in transmission lines and cabling was €2.2m. The entire group revenue for transmission and distribution (€11.7m) came from the central and southern African region.

WATTSUP

Limited space at universities does not mean the end for determined youth

As the country celebrates the achievements of the Class of 2013 with statistics about pass rates, distinctions and university exemptions making the headlines, the reality for many hardworking youngsters is that despite having done enough to qualify for university entry, there are simply not enough places available at the country's public institutions.

In 2013, a total of 181 921 matriculants from private and public schools passed with marks that would qualify them for tertiary education and Bachelors' Degree study.

Tens of thousands of these pupils will have applied to public universities however Dr Linda Meyer, Dean of Studies at Boston City Campus & Business College, says that approximately one in four applications that are made will be accepted.

'If one uses the example of three leading public institutions in Gauteng – they have approximately 33 500 spaces for undergraduates but receives over 129 000 applications from matriculants who have qualified to study at university. The question is where do those who have not been accepted go? What alternatives do they have?' she says.

The benefits of having a tertiary qualification are numerous, most significantly it increases the chance of employment.

'Only six percent of graduates are unemployed with total youth unemployment currently sitting at 36%. South Africa's graduate unemployment rate compares favourably with those of developed countries. Despite arguments that there is a crisis in graduate employment, the situation is quite healthy. An increasing number of black graduates are being employed in the private sector.'

'The traditional correspondence study route does offer an alternative, however this methodology is not suited to everyone,' explains Meyer. *'Only 45% of intakes at public institutions actually complete.'*

What is needed are private higher education institutions which accommodate those who achieve university exemption but also offer the kind of comprehensive support structure that is needed to ensure students successfully complete their chosen field of study and are at the same time adequately prepared for the workplace.

At Boston City Campus & Business College where Meyer is Dean of Studies, approximately 70% of those that enrol actually complete their studies. This can be attributed to the student-centred focus, quality of staff and interactive engagement that students at Boston receive. More importantly, the graduate unemployment rate for holders of qualifications in commerce, science and accounting is as low as 3.1%.

'Whilst public universities may be subsidised by the government and so are more affordable than private institutions, for many students the chance of dropping out or failing is far higher. This makes private higher education institutions an attractive option for those who are determined to see their studies through,' says Meyer.

SABS-Approved WEG CSW Range Of Pushbutton Pilot Lights From Zest

A full range of SABS-approved WEG CSW series pushbutton and pilot lights is available from the Zest WEG Group.

A full range of SABS-approved WEG CSW series pushbutton and pilot lights, incorporating LED technology, is available from the Zest WEG Group at an affordable price. WEG has used its leading edge technology and development capability to design these products, which are all supplied with the industry standard 22 mm mounting hole.

The user friendly and durable WEG CSW series pushbutton and pilot lights are used in many industrial applications and environments and are now available in complete sets, for example, pushbuttons complete with auxiliary block.

Designed to offer the ruggedness required for harsh industrial applications, these products are IP66 (IEC 60529) rated (totally insulated) and include a complete line of accessories. The ergonomic design of the mounting hole allows for manual tightening of the device, without requiring the use of additional tools, offering a simpler and safer tightening method. The entire series can be quickly mounted with just one "click" and can be disassembled just as easily, using a flat screwdriver. The contact blocks are individually assembled and do not require the use of tools for installation.

Groundbreaking solar PV back-up energy solution - ideal for load shedding

A new solar photovoltaic (PV) energy generating solution targeted at domestic users as well as the small-to-medium-size enterprise market has been launched by Powermode, the Johannesburg-based power provisioning specialist.

A key feature of the Soltra GTB 3000 is its ability to be used as a back-up power source in the event of a power outage or a load-shedding power cut. *"This sets it apart from conventional solar PV power systems,"* says Jack Ward, Managing Director, Powermode.

The GTB 3000 is the first of a family of utility grid-connected, hybrid solar PV power systems to be launched by the company. It features an integrated charge controller and inverter and can be operated in three modes: linked to the electricity grid (grid-tied); as grid-tied unit with battery backup (in a hybrid configuration); or as a stand-alone hybrid unit.

Ward says back-up is facilitated by the GTB 3000's built-in electronic monitoring system which is able to automatically draw current from its storage batteries should the mains power fail. *"Switchover time is a rapid 15 milliseconds,"* he notes.

The computerised system is also able to automatically prioritise its power delivery channels; to back-up batteries to facilitate recharging during daytime, for example, or to appliances during user-definable peak periods.

At other times the system will automatically juggle power sources between, solar, batteries and the grid to meet changing demands based on individual consumption dynamics.

"In addition, the unit is also able to feed power back into the utility grid - legislation permitting - slowing or even reversing consumption meters to significantly minimise costs to the consumer."

Ward says the Soltra GTB 3000 is one of the first of a new-generation of cost-effective modular solar solutions, requiring a comparatively low initial investment. *"The unit can be expanded in terms of capacity to meet future demands. It can also be configured as a three-phase solution to meet commercial and industrial users' requirements,"* he explains.

Jack Ward | Managing Director | Powermode

With the escalating cost of utility power and the imminent arrival of 'smart metering' systems which will allow municipal authorities to bill for electricity consumption at much higher rates during peak periods in a process known as time-of-day-billing, Ward maintains that solar solutions will soon be on par with conventional power from the perspective of amortised installation and maintenance costs. *"This is particularly relevant as prices are expected to rise exponentially for power consumed during peak periods,"* he adds.

"Valeo Innovation Challenge": Just 1 month left to go !

300 teams from 40 countries and representing 254 universities have already signed up on the website dedicated to the global Valeo Innovation Challenge.

Engineering students around the world have just one month left to take part in the global Valeo Innovation Challenge. Projects must be submitted by February 14, 2014 to try to win the first price of €100 000.

The goal of the Valeo Innovation Challenge is to design equipment that, between now and 2030, will make cars more intelligent and intuitive. Students taking part in the Challenge must develop bold, revolutionary solutions for the cars of the future.

On April 15, 2014, the 20 teams shortlisted by the Valeo experts will be named. Valeo will grant each team €5,000 to create a functioning prototype. The three teams that submit the most innovative projects will be chosen on September 17, 2014 to present their projects to a jury chaired by Jacques Aschenbroich, Valeo Chief Executive Officer, and comprised of members of the Group's senior management team, as well as eminent figures from the worlds of science and design. The jury will designate the winning team, which will receive €100,000, with the second and third-place teams each receiving €10,000.

With the Innovation Challenge, Valeo is demonstrating once again that innovation and R&D are top priorities for the Group. Indeed, innovation guides the teams who are working each day to invent the automobiles of tomorrow. For more info, visit www.valeo.com.

WATTSUP

Boston City Campus & Business College to be field global partner for Harvard Business School

In January Boston City Campus is pleased to be hosting a team of students from Harvard Business School. The team of 6 MBA students will be in Johannesburg, working with the Boston Head Office team, for just over a week. This trip forms part of a required first-year course at Harvard Business School called FIELD, which stands for Field Immersion Experience for Leadership Development. An important element of the course incorporates a practical training exercise involving both educational institutions.

"Boston is proud to have been selected as one of the 140 FIELD Global Partners spanning 10 countries around the world," says Yaron Gutkin, Business Development Consultant at Boston, *"We feel that this will be a mutually beneficial learning experience. Already some of our students have interacted with the Harvard student team, and this exchange has served to broaden our own student's horizons and provide them with a unique insight into one of the world's foremost universities. We are thrilled to be a part of this prestigious project"*. Including Boston City Campus, the Global FIELD partners will host more than 900 students in all.

FIELD has three modules that run through the entire first year of the two- year MBA program. The first module focuses on developing individual leadership skills through team feedback and self-reflection. The second focuses on developing global intelligence by immersing them in a foreign country to develop a new product or service in country for their Global Partner organization. The final module brings all the lessons together by challenging students to develop and launch their own micro-business as part of a small team back in Boston Massachusetts.

Gutkin continues, *"We are pleased to be working with Harvard Business School to provide foreign students with a real-world learning experience in Southern Africa. We feel confident that the students will gather invaluable insights whilst working with our staff and interacting with our students. I am confident that the unique exposure provided by the FIELD course will present students with a learning experience that they would be unlikely to gain form a more traditional and insular classroom environment. Real world work exposure has always been, and continues to be a keystone of Boston's training philosophy, and we therefore feel a perfect fit exists with the FIELD programme and are excited to be able to participate"*.

Boston executives have been working with the team remotely in the months leading up to their arrival in country. *"Due to the large time differences it's been an interesting challenge to set up our meetings but luckily up until now this has only proved to be a minor obstacle"*, comments Gutkin. While here, the team will pitch their ideas to the leadership team, conduct field research with consumers around Gauteng and present their final recommendations to Boston management.

The Harvard FIELD project serves to reinforce the notion that we live in global village and form part of a wider global community. It is almost impossible to be involved in any form of work or education

Yaron Gutkin, Business Development Consultant at Boston City Campus & Business College

which is not frequently impacted by changing global trends. The modern pace at which news, knowledge and ideas are able to spread has led to an environment which fosters greater global social awareness and greater global responsibility. Gutkin says *"By bringing two different international entities together to work towards a common goal, the Harvard FIELD course exhibits some of the benefits of living in a technological age which is able to strengthen global ties and build a positive global community. It stands as a testament to the rewards achieved from working and studying in the electronic age"*.

Harvard is quick to acknowledge that this important learning experience would not be possible without the Global Partners.

"We are extremely grateful to Boston City Campus & Business College, and all the FIELD Global Partner organisations, for all they do on behalf of our students," adds Professor Alan MacCormack, the faculty head of FIELD. *"The students benefit immeasurably from this experience and we hope the partner organisations do as well."*

New Altron, new identity

Allied Electronics Corporation Limited (Altron) has launched a new corporate identity following its recent reorganisation into two divisions, namely Altron TMT (Telecommunications, Multi-media and Information Technology) which houses the Altech and Bytes businesses; and Altron Power which consists of Powertech. The new high-technology identity features lines of clean blues, grey and new accents of red in the palette that will roll out nationwide beginning January 2014.

The identity better reflects the group's corporate brand and more accordingly reflects its strategy following the reorganisation. It clearly signifies its growth and transformation, and celebrates its traditional culture of technology and innovation established over many years of the company's 48-year history. The identity is also inspired by Altron's fundamental shift from being an investment holding company, to an operating company.

"We've retained the exciting visual elements that reflect our heritage, but have emphasised our objective to unify and signal growth both internally and externally. Our focus is to drive synergies within the organisation for cross-portfolio selling and to leverage the valuable equity of existing brands. We are proud to be ahead of the curve in a rapidly evolving industry, and our new identity will now illustrate how far Altron has come in its history, covering nearly five decades and where we are heading in the future," said Robert Venter Chief Executive of Altron.

Altron believes that a coherent brand portfolio is essential for activating an organisation's business strategy, easing customer navigation and driving stakeholder understanding. *"The new Altron identity and structure provides clarity and focus, makes portfolio navigation simpler, and creates opportunities to leverage existing brand strength and to share equity,"* said Venter.

The new Altron corporate identity - it clearly signifies its growth and transformation.

The new logo, evocative of shooting arrows and symbol of 'A' in appearance, is a vibrant new take on Altron's prior logo, which has represented the company for nearly 30 years. The arrows cross over, with one arrow representing the holding company and the other arrow representing the subsidiaries, as well as synergy and unity.

"This change marks a new chapter for our group and represents a fantastic opportunity to embrace our brand proposition "United we grow", which has become our way of doing things in the Altron group," said Venter.

Air Products on winning streak in Eastern Cape

Industrial gas company Air Products is notching up heavyweight clients on the back of its decision to establish a state-of-the-art air separation unit in the Coega Industrial Development Zone (IDZ), by securing Chinese automotive giant, First Automobile Works (FAW).

In September 2013, Air Products won the national contract to supply APM Terminals with welding gases at their Johannesburg, Cape Town, Durban and Port Elizabeth sites. Air Products believes the new contracts are due to their commitment to service excellence, quality of their product and the advantage of "being neighbours".

"The market research that led to our decision to locate in the Coega IDZ and Eastern Cape is proving true as Air Products' starts entrenching itself in both new and established markets," says Mike Hellyar, Air Products' Managing Director. *"Our presence at Coega has cemented our total national offering and is yielding interest across trade and industry particularly in Port Elizabeth, and specifically within the Coega IDZ, where we are able to maximize the internal supply chain. Coega is built on an industrial cluster model which encourages seamless supply chain integration. We are already benefiting from this – the FAW and APM Terminals contracts are prime examples of how well this approach is working."*

FAW Port Elizabeth project manager, Dan Jordan, says the company is particularly impressed with Air Products' ability to provide specialised and customised product solutions to suit their requirements, as well as a total engineering solution for supply, storage and use.

Air Products will supply FAW with all industrial and welding gases needed in the various processes of truck assembly and will be phased in to accommodate supply needs anticipated in the future.

GOOD NEIGHBOURS:
The friendly relationship between the neighbouring Coega Industrial Development Zone investors, Air Products and First Automobile Works, dates back to the ground breaking ceremony of the Air Products air separation unit in May 2013 when FAW Port Elizabeth project manager, Dan Jordan, handed over a welcome gift to Air Products Managing Director, Mike Hellyar.
Air Products is officially the preferred supplier of industrial gas to FAW truck assembly plant at the Coega IDZ.

WATTSUP

SEW-Eurodrive instrumental in Imatra Hydropower Plant

SEW-EURODRIVE has been instrumental in the refurbishment of Imatra hydropower plant

Finnish energy company Fortum Oyi is substantially refurbishing its hydropower plant in Imatra in the southeast of Finland between 2013 and 2015. The project involves the complete refurbishment of two of the power plant's seven units. In the run-up to the project, Fortum aimed to use as many local suppliers as possible in the project's subcontracting work. As SEW-EURODRIVE Oy was the only company capable of offering a complete package (see info box), it was awarded the contract for modernizing the intake gates.

The turbines, generators, and electricity and automation systems will be upgraded in units three and four that are targeted in the refurbishment work. Refurbishment of the electrical systems starts in summer 2013, refurbishment of unit three in summer 2014, and unit four will be refurbished in summer 2015. The power plant's safety and eco-friendliness will also be improved during the refurbishment project with new technical upgrades that will reduce the use of oil at the power plant.

SAIEE Engineering Candidate Mentorship Programme

From L-R: Allen Versteeg (Transnet Freight Rail), Stan Bridgens (SAIEE), John Gosling (SAIEE), Marthelene Buckle (SAICE-PDP), Lekgethile Mothoa (Ceta2), Mark van Niekerk (NAC Engineering) and Rex van Olst (Wits).

The Candidate Engineers from Powertech, City Power and Lebone.

The SAIEE has teamed up with the South African Institution of Civil Engineers Professional Development and Projects (SAICE-PDP) and presented the first CETA 2 "Road to Registration" Workshop on Tuesday 21st January 2014 at SAIEE House. The funding for Electrical Engineering Candidates is provided by the Construcion, Education and Training Authority (CETA) for a group of 50 Engineering Candidates from the Civil, Electrical and Mechanical Disciplines. The Electrical group of Candidates are from Powertech, City Power and Lebone.

This programme is part of the SAIEE's Mentorship service in which experienced Electrical Engineering Proffesionals provide workplace mentorship to candidates planning to register with ECSA.

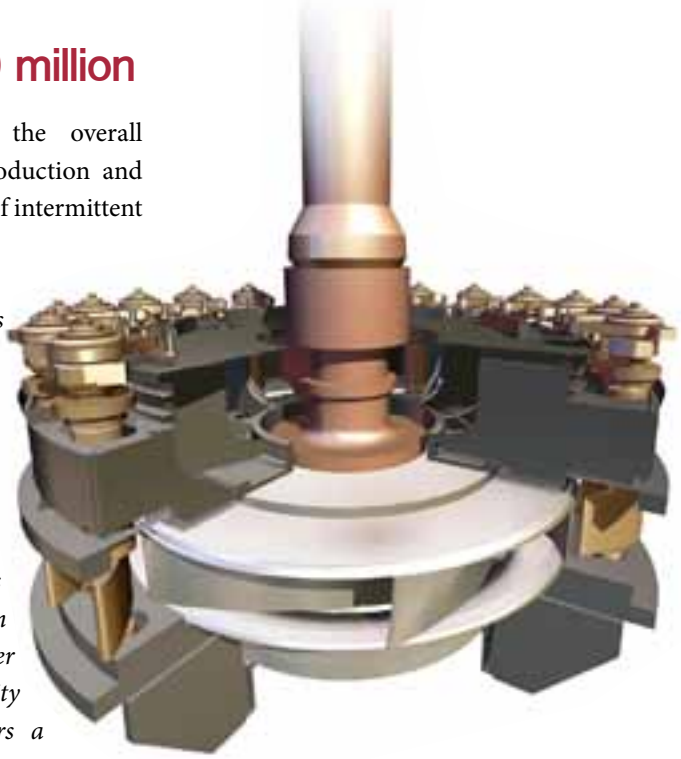
Read more about it on pages 56 & 57 or send an email to academy@saiee.org.za.

Two contracts worth approximately €120 million

Alstom has signed two contracts totaling around €120 million with PSP Investment Ltd for the supply of two 150 MW pump-turbines with the associated balance of plant equipment and Alstom's Distributed Control System (DCS) for the 300 MW Gilboa pumped storage power plant in Israel. Alstom also signed an eighteen-year operation & maintenance (O&M) agreement, covering day-to-day operation and maintenance of the power plant. The project represents Alstom's first entry into the Israeli hydro market and will be the country's first pumped storage power station. Alstom already has a proven track record in the Israeli power generation market with respect to existing steam plants and gas plants.

The power plant, located 60 km east of Haifa, will be commissioned in 2018, and will increase the country's installed power generation capacity by 2.5%. It will contribute to increasing the reliability of electricity supply and will provide an important tool to control the demand and distribution of electricity.

During off-peak hours, pumped storage uses the energy from other power stations to transfer water to a high storage reservoir. The stored water will later be reused to generate electricity to cover temporary peaks. This helps lower the overall operation cost of power production and levels the fluctuating output of intermittent power sources.



"This contract demonstrates Alstom's commitment to supporting the Israeli energy market, providing solutions for renewable and clean energy sources.

This order further reinforces Alstom's leading position on hydro pumped storage power market, and our capability to propose to our customers a complete offer from equipment to services" said Jérôme Pécresse, President of Alstom Renewable Power.

Pumped storage is the most widespread energy storage system in use on power networks, and today there is over 127 GW of pumped storage in operation around the world.

Alstom has been providing pump turbines for over 50 years and has supplied 140 units to date, which represents a market share of more than 30 % and positions Alstom as the leader in this area.

How poor maintenance and renewal threatens municipal service delivery

SAAMA to host asset management event at African Utility Week - 13-14 May 2014

It is essential that both public and private sectors get a strong understanding of their asset management maturity and develop a robust maintenance road map, says Anton Booyzen, chairman of the Southern African Asset Management Association (SAAMA).

Municipalities in South Africa are responsible for managing and caring for infrastructure with a combined value of R1.156 trillion. According to a report by the Financial and Fiscal Commission, R80-billion would be needed over the next 11 years to address the current maintenance backlog in municipal electricity, water and sanitation infrastructure and to return it to optimum condition. The minimum required spend in current facilities is R12-billion over the next two years.

ALARMING INCREASE IN COSTS

SAAMA's Anton Booyzen explains that *"depending on a company's asset management maturity, its cost to deliver a product or service can be up to 25% higher than it should be every year. What makes this all the more alarming is that these extreme costs for large scale industry, utilities and municipalities have escalated dramatically when compared to only five years ago without a commensurate increase in service or product delivery and stands to worsen still unless these business's act swiftly."*

"What's more", says Booyzen, *"with the impending ISO 55000 accreditation set to replace the outgoing PAS55 in 2014, it is essential both public and private sectors get a strong understanding of their asset management maturity and develop a robust road map to deliver a joined-up, risk-based, whole life cycle asset management."*

BENEFITS OF OPTIMISED ASSET MANAGEMENT

Improved planning and consistent, prioritised and auditable risk management are just a handful of the benefits of optimised asset management that will be available at SAAMA's inaugural Asset Management Conference, hosted at African Utility Week & Clean Power Africa, taking place from 13-14 May 2014 at the CTICC in Cape Town. Attended by more than 5000 power and water professionals from more than 30 African countries and 70 worldwide, it is the largest utility gathering of its kind on the continent.

Russell Hughes, African Utility Week event director, says the team is very excited about the co-location of the events: *"we have had a close affiliation with large scale industry as well as utilities and municipalities for a number of years and continue to develop this by supporting their need for renewable energy alternatives and energy efficiency solutions in the face of rising energy costs which is now stretching operational profitability to the limit. With the imminent new ISO 55000 standard it was the next logical step on our journey with the energy intensive user and municipal community to deepen our support and offering at African Utility Week."*

He continues: *"the beauty of this co-location is that 300 new and in the main technically focussed SAAMA Conference delegates will be granted free access to the*

exhibition. The makeup of these delegates will predominantly be Maintenance Engineers, Technical Managers and Asset Planning Managers all of whom have an inherit need to trial the latest technologies and solutions on offer given their hands-on day to day work."

SHARED CHALLENGES SHARED

The SAAMA and African Utility Week conference breakout sessions for coffee, lunch and refreshments will be hosted on the floor of Africa's largest power & water exhibition, where SAAMA have a dedicated pavilion for Asset Management service providers including the likes of Pragma and Aurecon. Says event director Russell Hughes: *"the African Utility Week welcome reception and main networking function will cater for both sets of conference delegates meaning that shared challenges, knowledge and interaction leading to lucrative new business partnership will be possible. This new co-location and our own dedicated Large Power Users conference stream and the co-location of Clean Power Africa ensure solutions will be found for the power and water industry's challenges."*

The SAAMA Conference will take the place of Pragma's Physical Asset Management Thought Leadership conference. wn

EVENT DATES AND LOCATION:

Conference and Exhibition:
13-14 May 2014
Focus day: 12 May 2014
Site visits: 15 May 2014

Location: Cape Town Convention Centre, Cape Town
www.african-utility-week.com

David Brown | Chief Executive Institution of Chemical Engineers (IChemE)

In search of a safer, greener firework

Fireworks are often the centrepiece of major religious, cultural and sporting events, but they can be the cause of air pollution and the fireworks industry is one of the most hazardous to work in. However, research is underway to find a safer and greener firework.

In 2013, there were eight reported accidents in firework factories worldwide including China (3), India (2), Italy, Canada and Vietnam killing at least 48 people and injuring over a hundred. The worst incident in Northern Vietnam's Phú Tho Province killed 26 people and damaged an estimated 1,300 households in a three kilometre blast radius.

Fireworks are also a significant cause of short-term, localised air pollution consisting of sulfur dioxide and fine particles of potentially toxic metallic elements such as potassium, magnesium, barium, copper and aluminium. The particles are small enough to be taken into the lungs and can cause breathing difficulties and aggravate lung disease.

Studies have shown that fireworks displays at festivals like Diwali can increase air pollutants by nearly six times and the Lantern Festival in China by a similar level. Another study in Eastern Spain (Mascletàs) has recorded increases of firework generated fine particle pollutants in excess of 100 times normal levels[1].

However, researchers[2] are beginning to find new ways to reduce the environmental impact of fireworks without affecting their performance, especially the sound they make.

The solution is to reduce the particle size of the chemicals in the firework. Researchers have found that fireworks made from the smaller nanoparticles require a reduced amount of chemicals to achieve the same performance. The result is less pollution.

Tests involving 'cake bombs' or 'repeaters - one of most popular fireworks after 'sparklers' and 'firecrackers' - made from nanoparticles required just a quarter of the powder used in traditionally made fireworks. Other tests, involving firecrackers, have resulted in sulfur dioxide emissions being reduced by 61 %.

David Brown, chief executive of the Institution of Chemical Engineers (IChemE), said: *"Fireworks are enjoyed all across the world, but it is easy to forget the hazardous nature of their production and the impact they can have on the environment, and on health and wellbeing."* This new approach to the manufacture of fireworks using nanoparticles has some important advantages for the environment. But there are risks too for an industry which has a poor record for safety.

"Chemical engineers are well aware of the dangers of using chemicals with very small particle sizes. They are particularly explosive and fireworks made from nanoparticles carry an even greater risk."
"More research is needed to identify safer methods of production in the fireworks industry, as well as higher standards of process safety[3]."

The role of chemical engineers to improve safety and risk in the chemical and process industries is explored in IChemE's latest technical strategy, Chemical Engineering Matters. wn

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2 Azhagurajan, A., Selvakumar, N., *Impact of Nano Particles on Safety and Environment for Fireworks Chemicals, Process Safety and Environment Protection (2014)*

3 Establishing and Maintaining a Safety Culture: www.icheme.org/emsc

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Solar Plant Gemasolar, Torresol Energy ©SENER

3D Printers help energize developing regions around the world

Companies using FDM3D printing technology to create innovative energy solutions that aid those without reliable electricity.

Additive manufacturing using 3D printing technology has the potential to compress supply chains, minimise materials and energy use, and reduce waste, according to the U.S. Department of Energy.

Beyond streamlining production processes, companies are also using 3D printers to bring innovative, low-cost energy solutions to the market itself – including portable solar arrays and bicycle-powered generators.

Organisations such as Peppermint Energy and Designs For Hope have used 3D printing technology from 3D printer manufacturer Stratasys (NASDAQ: SSYS) to help individuals spur economic development, participate in emerging industries, and access educational opportunities in areas of the world that don't have reliable access to electricity.

Worldwide, 1.3 billion people lack access to electricity, according to the International Energy Agency. South Dakota-based Peppermint Energy is determined to change that with its flagship product called the FORTY2. Like a solar plant in a suitcase, the FORTY2 is a portable array that draws enough energy from the sun to provide light, refrigerate medicine or food, or power a laptop. A battery connected to the array stores power for use when the sun is down.

For real-world design testing of the FORTY2, Peppermint Energy's development team used Stratasys3D printing technology to 3D print functional prototypes. At three feet wide and roughly 60 pounds, the FORTY2 required a robust housing strong enough to hold all of its components. The first full-scale prototype, built in a Stratasys Fortus 3D Production System, revealed some of the design considerations that led to the FORTY2's simple operation.

In response to the devastating Haiti earthquake in 2010, the FORTY2 was developed to bring emergency power to the area, and is being used in the rebuilding efforts, as shown in this video.

"It's only when you see it in physical form that you realise the form and function should be the same," said Peppermint Energy co-founder Brian Gramm. Using Stratasys FDM 3D printing technology, the team was able to quickly make modifications, allowing for fast improvements and saving an estimated $250,000 in tooling costs.

For example, a power switch is unnecessary; just opening the FORTY2 turns it on. The Peppermint team also decided to make the whole device even

Ugandan with one of the solar paneled bicycles supplied by "Designs for Hope".

smaller than intended after carrying the first prototype proved awkward.

Another company, Designs For Hope in Alabama, has developed an inexpensive, durable device that enables rotational energy to be harvested and stored from one of the simplest and most readily available forms of transportation in developing regions worldwide, a bicycle. The device holds a generator on a bike, harvests its power and conditions the electricity for storage in a battery.

The development team began making prototypes on a Dimension 3D Printer from Stratasys, but the initial design had some flaws. After the team 3D printed out its first idea and held it next to a bicycle, they realised it wouldn't work, said Chris Bond, founder of Designs for Hope. After many design iterations and prototypes, made possible using the Dimension 3D Printer, the team finalised the device, and has since worked with missionary networks to place units in the field.

One recipient is a Uganda orphanage whose only power comes from a small solar-panel system. Orphanage workers commute seven to ten kilometers daily by bike. Once at work, they charge their cell phones from the solar panels, gobbling up limited power. Bond hopes his device alleviates this problem.

"The beautiful thing is, they're using their bikes anyway," says Bond. *"It's free energy."* wn

Sitting in awe at the Forty2 panel.

IN MEMORIAM

Benjamin Ngulube

The South African Institute of Electrical Engineers recently said farewell to one of our Past Presidents. Not only was Ben Ngulube the 2004 SAIEE President, but he was a well-known community leader and activist.

BY I JANE BUISSON-STREET

1947 - 2013

Benjamin Nowa Balakasa Ngulube was born in Zambia. He started his training in 1965 at Ndola Northern Technical College in Zambia where he completed City and Guilds' Electrical Technician's course Part I and Part II.

From 1970 to 1973 he attended Oxford College of Further Education and graduated with an Ordinary National Diploma (Engineering), thereafter he attended Manchester Polytechnic where he completed his Higher National Diploma (Electrical and Electronic Engineering) in 1977. As if that wasn't enough, Ben then enrolled at Scotland's University of Aberdeen and graduated in 1980 with a BSc (Engineering) Honours.

In 1984 Ben became a member of The Institution of Electrical Engineers (UK). He was admitted as a member of The Engineering Institution of Zambia and was registered as a Chartered Engineer with The Engineering Council (UK) in 1985. Then, while working for Swaziland Electricity Board in 1993, Ben applied to and joined SAIEE as a Senior Member. In 1995 Ben became a Fellow Of the Institution of Electrical Engineers and became a Fellow of SAIEE in 1999. Ben served on several SAIEE committees and sections such as Membership, Technology and Transformation.

Ben's career was also just as interesting; he started as an Assistant Projects Engineer working for Zambia Consolidated Copper Mines (ZCCM), Kitwe, in 1980. He was then promoted to Sectional Engineer, in 1982, of ZCCM's Power Division. In 1986, he joined Zambia Electricity Supply Corporation (ZESCO) as Senior Engineer, Planning and Construction and as Assistant Director of Distribution and Supply until 1992 when he joined Swaziland Electricity Board as Deputy General Manager (Operations).

Ben and his family moved to Nelspruit, South Africa when, in 1995, Ben took up the position of Managing Director of Eastern Transvaal Transformers.

In 1996 the family moved again, this time to Durban, KwaZulu-Natal when Ben was appointed Managing Director of South African Transformers (Pty) Ltd. During 1999 Ben became Chief Consultant to Eskom, MWP. During his time at Eskom Ben quickly established a reputation both as an all round experienced utility engineer and an absolute gentleman. In 2002 he re-joined SA Transformers as Managing Director.

In 2004 he was appointed as a member of the Advisory Committee to the Minister of Science and Technology and served as President of the SAIEE from March 2004 until February 2005. Ben was SAIEE's first black President and during his term of office he brought in a whole new cohort and freshness of spirit. He was always very professional and polite, while having the special gift of being charming as well as influential to the dignitaries and high-ranking persons, during his Presidency.

Ben was a dedicated family man, a leader in his church and was considered a role model by many within the SAIEE and especially in his community of Bredell.

The President Paul van Niekerk and Council extend their sincere condolences to Ben's wife, Enes, her family and all of their friends. wn

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Making permanent savings through Active Energy Efficiency

BY JEAN-JACQUES MARCHAIS,
ENERGY EFFICIENCY STANDARDISATION & REGULATIONS DIRECTOR
SCHNEIDER ELECTRIC

Active Energy Efficiency is defined as effecting permanent change through measurement, monitoring, and control of energy usage. Passive Energy Efficiency is regarded as the installation of countermeasures against thermal losses, the use of low consumption equipment, and so forth. It is vital, but insufficient, to make use of energy-saving equipment and devices such as low-energy lighting. Without proper control, these measures often merely militate against energy losses rather than make a real reduction in energy consumed and in the way it is used.

This article argues strongly that meeting greenhouse gas emissions targets set within the Kyoto Protocol will fail unless Active Energy Efficiency becomes compulsory.

Everything that consumes power – from direct electricity consumption through lighting, heating, and, most significantly, electric motors, but also in HVAC control, boiler control, and so forth – must be addressed actively if sustained gains are to be made. This includes changing the culture and mindsets of groups of individuals, resulting in behavioural shifts at work and at home, but clearly this need is reduced by greater use of technical controls.

That energy efficiency is high on the agenda of most people is now clear. However, understanding of what energy efficiency really involves and how energy saving initiatives can be implemented remains fragmented.

For this reason some companies have defined two approaches to energy efficiency: Passive Energy Efficiency and, more significantly, Active Energy Efficiency.

For many, energy measures revolve around the consideration of thermal issues in the building fabric with remedies such as insulation, glazing, and heat loss countermeasures. For others, it is lighting, albeit often constrained to merely installing low consumption systems. Those with significant heating requirements may see efficient boiler systems as the answer.

All of the above are laudable and necessary, but they are really only passive countermeasures that largely mitigate energy loss rather than the energy deployed.

Active Energy Efficiency can be achieved when energy-saving devices are not only installed, but controlled to use only the energy required. It is this aspect of control that is critical to achieving the maximum efficiency. To illustrate, consider an energy-efficient lamp that is left turned on in an empty room. All that is achieved is that less energy is wasted than would have been using an ordinary lamp!

It is the management of energy use through measurement, monitoring, and control that effects permanent change. Moreover, compared with the costs (and technical skills necessary to avoid risks) of installing thermal solutions, energy control can be implemented at a relatively modest price and with a very rapid payback. This is especially true when measured against escalating energy prices – most energy control solutions can be amortized within a few years.

Another very important factor that should drive Active Energy Efficiency from this point forward is the need to meet ambitious carbon reduction targets set by those governments in alliance with the Kyoto Protocol. In the built environment, for example, it is a fact that unless existing buildings (as well as all new buildings) are made energy efficient, it will simply be impossible to reach the targets set for 2020.

Reducing greenhouse gas emissions was a global target set at the Kyoto Earth Summit in 1997 that was finally ratified by 169 countries in December 2006.

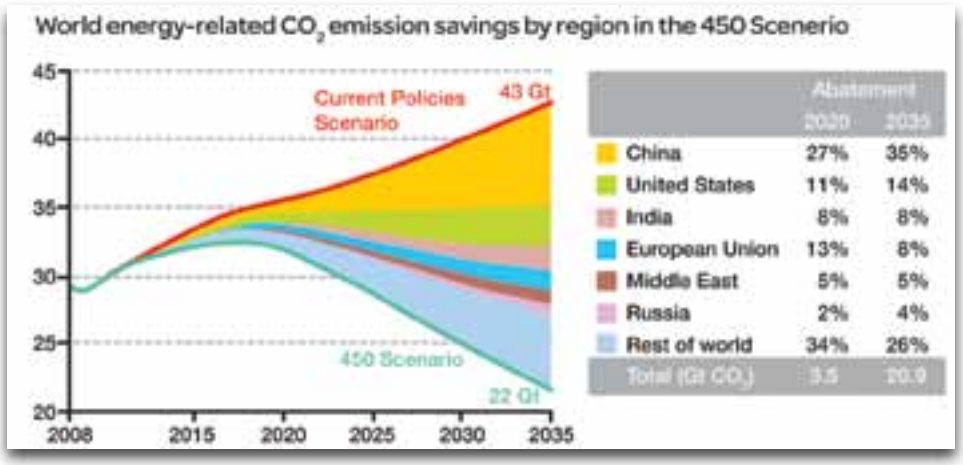
Under the Kyoto Protocol, industrialized countries have agreed to reduce their collective emissions of greenhouse gases by 5,2 per cent by 2012 compared to the year 1990. (Compared to the emissions levels expected by 2012 prior to the Protocol, this limitation represents a 29 per cent cut.) The target in Europe is an 8 per cent reduction overall with a target for CO2 emissions to fall by 20 per cent by 2020.

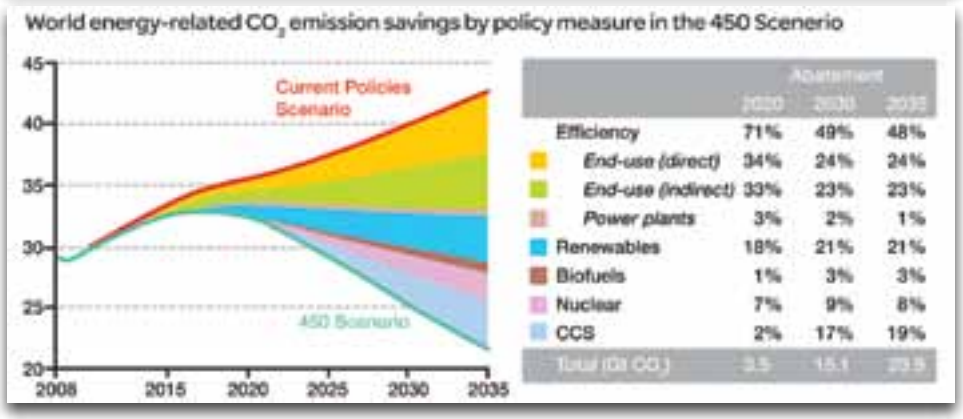
Making permanent savings through Active Energy Efficiency

continues from page 27

This article looks at the approaches to Active Energy Efficiency that can be applied within new and existing buildings – in commerce, industry, private, public, and residential – as well as in manufacturing, industry, and the transportation infrastructure.

Energy is consumed in a broad variety of ways across all sectors of life, from the provision of vital resources such as water, oil, and gas, to the lighting and heating in homes and the power required by industry and commerce. Much of that energy is consumed usefully, but huge amounts are wasted every day. It is the waste or inefficient use of energy that must be addressed.





EUROPEAN UNION EMISSION REDUCTION TARGETS

Kyoto commitment

- Reduction of GHG emissions by 5% over the period 2008 - 2012

March 2007 Spring Council's Commitment:

- Reduce at least 20% of GHG emissions before end of 2020*.
- Reduce at least 80% of EU emissions before end of 2050.

Target of 80-95% reduction of EU CO_2 emissions is part of the 2050 Low Carbon Roadmap

This white paper explores every aspect of the use of electricity and its impact on the environment. With greenhouse gas emissions in sharp focus around the world, the time has come for everyone to take action to economize on energy use by the intelligent application of technology to bring about Active Energy Efficiency.

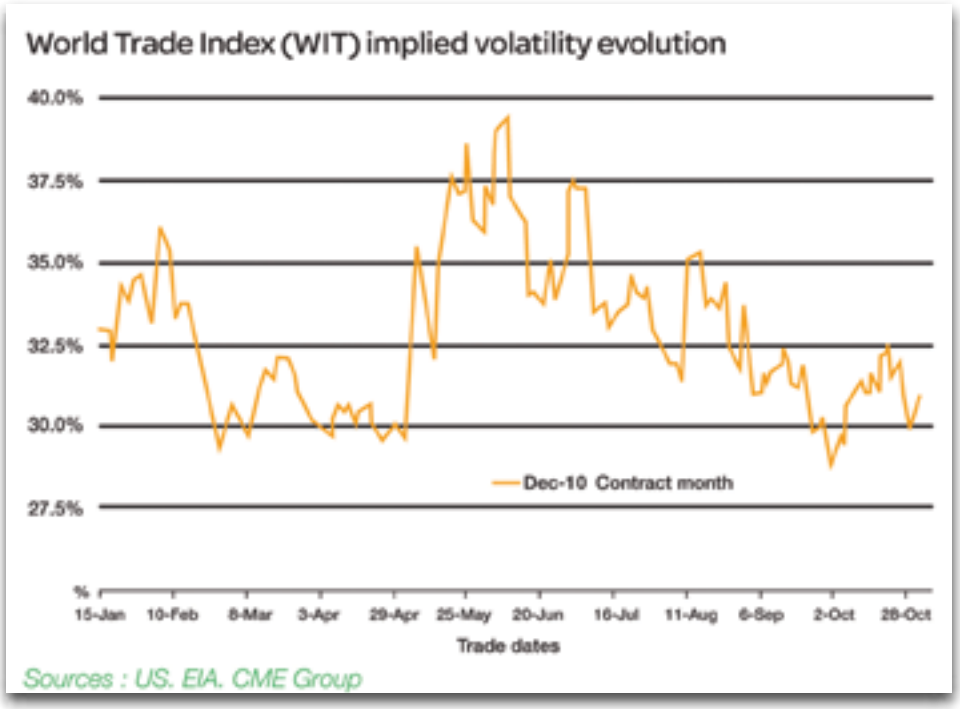
At a European level, the Energy Performance in Buildings Directive (EPBD) has been recasted. This requires all buildings - including in the residential sector - to have energy ratings, similar to those seen on consumer white goods today, and to display these ratings in the building's public areas or, in the case of residential buildings, within the documentation about the property. Some EU governments have stated that they expect an average 25% reduction in energy consumption from the introduction of this bill.

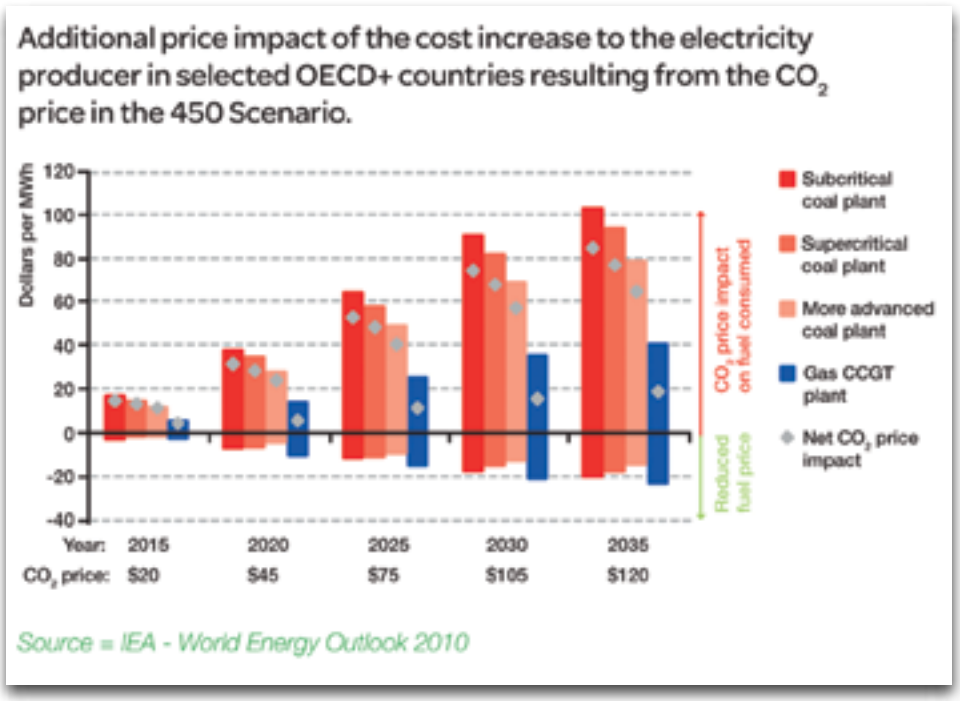
As far-reaching as the legislation is, perhaps the biggest impact on businesses is the steep rise in the cost of energy. This poses a big problem for businesses as their profit margins are squeezed and they are faced with the dilemma of whether to take the cut on their bottom line or to pass the cost increase through to the prices of their products and services, and therefore risk being uncompetitive.

Economies are readily possible in electricity generation and distribution, in its use, and in the way electricity can be used wisely to make efficiencies in the use of other energy. The technology is available to maximize the effectiveness of electricity – including its application in controlling other energy usage – and the way in which it is distributed.

The technology is there to control buildings' energy use in lighting, HVAC, building controls, and distribution. Lighting alone can account for 40 per cent of a typical commercial enterprise's electricity consumption. In offices, the explosion of information technology has also brought huge increases in electrical consumption, as has the preference for air conditioning

** base = 1990 level*





systems. The prolific growth of data centres and new industries has also contributed to a dramatic rise in electrical power usage.

In industry there are proven systems to reduce the power consumed by electric motor systems and to better control the application of electrical power throughout a plant. Two thirds of electrical energy used by industry is used powering motors. In most countries less than 10 per cent of those motors have any kind of control and therefore cannot be slowed down or switched off automatically. Automation and the increasing use of electrical power, as well as inefficient hydraulic and pneumatic systems, have also grown in industrialized regions.

In the home, new products enable lighting and heating controls that enhance living standards while saving electricity. In most countries, every single domestic dwelling (including individual apartments) contributes about 6.5 tonnes of CO_2 each year — or, to put it another way, enough gas to fill six hot-air balloons! Yet, just switching off lights in unoccupied rooms could save 2.2 tonnes per household. Computers, multiple televisions sets, modern electrical appliances, air conditioning, and even outside lighting and powered equipment have seen an exponential growth in consumption. Indeed, in many western economies, domestic electricity consumption outstrips even industrial use. In short, there is no reason not to be able to actively save electricity and other energy, provided there is the understanding of what is at stake, and a desire to do something about it.

World energy demand is projected to rise by 36 per cent by 2035 according to the World Energy Outlook 2010 – with the steepest increase coming from emerging economies, where the use of new electrical equipment is growing and where much of the populations of certain regions currently without electricity supplies will subsequently get them.

It would be hard for most people to imagine a life without electricity, but that does not mean consumption cannot be controlled to deliver Active Energy Efficiency. Indeed,

Making permanent savings through Active Energy Efficiency

continues from page 29

without firm resolve to apply Active Energy Efficiency measures, governments will be compelled to act legislatively in order to stand any chance of meeting Kyoto objectives and targets.

TAKING ACTION ON ENERGY

Everyone can take positive action to conserve energy or use it more wisely. The technology is in place, is relatively inexpensive in most cases to install, and provides rapid payback.

On the premise that it is impossible to manage what cannot be measured, for large energy users – i.e. those other than residential – the Active Energy Efficiency process should start with an assessment of how and where energy is used, and how much of it is consumed.

Fundamental questions that every organization must ask:

- Is your organization equipped for energy efficiency?
- Changes in legislation and regulations are forcing building occupiers to get ready for carbon management. Is your staff trained?
- Can your financial teams find their way through any grants and incentives offered?
- How would you evaluate your success?
- Can you demonstrate this to your customers?
- How much of your energy usage (including electricity, gas, water, oil and steam) can you account for?
- Who uses your energy? Applying effective monitoring and targeting measures to energy consumption increases the success of energy efficiency. However, without the buy-in of the people who are using energy in an organization, savings will be unsustainable.
- Do you monitor awareness levels and attitudes towards Active Energy Efficiency in your company?

Further assessment needed:

- Do you know your requirements? In order to determine where to start, you need to know where you are now. However, taking advice can be a risk, unless the advice is backed with experience and knowledge. Begin with a study of your facilities built around your objectives.
- Do the recommendations show you your route to energy efficiency?
- Do you understand the next steps?
- Who delivers on energy efficiency? You are in the driver's seat, and with the right investments come savings. A poor implementation of an energy efficiency scheme could significantly reduce the potential for savings.
- Do you have the resources to manage the procurement and installation of equipment and ensure you stay on track?

Expert audits of energy consumption, together with recommendations, are a good starting point. There are also some remarkably accurate, inexpensive, and easily installed consumption meters and controls now available that allow wasteful consumption to be better identified and managed.

ISO 50001

In 2011, ISO published its new ISO 50001 standard on Energy Management. This ISO 50001 standard helps establish management systems and processes to improve energy performance, in particular energy efficiency. It defines all requirements for an efficient Energy Management system: how to develop and implement an energy policy, how to set objectives, targets and action plans.

ENERGY AUDITS

Specialist energy consultants can measure and analyse energy consumption across a site or business and identify areas where energy savings can be made.

Remote monitoring of energy consumption Energy managers or outside experts can remotely monitor energy consumption via wired or wireless links to the electrical installations. Based on data collected, these experts make recommendations that can be applied in real time.

TECHNICAL SOLUTIONS

Technical solutions for optimizing electrical installations can include an extensive range of products, equipment, intelligent controllers, and control devices, but these are relatively inexpensive and can reduce the energy consumption of a commercial or industrial facility by typically 20 per cent.

LIGHTING SOLUTIONS

Lighting control solutions that enable optimization of lighting systems in terms of both function (comfort and safety) and energy usage are available. Lighting makes up about half of the energy consumed in commercial buildings.

POWER QUALITY

Two areas frequently overlooked are those of harmonics and power factor. These invisible characteristics of an electrical system can influence consumption, costs, and even life expectancy of equipment. There is European legislation relating

to harmonics and electromagnetic interference, but even without such legislative concerns, it is beholden on businesses to ensure they do not pollute the electricity supply infrastructure with reflected harmonics – in the UK these are measured all the way to the 50th harmonic!

Of even greater direct impact is power factor. Consumers with poor power factor waste electricity and incur additional costs - often without knowing it. Yet power factor correction equipment is easy to specify and install.

A further consideration is that because capacitors lie at the heart of power factor correction equipment, as these devices deteriorate towards their natural half-life, upgrades may be required to maintain the highest possible power factor. Maintenance can therefore be a key to maximizing savings.

This white paper will now examine some specific sectors in which Active Energy Efficiency measures can be applied.

ACTIVE ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT

It is difficult to understand these days why so many buildings are ultimately energy inefficient. There is the possibility for Active Energy Efficiency to be considered at so many points in the design, development, construction, and eventual occupancy of a building. However, the differing vested interests of those involved in a building's design and ultimate use, far from motivating energy management, can sometimes impede it.

For instance, architects may consider energy conservation in terms of the materials and insulation regimes they adopt – that is, Passive Energy Efficiency. It is rare for energy management controls to be considered at the design stage, since this tends to remain within the remit of the building services engineering.

Construction companies are not always concerned with energy issues – their prime focus is in meeting budgets, cutting construction costs, and avoiding punitive penalty clauses. Only if strictly instructed do they readily embrace building systems or energy management during the construction phase.

Building services engineers are the most likely to consider building controls. However, even here there is a stronger imperative to add perceived value in terms of comfort and access control, mood lighting, and sophisticated IT arrangements than in energy control.

Where commercial property is concerned, even the end users sometimes care little for energy conservation or measurement. Often residents on short-term leases, the perception is that although it is they, the occupiers, that foot the energy bill, they are powerless, or too late, to do much about it.

In short, getting proper and effective Active Energy Efficiency controls onto the agenda is made easier when it is integrated with other compelling BMS offers. The same argument can bring about savings in the installation phases by enabling shared use of structured cabling, combined data and power cable pulls, and orchestrated accessory fixes (power control, data outlets, HVAC control, access control, and lighting controls on common networks).

LEGISLATIVE DRIVERS

Many consider the imposition of the Climate Change Levy to have had far less effect on energy conservation than anticipated.

While there has been an increase in the specification of the likes of energy-efficient motor controls in heating and ventilation systems, for example, there is little evidence of wide-scale retrofitting. But, the need to embrace energy management is becoming impelled by new legislative measures.

It is fair to state that for most, it is less the quest to save the planet than to reduce costs that focuses attention. Utility price is the most obvious and volatile driver for energy efficiency, but increasingly environmental legislation and the business benefit of company reputation, of 'being a good corporate citizen', has real value.

The Energy Performance of Buildings Directive (EPBD) will also force many organizations to regularly evaluate and publicly display their energy performance, giving further visibility, impetus, and business value to their energy credentials.

Using energy-efficient equipment (Passive Energy Efficiency) is vital but not the whole story. To be effective, sites have to be monitored, managed, and controlled to achieve consistent performance and prevent deterioration — it is just as important to focus on procurement, operation, management, and maintenance as it is to implement physical plant changes.

Moreover, cost and carbon savings are often achieved quickly and at low or moderate cost. wn

2014: the year of the data economy

Data is the fuel that drives the digital economy. During 2014, we can expect to see more focus than ever on how brands can derive value from data for their own businesses, but in a way that also delivers massive value to their customers.

BY | JACQUES VAN NIEKERK **|** CEO OF ACCELERATION

What we are seeing is a broad transformation from the wasteful, interruptive advertising models of the past to an approach to marketing that is as engaging and empowering for the consumer as it is effective and efficient for the brand. I believe that three interlinked trends in the market are moving us in this direction.

NEW WAYS OF THINKING PRIVACY

Privacy has always been an emotive issue in the world of digital marketing and advertising. Privacy advocates and many consumers have had understandable concerns about just how aggregators, brands and Internet companies use personal information gathered online for marketing purposes.

But we are seeing a subtle shift now as consumers accept that providing personal information to the likes of Google, Facebook and Microsoft is the cost of the many free applications and value added services they use in their day to day lives, such as Web mail and social networking. There is an implicit trade of value here – as a consumer I pay a price in data for using a service provider's free offerings.

That service provider, in turn, will leverage my attention and information for commercial benefit.

As consumers are increasingly familiar with that value exchange principle, their attention is shifting towards getting the best deal possible for the information they are willing to share with the operators of large Web-based communities.

What I expect to see unfold within the next year is a move by consumers to take more control over their own data and manage it as carefully as they would a currency.

They will want transparency from brands and Web communities and services about how their data is used, stored and managed, and they'll want to be more proactive about leveraging their data for incentives, discounts and other rewards.

For that reason, look out for a new class of aggregator to rise in the future in the form of intermediaries that help consumers to manage their data and their relationships with the providers of the digital apps and services they rely on.

EVERYWHERE YOU GO, YOU TAKE YOUR DATA WITH YOU

With mobile technologies such as location-based services, geo-tracking and near-field communications maturing rapidly, they are starting to find a strong role in marketing and advertising.

Now, in addition to being able to ask for and infer demographic, behavioural and psychographic data about consumers, companies can also gather real-time information about where consumers are and what they are doing. In addition to location data from smartphones and tablets, users are also capturing data through wearable computing devices such as the Nike Fuel Band activity and other exercise trackers.

Mobile devices and wearable sensors mean that in addition to location data, users can share information about their current activities, fitness states (heart rate, for example), and more with trusted parties, i.e. Health Insurer. Of course, this raises some serious privacy questions, in addition to the many benefits it can offer for applications in healthcare, emergency response, and commerce. But if the privacy concerns are managed sensitively and intelligently, such data can be used to improve the consumer experience while creating efficiencies for companies.

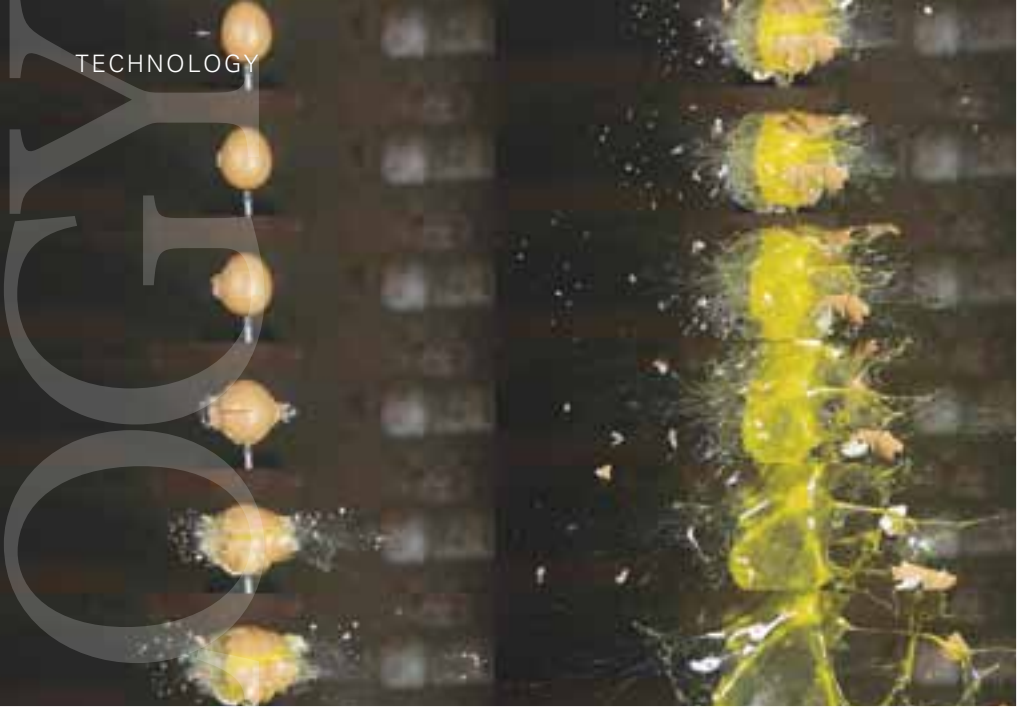
For example, imagine the potential of find-me-deliveries where a Fedex courier can come to your present location to deliver your package from Amazon to you, even if you're not home or in your office. Or imagine receiving a targeted offer via an SMS or mobile app for a television you've expressed interest in when you step into a shopping mall.

ASKING PERMISSION RATHER THAN FORGIVENESS

With new sources of data - mobile technologies, social networking services, ever-more sophisticated tools for gathering and analysing behavioural and demographic data – marketers are suddenly able to engage more with their customers in a personalized manner. But as data about end-users becomes more detailed, organisations need to become ever more responsible and sensitive about how they use and manage customer information. That means permission-based marketing is more important than ever before. Brands, aggregators and online services must outline in detail to customers which information they would like to track, how they plan to use it, and what the benefits to the consumer are. They should secure permission from customers to use their data for marketing and then show that they treat customer data with respect.

Companies that are able to demonstrate that they use consumer data in a way that benefits their customers will be more trusted and competitive than those that are careless or insensitive in the way they leverage customer information. Their customers will be more engaged, more satisfied and more loyal.

Their relationships with their customers will be ones of dialogue and mutual respect, built on an exchange of value that is beneficial for brand and consumer alike. Advertising will be more precise and less wasteful – and customers will welcome it because it is relevant to their needs. wn



As an example of the detail that can be acquired from high-speed cameras, in the pictures, the pellet - seen in the first image just before the egg - is travelling at around 165 meters per second. The entire sequence of pictures from beginning to end took 0.024 seconds. It was filmed at 19 000 pps, with an exposure per picture of 16 microseconds.

High-Speed Photography in Electrical Engineering

Put a high-speed camera in the hands of almost anyone, and the first thing they film is likely to be a explosion. It is fun watching a watermelon or egg explode into thousands of small pieces in slow motion.

BY | DAVID HORNE **|** HORNE TECHNOLOGIES CC

However, the use of high-speed imaging to view and analyse not only explosives but also normal industrial processes and even electrical processes and equipment,such as trip switches, arc formation and even lightning formation, is serious business for engineers and scientists.

High-speed photography is the process of taking pictures of very fast moving events, which are usually too fast for the human eye to see. Two manufacturers of high-speed cameras have as their slogans "When it's too fast to see and too important not to" and "Making time visible", which allows one to appreciate the fact that we cannot see everything as it happens. As fast moving processes get quicker, it has the side effect of errors and faults occurring at much higher speeds too, not to mention the normal processes. High-speed photography allows maintenance engineers, scientists, engineers and designers to quickly and effectively understand the processes and troubleshoot problems, by allowing a large number of crisp informative pictures to be viewed.

The human eye is able to register and process around 25 pictures per second (pps). Faster than this, the eye is not able to notice individual pictures. However many events are occurring so quickly that normal video taken at 25 pps does not give enough information. Furthermore, typically each picture would be exposed (think of old film cameras with shutter speed) often for as long as possible, approximately 1/25th of a second. In fast moving processes however, 1/25th of a second can result in substantial movement during that exposure. The result of this is a blur of motion within each picture. High-speed photography serves to address this and other issues.

In a fast moving process, it is advantageous to have as many pictures per second as possible during an event, a lightning strike, or a trip switch activation. The greater the number of pictures available, the shorter the physical distance travelled during each picture, during that second. This can allow millimetre by millimetre analysis of what is happening. This is in contrast to single shot images or strobe lit sequences from machine vision cameras. These, while often producing useful pictures, all too often do not reveal what is happening between pictures as there is too much movement and time between each picture that is recorded. The net result is often the cause of the problem is missed. The other advantage

of high-speed cameras is that due to the number of pictures (frequently starting at 1000 pps going up to more that 1 million in some models) taken per second, the technology has had to adapt to ensuring that the exposure time per picture is kept to a minimum, yet still producing clear well exposed images. Typically, digital high-speed cameras today have minimum exposure times of 1-2 microseconds. Some can even go down to 300 nanoseconds. The very low exposure times keep that movement during the exposure to a minimum. The short exposure results in crisp, sharp edged images, which give great detail of the processes and movements.

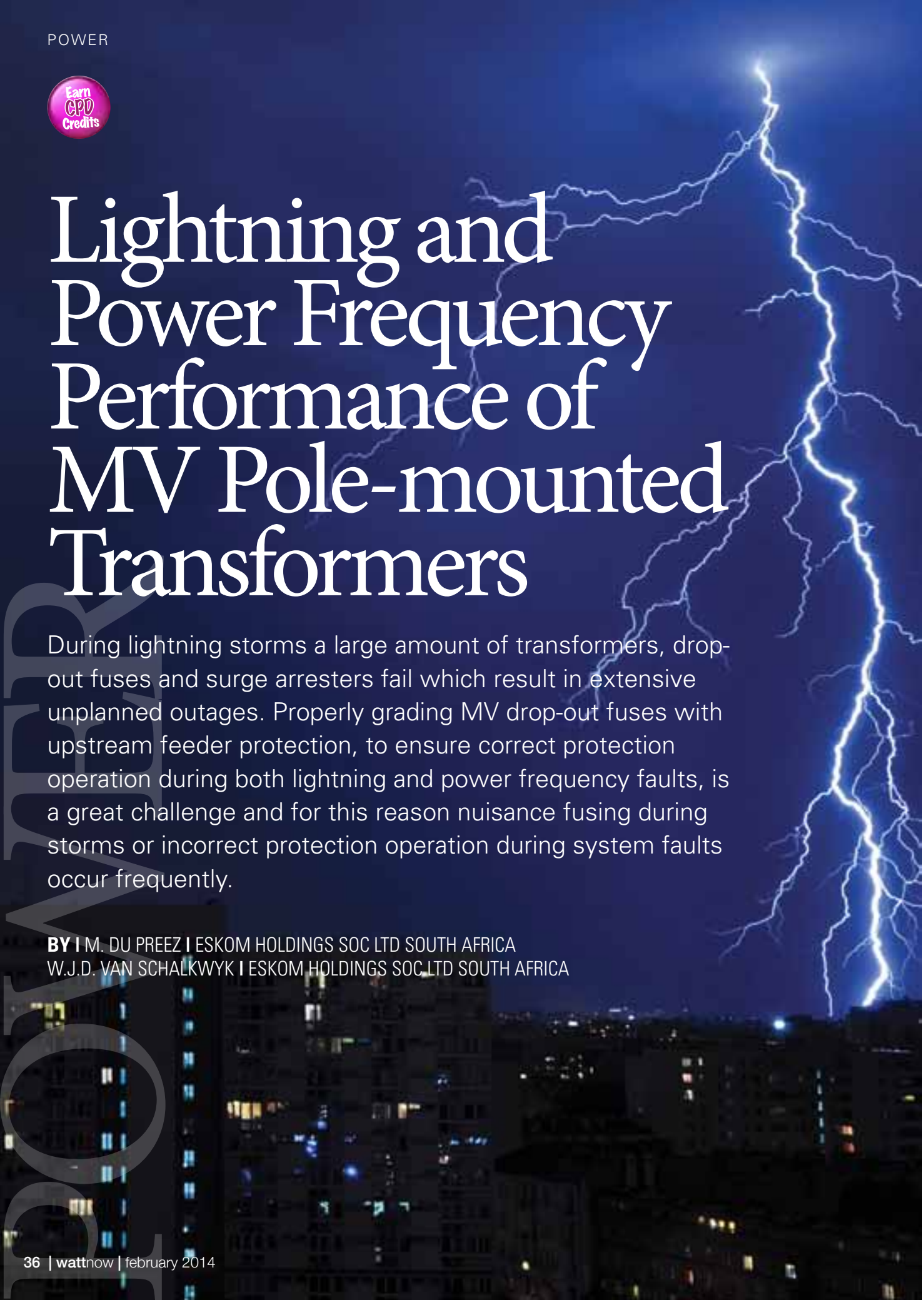
Some examples of applications include the aforementioned trip switches, lightning strokes, or arc formations. In trip switches, not only does the high-speed filming allow for detailed analysis of the mechanical motion of the parts of the switch, but also allow engineers to see the formation of any arcs, where they are starting from, and even gauge a level of intensity. All this happens within a fraction of a second, far too fast to be seen. Filming lightning strokes at high-speed has shown scientists that there are two distinct parts to a lightning stroke. Firstly there is the stepped leader, invisible to the human eye, and travels to the ground in less than a blink. The crackling sound of a thunderous boom that follows a lightning strike is caused by the stepped leader, which is a downward moving negative charge formed at the base of the storm cloud. While the entire overall process of a lighting strike is visible, the parts and formation detail is not.

However, filming a strike at 15 000 pictures per second, with cameras which record some UV detail allow full analysis. Furthermore the extreme sensitivity of the sensors allows the capture of faint details of light as the lightning forms. The standard lens mount on the cameras also allow for fitting of specialised lenses and also image intensifiers, which function to increase the intensity of available light in an optical system to allow use under low light conditions. This aspect makes a perfect combination for engineers looking to better understand things like fuel ignition, arcing and spark formation. The very high speeds achieved by the cameras, coupled with the intensification of extremely low light sources reveal details of the arcs and fuel ignition which would otherwise be impossible to understand. Both arcs and fuel ignition studies are typically laboratory based, and scientists strive to see the very first seconds of an event, as the arc forms, similar to lightning, or as the fuel mixture first ignites. This is the critical time for their understanding, and having a camera that can take 20-30 000 or more individual pictures per second at this time, coupled with having the very faint light intensified to better view it, means that the data required can be captured.

For more information, contact David Horne at david@hornet.cc or visit www.hornet.cc for information and advice around high-speed photography of fast moving process lines. wn

Earn CPD Credits

Lightning and Power Frequency Performance of MV Pole-mounted Transformers



During lightning storms a large amount of transformers, drop-out fuses and surge arresters fail which result in extensive unplanned outages. Properly grading MV drop-out fuses with upstream feeder protection, to ensure correct protection operation during both lightning and power frequency faults, is a great challenge and for this reason nuisance fusing during storms or incorrect protection operation during system faults occur frequently.

BY | M. DU PREEZ | ESKOM HOLDINGS SOC LTD SOUTH AFRICA
W.J.D. VAN SCHALKWYK | ESKOM HOLDINGS SOC LTD SOUTH AFRICA

Numerous MV pole-mounted transformers fail during lightning conditions. Blown surge arresters are not always replaced promptly and the pole-mounted transformer are unprotected against lightning for that time. Changing distribution surge arresters or pole-mounted transformers poses safety risks to operators where they are required to work at heights and in close proximity to high voltages.

An MV pole-mounted transformer installation consists of a combination of fuses, surge arresters and a transformer. In a standard installation the surge arresters protect the transformer against lightning and the fuses open and isolate a faulty transformer installation from the network.

The Lightning Proof Fuse (LPF) was developed, constructed, tested and implemented at several test sites. The installation of LPFs eliminates nuisance fusing on MV feeders caused by lightning and still allows sufficient protection grading. A detailed study was done to determine the optimum placement and configuration of the equipment at a transformer installation to ensure an improvement in performance.

A strong emphasis was placed on the use of technology to enforce operator discipline. A Combi Unit, consisting of a drop-out fuse and a surge arrester, was developed to resolve the lightning surge challenges around MV pole-mounted transformers installations. The unit also addresses and resolves the lack of discipline of operational staff. The Combi Unit was constructed in such a way that both the MV pole-mounted transformer and drop-out fuses are always protected against lightning by the surge arresters. The Combi Unit also solves the challenge of grading fuses for both lightning and power frequency faults.

Due to the configuration and operation of the Combi Unit all operating is done from ground level with an insulated operating stick eliminating the risks of falling from heights and inadvertent electrical contact. The installation of Combi Units at problematic pole-mounted transformer installations does not only improve network performance and the safety of operating staff, but also bring about operational cost saving.

KEYWORDS

Combi Unit, lightning, drop-out surge arrester, drop-out expulsion fuse, pole-mounted transformer.

INTRODUCTION

During lightning storms a large amount of transformers, drop-out fuses and surge arresters fail which result in extensive unplanned outages. It is a great challenge to properly grade MV drop-out fuses with upstream feeder protection to ensure correct protection operation during lightning and power frequency faults and for this reason nuisance fusing during storms or incorrect protection operation during system faults occur frequently. Numerous MV pole-mounted transformers fail during lightning conditions.

Blown surge arresters are not always replaced promptly and the pole-mounted transformer will be unprotected from lighting for that time. Changing distribution surge arresters or pole-mounted transformers poses safety risks to operators where they are require to work at heights and in close proximity to high voltages.

A Lightning Proof Fuse (LPF) was developed to reduce fuse failures due to lightning. A Combi Unit was developed to resolve the lightning surge challenges around MV pole-mounted transformers installations. The Combi Unit ensures that both MV the pole-mounted transformer and drop-out fuses are always protected against lightning and solves the challenge of grading fuses for both lightning and power frequency faults. All operating is done from ground level, eliminating the risks of falling from heights and inadvertent electrical contact. The installation of Combi Units at lightning problematic pole-mounted transformer installations improves network performance and greatly reduces operational costs.

Lightning and Power Frequency Performance

continues from page 37

EQUIPMENT FAILURES

Annually many thousands of MV drop-out expulsion fuses and MV pole-mounted transformers in the old North Western Region are lost particularly during lightning conditions.

Table I gives an indication of the annual amount of failures. If the labour, material and transport cost to replace a pole-mounted transformer are taken into account (estimated average of R40 000), it is not difficult to see the large financial implications as well as the negative impact on customer satisfaction.

Whereas the average once off installation cost of a Combi unit 3 phase set is R28 000 and the installation cost of a Lighting Proof Fuses 3 phase set is R3 000.

FUSE OPERATIONS AT LIGHTNING FREQUENCIES

It is a challenge to avoid nuisance fusing on rural feeders caused by lightning impulses while also making proper 50Hz protection grading possible. In order to minimize nuisance fusing, Field Services inserted 20A fuses in many pole mount installations. However when a fuse is rated too high it causes the Sensitive Earth Fault (SEF) protection of the upstream breaker to operate before the fuse blows, resulting in a line outage.

In some cases where 20 A fuses were installed, only a single fuse operated (the one on the faulted phase). The other two fuses fed into the fault through the transformer windings, tripping the breaker on SEF before the fuses blew. It is evident from Table II below that when grading fuses higher (to limit nuisance fusing due to lightning) results in more breaker operations.

Average failures per year	Total amount	Due to lightning
MV Fuses	16 502	12 789
MV/LV Pole Mounted Transformers	1212	939

Table 1 - Average MV equipment failures per year.

Area	Fuse sizes used	Number of breaker T&L/O operations	Number of transformer faults
1	20 A	11	11
2	20A	3	3
3	20A	8	8
4	8A	1	18
5	8 & 20 A	12	61
6	20 & 8 A	28	65

Table 2 - Amount of breaker operations that occurred when transformers with different fuse ratings failed.

It is relatively easy to grade fuses to operate correctly for power frequency faults, however fuses are also sensitive for high lightning currents. Normally lightning consists of a first stroke followed by several subsequent strokes as it can be seen in Figure 1. The illustration shows that lightning consists of three major components namely an amplitude component, the rate at which the current rises and an energy component that exists due to the DC current found within a lightning flash. The total surface area underneath the wave form represents the energy that needs to be dissipated by the fuse and surge arresters on the line.

The combination of all of the above given factors contributes to the reason why MV drop-out expulsion fuses blow for lightning impulses. In practice this means that since lightning flashes are of very short duration and consists of high peak values with the possibility of a DC component, the maximum RMS current handling capability of the fuse is reached almost instantaneously, resulting in a blown fuse (this is mainly due to the energy dissipation in the fuse). However, this problem can be avoided by the installation of a Lightning Proof Fuse where passive components are introduced into the circuit or by the installation of a Combi Unit where the fuse is protected against lightning by the surge arrester.

LIGHTNING PROOF FUSE (LPF)

Circuit Configuration and Parameters

By introducing a spark gap in parallel with a MV drop-out expulsion fuse (which is in

series with an inductor), with the inductor acting as a low impedance path at 50 Hz and as a high impedance device at lightning frequencies it was found that the arising problems due to lightning frequencies can be avoided with great success. Figure 2 illustrates the arrangement of the circuit components found in the fuse and figure 3 shows the operation of the Lightning Proof Fuse.

During normal 50 Hz operation the inductor must act as a low impedance path with low over all energy dissipation. The impedance of the inductor at power frequency is given by: $X = 2 \bullet \pi \bullet f \bullet L_c$

Where:
X_L = Power frequency impedance.
f = Power frequency.
L_c = Inductance.

This will ensure that the fuse will work correctly for normal over current situations. However, from equation 1 it can be deduced that the impedance of the circuit will be high for lightning frequencies resulting in the current attempting to find an alternative conducting path. The maximum volt drop across the inductor is 75 kV at lightning frequencies and 0.15 V (load current = 5 A) at 50 Hz. The power frequency will pass through the inductor and the fuse while the lightning impulses will flash over the spark gap, bypassing the fuse element.

Impulse Test Results

All current impulse tests have been performed at NETFA using 8/20 µs current impulses. The 8/20 µs current impulse test was done to determine the breakdown currents of the 3 A and 5 A fuses. The 3 A fuse lasted for 5 tests in succession (without blowing on the last test) with current varying from 20 kA to 70 kA.

Advantages

- The advantage of the Lightning Proof Fuse is that it eliminates nuisance fusing on MV feeders caused by lightning and still allows sufficient protection grading.

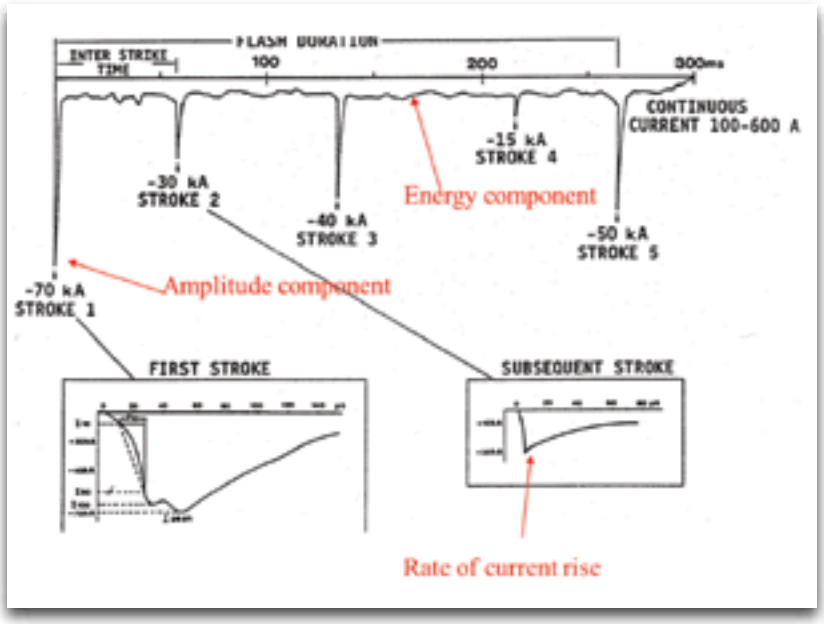


Figure 1: Three basic components found in a lightning flash [1]

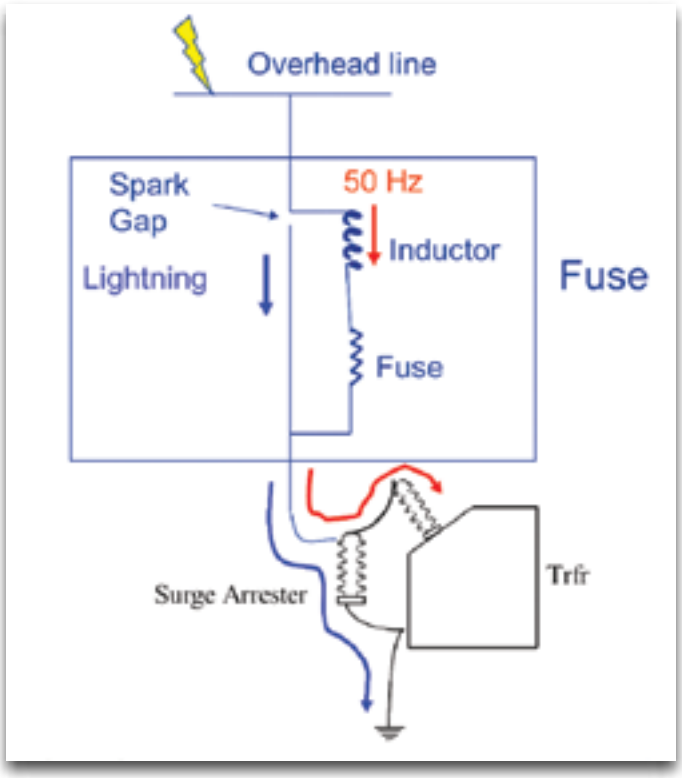


Figure 2: Circuit configuraton using a Lightning Proof Fuse.

Lightning and Power Frequency Performance

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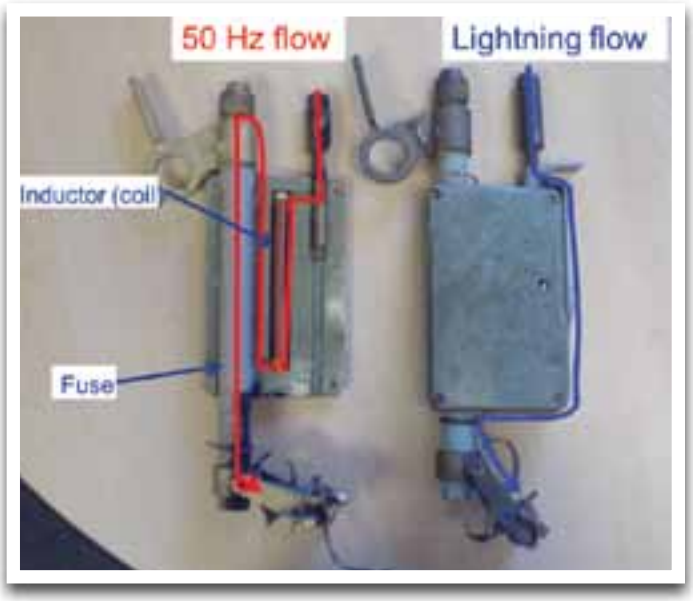

Figure 3: Illustration of the Lightning Proof Fuse Operation

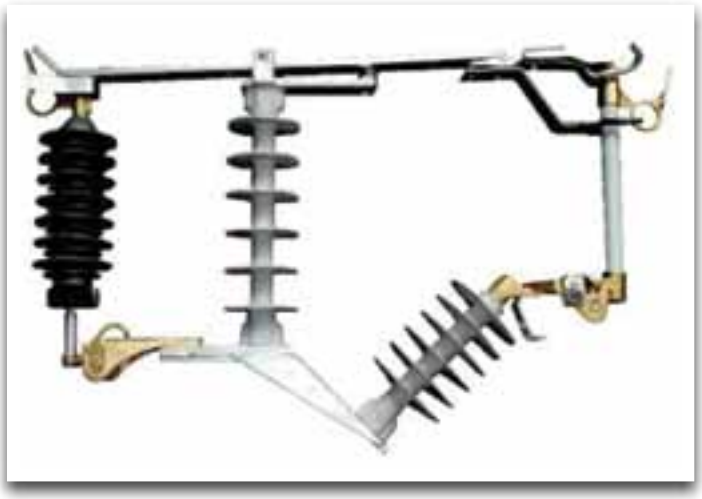

Figure 4: Combi unit consisting of a drop-out expulsion fuse and drop-out surge arrester.

- Standard Eskom fuses are used and the LPF fits in a standard fuse holder.
- The LPF saves overtime, man hours and transport costs.
- It minimizes supply loss, voltages unbalance and subsequent equipment damage (pumps, electronics, and fridges) to customers.

Disadvantages

- The disadvantage of the LPF is that it does not protect the pole-mounted transformer from lightning.
- Secondly, whenever the fuse blows for a 50 Hz fault at the transformer, a standing back flash-over will occur across the spark gap while the fuse is falling open. The arc will be cleared by the upstream breaker. The breaker will auto reclose in about 3s and the faulty transformer is isolated from the network.
- The LPF is more costly than a standard fuse.
- The LPF cannot be used as a line fuse (coil heats up for load current greater than 15 A).

THE COMBI UNIT

The Combi Unit consists of a post insulator in the middle with a drop-out type surge arrester on the one side and a drop-out expulsion fuse on the other side, see Figure 4.

Development and Operation of the Combi unit

The Combi Unit was primarily developed to minimize the MV drop-out expulsion fuse and MV pole- mounted transformer failures during lightning activities.

In the standard configuration, the MV fuses are exposed to lightning as it is installed line side of the surge arrester. The surge arrester only protecting the MV transformer as illustrated in Figure 5 (A) Therefore an alternative configuration was proposed where the surge arrester is connected across the fuse and transformer to provide lightning protection to both, as can be seen in Figure 5 (B).

The Combi Unit was developed to implement the proposed configuration. Should the fuse blow, only the fuse will fall open while the arrester stays closed. In the case where the surge arrester GLD (ground lead disconnect) operates, both the fuse holder (fuse element still healthy) and the surge arrester fall open. Figure 6 illustrates the operation of the Combi unit.

Compliance to Distribution Standard

The Combi Unit complies with the DSP 34-1962: Distribution Specification – Part 4: Specification for a combined cut-out fuse and drop-out surge arrester unit.

Combi unit Calculations

It can be seen in Figure 7 that the potential difference (voltage drop) across the transformer in the standard configuration will be 122kV

when lightning (34kA 1.2/50µs) terminates on top of the transformer pole. When Combi Units are installed 1.5m above the transformer, the surge arresters are move further and the potential difference across the transformer increases to 137kV, which is still well below the transformer BIL of 150kV, see Figure 8.

When lightning terminates on the line close to the installation, the voltage across the transformer in the Combi configuration will be at most 10kV more than for the standard configuration.

Case study

A transformer where a Combi Unit set was installed failed on 4 Mar 2011 at 19:07. FALLS (Fault Analysis and Lightning Location System) was used to locate the lighting strokes that terminated near the transformer installation and if was found that a 14 kA subsequent lighting stroke (indicated in the Figure 9 by a red filled ellipse) was responsible for the transformer failure.

After site inspection it was found that the Combi Unit was mounted about 3.5m above the transformer tank and it resulted in a potential difference (calculated at 206kV) between the transformer windings and tank (greater than the transformer's 150kV BIL) when the lightning stroke terminated at the installation.

Operating and safety

The only challenge so far was the weight of the surge arrester when a petite operator needs to pick it up from ground level with a fully extended link stick. However, should the operator uses the correct method (use the telescopic function of the link stick) the installation of the drop out arrester should not be more challenging than the installation of a MV drop-out expulsion fuse.

To minimize the risk of falling objects, a tool was developed to replace drop-out surge arresters and drop-out fuses from ground level using a link stick. Figure 10 shows the insertion tool.

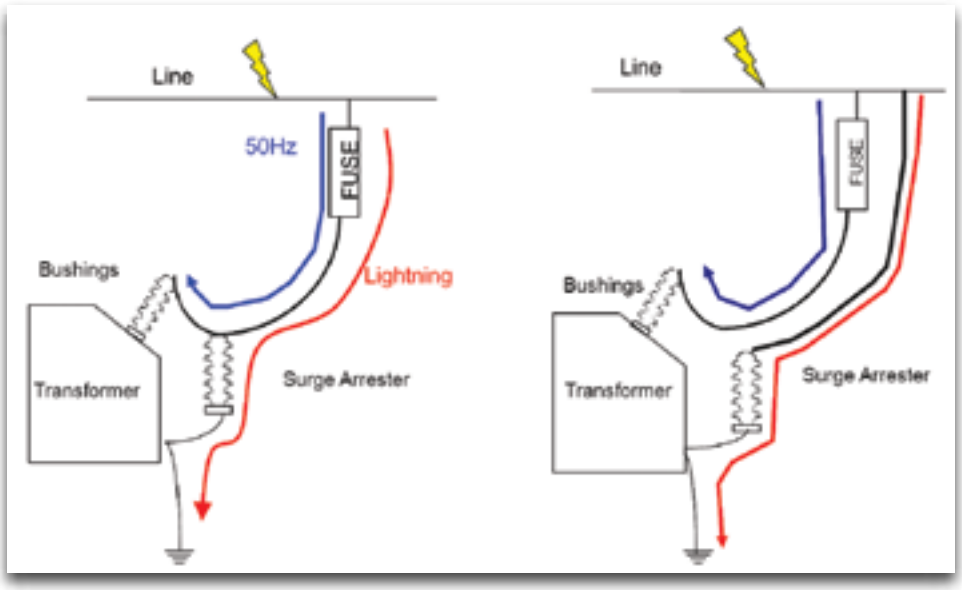

Figure 5 (A) Standard pole mounted transformer configuration and (B) Combi unit configuration

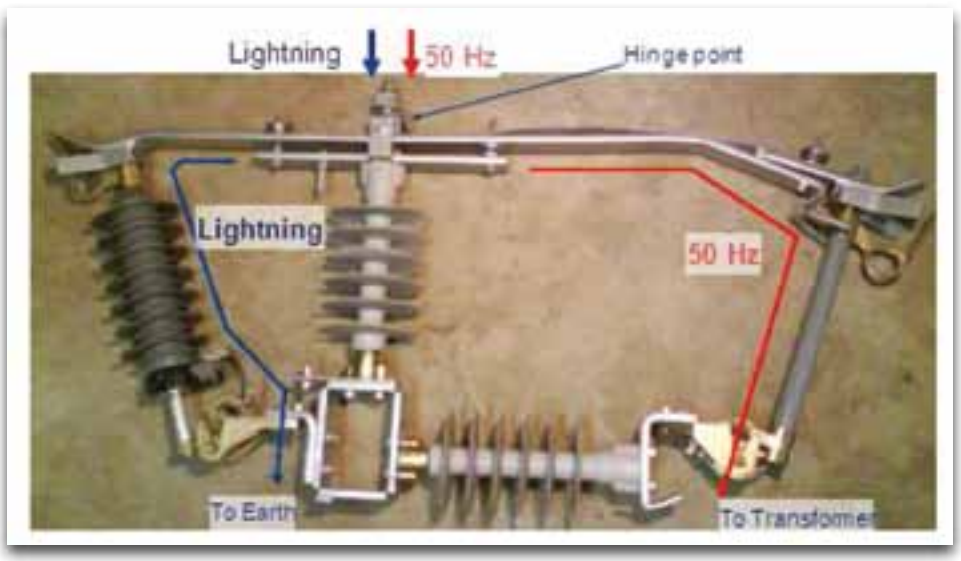

Figure 6: Illustration of the operation of the Combi unit

Advantages

Using the Combi Unit, the following advantages can be expected:

- Replacing drop-out fuses and surge arresters from ground level.
  – No slip and fall from step ladder
  – No risk of electric contact
- Both the transformer and fuses are protected against lightning.

Lightning and Power Frequency Performance

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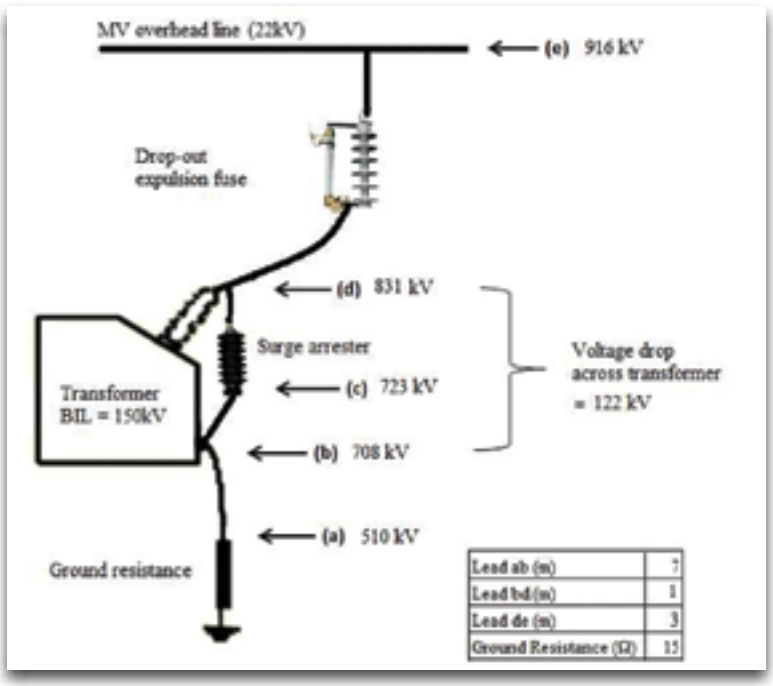

Figure 7: Voltage drop calculations of standard configuration

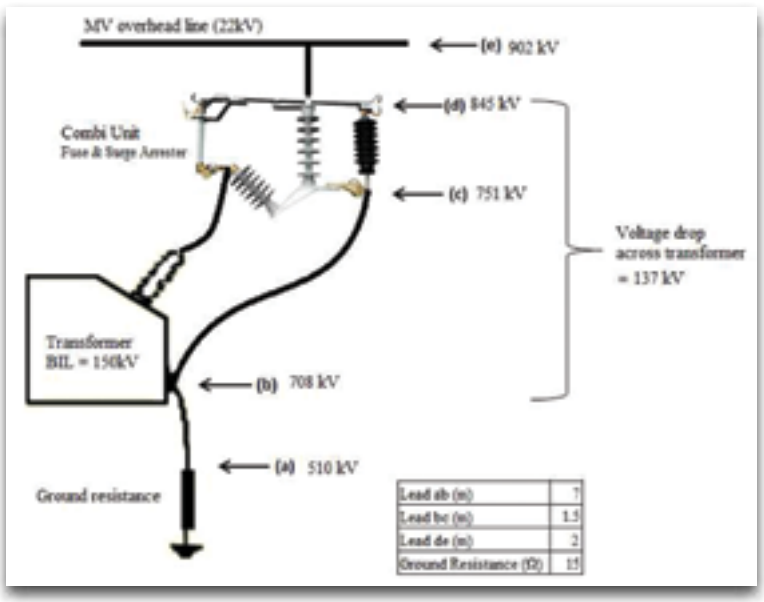

Figure 8: Voltage drop calculations of Combi configuration

- No nuisance fusing occurs due to lightning.
- A maximum size of 15A fuses are used in the Combi Units to ensure correct protection grading.
- The transformer is always protected against lightning.
- A faulty fuse or surge arrester will fall open and is easily noticeable.
- The Combi Unit can be used as an isolation point.
- Standard Eskom fuse and fuse holder is used.
- The Combi Unit surge arrester has the same dimension as a drop-out line arrester.
- No outage booking is necessary for the replacement of a fuse or surge arrester.
- The replacement time of a Combi Unit surge arrester is much faster than replacing in a surge arrester in the standard installation.

Disadvantages

- Cost of installation: it costs more to install a Combi Unit than a normal fuse and surge arrester arrangement.
- Should the surge arrester fail, the customer is without supply. A new surge arrester should therefore be installed as soon as possible.
- In the Combi configuration the surge arrester is further away from the transformer, resulting in a 137kV impulse level instead of a 122kV potential difference across the transformer. However the transformer should be insulated at 150kV.

Performance of the Combi Unit

A total of 1064 pole mount installation were fitted with Combi Units over the past 6 years. At all these installations at least one transformer failure occurred annually. After the installation of Combi Units only 6 transformers were recorded to have failed in the last 6 years, instead of an expected 3000 transformer failures in 6 years' time. Transformer installations where Combi Units are installed can be seen in Figure 11.

Lessons learned

The 6 installations where the transformer failures occurred were visited and the findings are as follow:

- Three installations had neither neutral arresters nor any connection between the 400V neutral and earth, leaving the transformer without proper lightning protection.
- One installation was hit by a lightning flash consisting of

18 strokes. All the surge arresters failed but in the process the transformer was damaged.

- One transformer failed shortly after installation with no lightning in the vicinity – failure not lightning related.
- Incorrect installation – Combi Unit mounted too high above transformer tank. The earth lead was 3.5 m instead of 1 m as indicated in the specification [2].

Recommendations based on Findings

Combi Units should be installed at lightning problematic pole-mounted transformer installations to minimize equipment failures (fuses and transformers), improve network performance and bring about large operational cost saving. Proper protection grading is achieved and nuisance fusing is eliminated.

Safety: All operating is done from ground level making operating safer and easier. It can be considered to install Combi units at all transformer installations due to the safety features. wn

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[2] Specification for a combined cut-out fuse and drop-out surge arrester unit, Distribution Specification DSP 34-1962 Part 4, Mar. 2009.

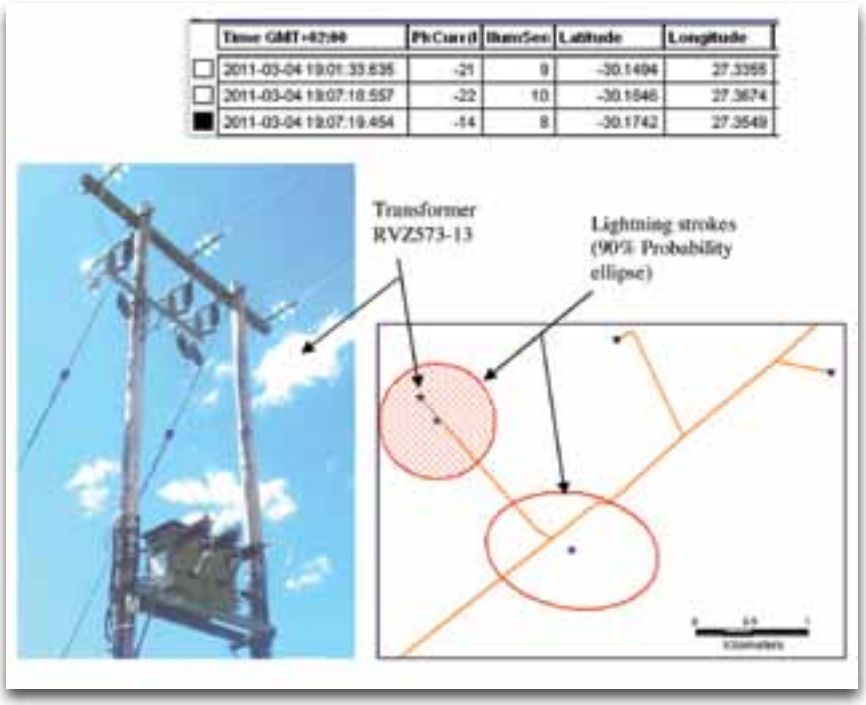


Figure 9: Transformer installation and lightning study results

Figure 10: The insertion tool to replace drop out surge arresters & fuses

SINGLE POLE ARRANGEMENT DOUBLE POLE ARRANGEMENT

Figure 11: Combi unit installations

In Memoriam: Allan Meyer

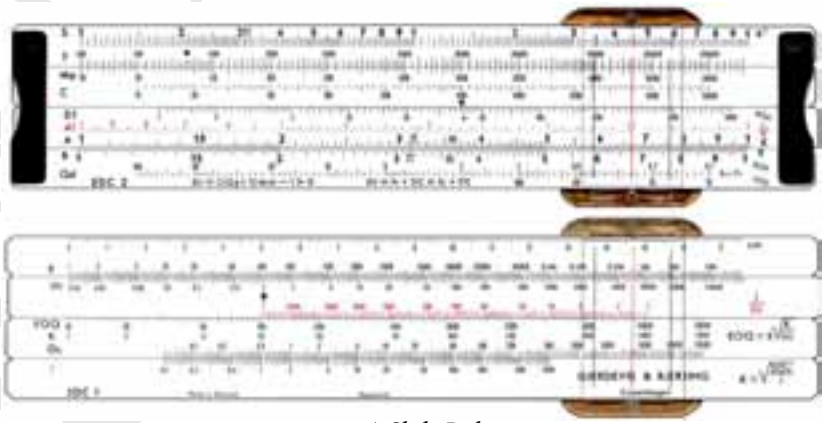
A.S. MEYER
1931 - 2013

I was saddened by seeing the Obituary to Allan in the January issue as I was unaware that he had passed away. Allan was my first real "Boss" and left a deep and long-lasting impression on me.

BY | BEV LAWRENCE **|** FSAIEE

My engineering practical training was experienced at the FEC/GEC works at Knights, and after completion I applied for a position in the Motor Design Department, which Allan headed. He accepted my application and I was duly appointed as Small Motor engineer, sharing an office with Giovanni (John) Romano, the Traction Motor Engineer, whose patience and kind helpfulness was of huge value to me to get in into the job successfully. There were two other engineers - Derek Heard (large motors) and Wendy Stallard.

As part of my induction I was taught to design motors by hand, using the appropriate company design rules, formulas, and a slide rule (electronic calculators had not been invented at the time).



A Slide Rule

Through his keen technical insight Allan had learnt how to use the "new" super-computers to write a motor design program, which sped up the design process considerably. For this he was awarded his M.Sc. by the University of Witwatersrand.

As such computers were much too expensive to buy, we used an IBM 360 installed at the IBM head office. At the time it was the largest and fastest computer available, with dozens of cabinets, hard-drives, card and tape readers, and consoles. They were all mounted on a suspended floor with temperature and humidity controlled air-conditioning - but it was slower with smaller storage than the modern PC!

The IBM 360 Computer

A typical "small" motor

The program instructions and input data were read by the computer's punched card reader. We would write them out on a Data Capture sheet, which went to the punched card section. Here a group of about seven ladies encoded the data onto punched cards using high-speed punching machines.

The continuous high sound level of several card punches running continuously was unbearable, and I'm sure they suffered severe hearing loss. The cards were then taken to the IBM Bureau in central Johannesburg, and run overnight. The printouts and cards were then collected the next day.

Each character of the data was represented on the card by two holes punched into it, and a series of them on each card represented a line of data.

The design program was written in the very powerful technical language Fortran. As computers operate on perfect logic, the Syntax rules were very precise, and each line of code had to be 100.0000% perfect, or it would be rejected, and returned for the programmer to correct. So writing a program that ran correctly was one ARDUOUS job, requiring more patience than Job! It was not necessary for users of Allan's design program to know Fortran, but during my practical training I took advantage of the opportunity to learn it. I taught myself from the manual, and used it to write a Transformer design program while training in that department. It was never completed and used, but I learnt a lot in the process. Perhaps some of that learning helps me today when working on my PC?!

To get back to Allan - he had a very keen brain technically, with superb reasoning skills. His ability to reason his way through technical problems logically and clearly taught me a great deal, which I have been able to apply throughout my career. The

In Memoriam: Allan Meyer

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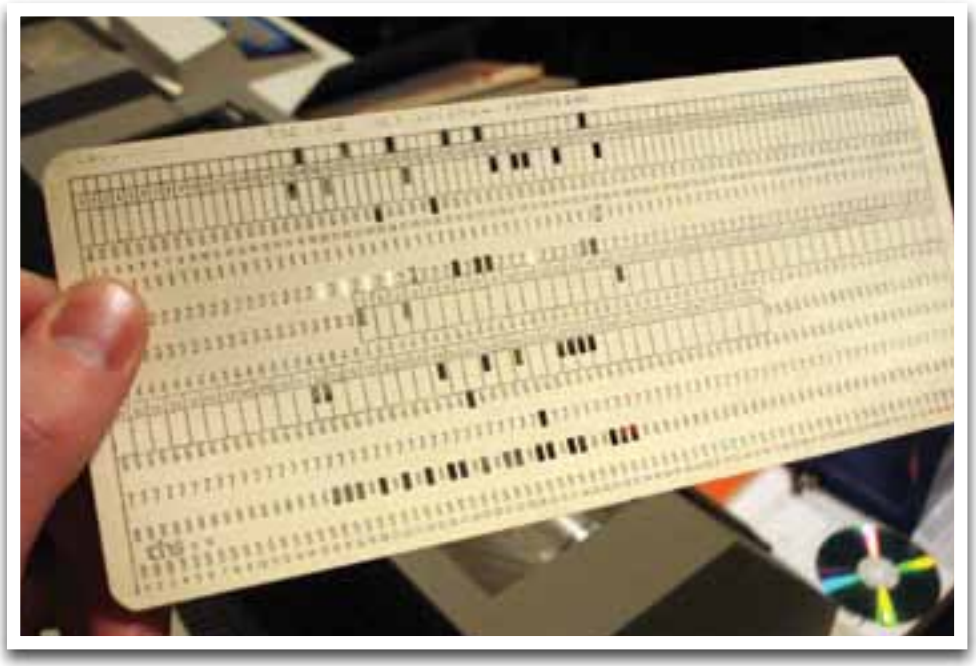


Computer punched cards

basic design of the smaller motors was fairly straightforward. But the requirement for easy and quick manufacture, especially in the insertion of the copper coils by the armature winders, was not adequately appreciated by the designers, including myself. With present hindsight I would have liked to have produced more Winder-friendly designs.

One aspect I felt very deficient with was the practical side of engineering. I didn't even know how you would operate a motor in a plant, and I kept asking Allan how I could gain some exposure to that side. So he invited me to accompany him to the under-construction Camden power station near Ermelo – at 1 600MW the largest power station in the Southern hemisphere!

GEC had supplied the large motors for the boiler plant, and he had to attend to some complaints received. We set off one wintry morning in his trusty beige Valiant – imagine my disappointment when we ran into a snow blizzard and he had to turn back! Anyway some time later we did make it into the office of the Electrical Assistant Resident Engineer (Arthur Lutz). I was shocked to hear the long tale of woes the GEC motors were evidencing once they were placed into service, and I guess Allan had to implement quite a major service effort to rectify the problems.

I also gained a bit of insight into non-technical aspects of an engineer's job. Interpersonal skills were somewhat lacking and the engineers seemed to regard everybody else as inferior. But whilst learning the practical side of the factory I was able to develop relationships with many of the workers, and found that they were prepared to teach me many aspects of their job. I came to realize that they too were people, and tried to treat them with dignity and respect. This served me well once qualified, as I found them very co-operative and helpful in solving the various problems that arose.

Allan was Jewish, and I was intrigued to find him listening to regular news updates on some fighting going on in Israel. He was getting so excited, and jumping up and down with enthusiasm. So he explained to me about the state of Palestine and the Jewish occupation in 1948, and the creation of the state of Israel when the United Nations voted in favour of its establishment. And then about the Six-day war with Egypt, Syria and Jordan, which was happening as he spoke. And finally of its amazing end, and especially the significance of the Jews reaching the Western (Wailing) wall. I thus obtained my first insight into the Middle East conflict from him, which has remained of interest to me ever since..

Another interesting aspect was company politics. The General Manager, Financial Manager and Company Secretary had offices in the executive wing, behind a large and imposing door in the corridor, virtually sealing them off from the organization. Ordinary mortals would then be summoned into the presence of the "Great Ones"! No production or technical manager was based there, so the organization was obviously led by non-technical bosses. This seems to me an amazing way to run a highly technical engineering firm!? But imagine my surprise when one day the Financial manager was escorted from his office out of the building by the Security staff AT GUN-POINT! Alan was denied parking inside the factory (not deemed senior enough, I guess). So he parked in the visitor's parking right at the office front door!

Related to this was the fact that our main opposition in South Africa was English Electric, with their factory a few km down the road. One day we were somewhat

surprised when Allan announced that the senior engineer, Derek, had resigned. We learnt that he was leaving to join the opposition company, and presumed that his motive was to escape the interminable arguments he seemed to have with Allan. But imagine our HUGE surprise when a few weeks later the English Electric main company in the UK bought out GEC. So Derek and Allan suddenly found out that they were working together again!

This frightened me greatly, and so I set about finding a way out of a career with only a single possible employer. I noticed that a lot of companies advertised for Certificated Engineers to comply with the (then) Factories Act. So I saw a possible means of escape if I could obtain my Government Certificate of Competency for Engineers ("Govt. Ticket").

I applied to the Department of Labour to write the exams, but was turned down because my design experience was unacceptable. What was required was two years experience in the Operation of (large) Machinery. So I set about finding such experience – not an easy matter for a qualified engineer.

Eventually by good fortune I found myself in Eskom's offices in Braamfontein being interviewed, and a few days later a letter offering me a position. This was as a Shift Engineer (read supervisor) at the new Camden power station, and I think Allan was surprised, and disappointed, that I should leave to pursue such a "lowly" job opportunity. (Incidentally, on shift there I then found myself operating the motors GEC had supplied, and I discovered they were operating very successfully with few problems).

During the next two years I learnt a great deal about operating a power station, and was accepted as a GCC candidate. To my amazement I passed all 6 subjects at first attempt. I was immediately summoned by the Generation Manager, and offered a very senior position as Operating Manager at the brand new Hendrina power station. But that, and the fabulous career I enjoyed with Eskom over the next 30 years is a story for another day.

Let me end by saying that over the last few years I had several conversations with Allan by phone. He was so interesting to chat to, and very interested in my career and what I had been able to achieve.

In November I was in Jhb presenting a course at SAIEE training center in Observatory. I obtained his phone number from the receptionist, and phoned him to arrange to visit him after classes were finished for the day. I did not get an answer to my call, and never got to visit him.

Now I know why!

Farewell Allan – well done, and thank you for your big input into my development.

Tailor-made solutions to meet business needs

Voltage Optimisation (VO) is an intelligent technology proven to substantially lower energy costs and reduce CO_2 emissions, as well as protect vital business operations and expensive electrical equipment from harmful transients.

Powerstar, market leader in the research and development of this revolutionary technology, has created a range of products to suit every business; assisting individual companies to save significantly on their energy costs, boost their green credentials and help contribute to South Africa's international commitments to reduce greenhouse gas emissions.

Electricity is supplied at between 220V and 230V in most places in South Africa. However, in some areas, such as Grahamstown, Port Elizabeth and King William's Town, the electricity is supplied at a voltage rate as high as 250V. This wide variation in supply can lead to energy wastage and conditions detrimental to electrical equipment, which is in the main designed to operate at 220V. A VO system will ensure a constant voltage is supplied to a business with levels set at a reduced rate, to suit the specific requirements of the particular site.

There are two main types of LV voltage optimisation: fixed and variable. For a building that has a higher than required, but stable voltage supply, a fixed voltage optimisation system, such as Powerstar, is required. For a building with an unstable power supply a variable, or electronic-dynamic, VO system is needed. A variable system is also recommended for sites that operate high night loading or process secure and critical data. A variable VO system, such as Powerstar MAX, is designed to automatically manage the peaks and troughs inherent in an unstable power supply to ensure voltage is delivered at a constant level, through intelligent electronic controls. This also helps to protect the site against damaging transients, also

Tailor-made solutions to meet business needs

continues from page 49

known as power spikes, of up to 25,000V, which if unchecked can instantly destroy electrical equipment.

An alternative to the LV side voltage optimisation systems is HV optimisation, available in the form of Powerstar HV MAX, a unique solution offering a high voltage, electronic variable, voltage optimisation system that combines a super low loss amorphous core transformer with an electronic variable (Powerstar MAX) voltage optimisation system

ENERGY SAVINGS AND REDUCED CARBON EMISSIONS

Voltage optimisation reduces onsite energy consumption which in turn leads to significant savings in electricity costs and lower carbon emissions.

Additional benefits of installing a voltage optimisation system are numerous. Excess energy delivered to a building can manifest itself in electrical appliances as heat or vibration; both unwanted by-products that can shorten the life-span of equipment. The on-going maintenance and early replacement of electrical appliances are unnecessary financial costs to a business in addition to that of the inflated energy bills resulting from power being delivered at a higher voltage than required. Typical electrical consumption savings from voltage optimisation average at 12%-15% and payback periods are typically under 5 years.

In 2011 world attention was focused on South Africa as Durban hosted the United Nations Climate Change Conference. As part of its commitment to combating climate change the South African government has set ambitious targets to reduce the country's carbon emissions by 34% from 'business as usual' levels by 2020 and 42% by 2025. Many strategies will have to be implemented by every sector of the community, from public bodies to private businesses, to reach these levels. The promotion of energy efficient technologies, the strengthening of energy security and the transition to a lower carbon economy will all play a part. Businesses are also being encouraged to sign up to the National Energy Efficiency Strategy.

With the installation of a VO system a business can save significantly on its energy bills and reduce its carbon emissions. Maintenance costs are also lower as electrical equipment is protected against unnecessarily high and unpredictable power supplies. In addition to these benefits the real-time monitoring interface and targeting system built into the latest Powerstar VO technology, for example, can assist businesses aiming to prove their green credentials to external assessors whilst enabling building managers to implement energy saving strategies based on actual facts on the ground.

TAILORED ENGINEERING SOLUTIONS

VO systems such as the market-leading Powerstar range are not off-the-shelf units. Instead these specialised products offer an engineered solution for each individual client. Engineers fully conversant with all aspects of VO are in the best position to conduct full site-specific energy audits. With their specialist knowledge they can ensure the best system is installed to maximise energy savings and reductions in CO2 emissions, whether this is in a single location or across multiple sites, as part of a new build or retrofitted to existing premises. A small team of dedicated engineers can install a tailor-made VO system within hours with no disruption to business operations.

POWERSTAR RANGE

Powerstar, the only VO system in the world to be granted a patent for the design, has been at the forefront of the market for a number of years. Independent tests have also shown that it is the most effective system on the market and comes with a 10 year warranty on the installation and equipment. It also has a 50 year life span. As there are no moving parts the unit itself does not require maintenance.

The original Powerstar solution is a fixed system for high but constant power supplies, whereas Powerstar MAX is a variable VO system that represents utilising electronic-dynamic intelligent technology. The solution delivers voltage at a constant level regardless of the inconsistent supply. This is crucial for sites that require outstanding levels of reliability and security with high night time loading, or processing critical loads and secure data, such as data centres, hospitals, cold storage units, hospitality venues and retail outlets.

For businesses operating their own transformer, new buildings or those with space restrictions limiting validity of LV solutions, the optimum solution is Powerstar HV MAX, an high voltage, electronic variable, voltage optimisation system, which combines the energy efficiency of the very latest super low loss transformer with Powerstar electronic-dynamic VO technology. The installation of such a low loss transformer can deliver additional savings of between 3% and 10%,

compared with older transformers. And these savings are in addition to the 12% to 15% delivered through the use of the latest electronic-dynamic voltage optimisation technology. This means that total average savings can be as much as 17% with the installation of Powerstar HV MAX.

Powerstar is so confident in the energy efficiency capabilities that it will guarantee savings for each installation. A one-off payment will be made by the company if the agreed saving is not achieved. For example, if a saving of 10% has been agreed but only 9% is achieved Powerstar will compensate the customer with the difference.

The Powerstar HV MAX is the only fully electronically variable HV transformer in the world. It has a three phase amorphous metal core that contains ferromagnetic elements alloyed with a glass former. These materials, with their low coercivity and high electrical resistance, have high magnetic susceptibility. This means they reduce losses when subjected to alternating magnetic fields; up to 75% when compared to conventional steel core transformers. They are also much more efficient, delivering proven efficiencies of 99.91%. 'Green' credentials are also high, as 98% of its components are recyclable.

Thanks to the innovative design the Powerstar HV MAX is able to provide a fully regulated voltage output at 380V or set at a level defined by the user, regardless of the grid variations, even accepting input of up to 33,000V. The user defined voltage output can by altered locally on site or remotely via the internet. And the intelligent interface can offer building managers the opportunity to monitor real time savings.

Installation is quick and easy, taking specialised voltage optimisation engineers only four to six hours to install a Powerstar system. The site impedance and discrimination are unaffected as the system does not interfere with the on-site power supply. This ensures normal business operations are unaffected. Also a lack of physical space need not be a restriction, as the system can be installed inside or outside a building, in a new build or retrofitted.

Powerstar systems have been installed in a wide range of buildings, both public and private, in countries around the world, from Europe to South East Asia. A UK-based company, with offices in Australia and Cyprus, the company has partners in 15 countries, including South Africa, UAE, Spain, Greece and Malta. Satisfied customers include Hilton Hotels, ASDA Supermarkets (a UK subsidiary of Walmart) and London City Hall, a prestigious and iconic building situated on the bank of the river Thames.

To find out more about this innovative and unique system visit www.powerstar.com or email southafrica@powerstar.com for further information. wn

BY I DU TOIT GROBLER
INTPI(SA)(EE), PRING(EE), PRDIPLING(EM), BSC(ING)(ELEK)(PRET), FSAIEE, SMICMEESA

"Decades of Engineering Excellence" is a 216 page hardcover prestige coffee table publication of the Engineering Council of South Africa.

"Decades of Engineering Excellence"

All categories and disciplines of engineering have achieved much in South Africa during past decades. Much of these were not limited to single categories or disciplines but rather a combination of two or more of those. In this chapter, only examples of those and not necessarily the most spectacular ones either, in no particular order and with photographs are described. Profiles of sponsors of this book provide complementary information on engineering achievements.

South Africa can claim a number of engineering firsts and inventions in the world.

South African engineering practitioners together with their international counterparts have played significant roles in the engineering achievements described herein.

Engineering practitioners find a professional and vocational home in voluntary associations such as learned societies and vocational bodies established to serve engineering practitioners. One of the earliest references to such bodies is the SA Association of Engineers and Architects, later the SA Association of Engineers, which amalgamated with the Transvaal Institute of Mechanical Engineers in 1892. ECSA recognise Voluntary Associations (VAs) such as the SAIEE, and SAICE. VAs have played significant roles in the Excellence in Engineering achieved during the Decades.

Until the discovery of vast deposits of various minerals in South Africa, the economy depended mainly on conventional agriculture. Engineering played a secondary role. This has however since changed significantly. The mining industry necessitated the introduction of engineering skills (see Chapter 3), technology, plant and equipment and the development of infrastructure, secondary industry, facilities to beneficiate minerals and services such as roadways, railways, large scale electrical power generation and distribution, collection, purification and distribution of water, treatment of human and industrial effluent, fuel from coal production, iron and steel making, pulp and paper making, enrichment of radioactive minerals, communications, health care, etc.

IMPORTANT ADVANCES IN SOUTH AFRICA

Herewith is a listing of important advances made in South Africa since 1,5 million years ago (mya), of an engineering and general nature. This is according to Wikipedia in a World Wide Web article:

- 1,5 Mya - Earliest evidence of controlled use of fire by humans near Sterkfontein in the Cradle of the Humankind;
- 1882, 1 September - Kimberley becomes the first Southern Hemisphere and African city to have electric street lights;
- 1920 – Dr Hendrik van der Bijl, an electrical engineer, publishes *The thermionic vacuum tube and its applications*, the standard textbook on the subject for more than 20 years;
- 1937 - Max Theiler announces the 17-D Yellow Fever vaccine;
- 1945 - Council for Scientific and Industrial Research was founded;
- 1955 - SASOL produces first automotive fuel from coal;
- 1959 - Trevor Wadley, an electrical engineer, invented the Tellurometer, first successful microwave distance measurement device;
- 1962 - SANAE I, first South African Antarctic base is built;
- 1963 - The Dolos, a complex geometric shaped concrete block, weighing up to 20 tons, used in great numbers worldwide to protect harbour walls and river mouths from the erosive force of ocean waves, was developed in East London;
- 1965, 18 March - SAFARI-1, Africa's first nuclear reactor goes critical;
- 1967, 3 December - First successful human-to-human heart transplant was performed by Prof Christiaan Barnard at Groote Schuur Hospital, Cape Town;
- 1974 - Automated pool cleaner, the Kreepy Krauly, was introduced by Ferdinand Chauvier, a hydraulic engineer;
- 1975 - Development commenced on a helmet mounted sight system;
- 1978 - SAR Class 6E1 sets the narrow gauge land speed record for rail vehicles at 245 km/h;
- 1995 - Mark Shuttleworth founded Thawte, an early Internet security company;
- 1995 - Natal Sharks Board develops the Shark Pod, a personal device to deter sharks; and
- 1999, 23 February - SUNSAT, first South African produced satellite was put in orbit by an American Delta II launch vehicle.

This synopsis include some of the Engineering achievements covered in this Chapter:

AGRICULTURE

Agriculture has become highly mechanized and automated and applies modern technology not only in the fields and on the lands, but also in the storage and processing of agricultural products such as sugar cane, timber, wood fibre, grain, fruit, vegetables, and of the dairy industry. It includes modern purification, irrigation and transport systems.

MINING

Mining in South Africa has been the main driving force behind the establishment of Africa's most advanced and richest economy. Large scale and profitable mining started with the discovery of a diamond on the banks of the Orange River in 1867, while

Decades of Engineering Excellence

continues from page 53

gold rushes to Pilgrim's Rest and Barberton were precursors to the biggest discovery of all, the Main Reef/Main Reef Leader.

The use of coal in South Africa dates back to the Iron Age (300-1880 AD), when charcoal was used to melt iron and copper, but large-scale exploitation of coal only occurred since the mid-19th century.

Mining takes place as surface, underground and undersea operations. South Africa has some of the world's largest open cast and deepest underground mines, with some of the tallest headgears and largest winders.

Mining methods range from labour intensive conventional, to track bound, to sophisticated mechanised trackless mining.

Mining necessitated the introduction of an engineering skill unique in the world, namely that of certificated mechanical engineers in 1911. This was later expanded to certificated electrical engineers and in 1941 to certificated electrical and mechanical engineers for factories. This qualification is the prerequisite for one of the four professional registration categories in engineering.

ELECTRICITY

The Encyclopaedia of Southern Africa records that "an electric device" was used in South Africa in about 1809. The first single line electric telegraph system, connecting Cape Town and Simons Town, was opened in April 1860.

An early arc light was demonstrated in 1860 and the telegraph system was used for a time signal in 1861. In 1881, the local railway station in Cape Town was illuminated by means of electricity, and Port Elizabeth opened the country's first telephone exchange in May 1882. The first electric street lighting in the country was commissioned in Kimberley in 1882.From April 1882, electric arc lamps illuminated Cape Town's Table Bay docks.

The use of electric lights by the Cape Colonial Parliament in Cape Town is reported in the Cape Times of May 1882: "The House of Assembly continues to be lighted by the electric light and result has so far been highly satisfactory.

The country's first electrical power plants were developed to support the turn-of-the-century mining industry. Most mines used on-site electrical generators until 1909, when the Victoria Falls Power Company was established.

Electricity is generated in coal-fired, nuclear fueled, wind driven, solar energy, hydro, mostly pumped storage, biomass fired, gas fired and diesel fired power stations and in co-generation plants. Details of coal-fired power stations are tabled in this chapter.

COMMUNICATIONS

Communications include telecommunication, fixed-line telephony, undersea cable networks, mobile telephony, radio and television. It should come as no surprise that the country that invented touchtone dialing offers world-class telecommunications.

Telecommunications is one of the fastest growing sectors of South Africa's economy, driven by explosive growth in mobile telephony and broadband connectivity.

The first radio broadcast station in South Africa was put up by the South African Railways in Johannesburg on 29 December 1923.The South African Broadcasting Corporation was created under Act No. 22 of 1936, in which it was stipulated that broadcasts should be made in Afrikaans in addition to English within the following year. In 1952 the Rediffusion Service was established to broadcast in African languages.

Broadcasts were made in three languages to Soweto. From 1962, broadcasts were made in Tswana and Sepedi from Pretoria. This was followed in 1963 with Zulu from Durban, and Xhosa from Grahamstown. In 1965, broadcasts in Venda and Tsonga commenced from Johannesburg. Television was introduced in 1976.

ASTRONOMY

Nicolas Louis de Lacaille performed the first significant work in astronomy in South Africa between 1751 and 1753, culminating in the measurement of the arc of the southern meridian and a catalog of almost 10 000 southern stars, later published as Coelum Australe Stelliferum.

The Royal Observatory was established in Cape Town in 1820 and opened in 1829. Today, with the main observing site having moved to a higher site near Sutherland, it is host to the Southern African Large Telescope (SALT) as well as numerous other local and international telescopes.

The Karoo Array Telescope (MeerKAT) is under construction at Sutherland as a pathfinder for the $2 billion Square Kilometer Array (SKA) project, which will be split between sites in South Africa, Australia and New Zealand.

RAILWAYS

The first railway line in Southern Africa was laid along the Bluff in Durban, and the train was hauled by oxen. The Natal Railway Company was formed in 1859, and its line from Point to Durban, barely 3,2 km, was opened on 26 June 1860.

The railways played an important role in the development of South Africa, by transporting goods, minerals and passengers. Haulage by train has developed over the years from being drawn by oxen and horses, to coal fired steam locomotives, to diesel, diesel electric and electric units.

The most modern railway system in South Africa is the Gautrain Metro. It carries passengers partially underground at high speed between Braamfontein, Pretoria and OR Tambo International Airport. Trains are hauled by electric units and run on a wider track than the general railways in the country.

IRON AND STEEL MAKING

Iscor, now Arcelor Mittal, was established as a state company in 1928. The objectives of establishing the company were to produce iron and steel products, and create employment opportunities.

PULP AND PAPER MAKING

One of a variety of pulp and paper suppliers in the country, SAPPI Ltd was founded in 1936 to establish the pulp and paper making industry on an integrated basis.

FUEL FROM COAL

Sasol Ltd is a South African company involved in mining, energy, chemicals and synthetic fuels. It was formed in 1950 and started producing oil from coal in 1955 in Sasolburg.

AUTOMOTIVE INDUSTRY

South Africa's automotive industry is a global, turbo-charged engine for the manufacture and export of vehicles and components. Many of the major multinational manufacturers use South Africa to source components and assemble vehicles for local and international markets. The first vehicle assembly plant was established by Ford in Port Elizabeth.

INFRASTRUCTURE

In 2010 South Africa hosted the first FIFA World Cup Competition on African soil.

In order to prepare for that event, significant upgrading of well-established existing, and the establishment of new infrastructure and facilities, such as roadways, airports, and soccer stadia were undertaken. The engineering and construction capabilities of the country were given a real test.

South Africa is water-scarce, and dams and associated water supply, purification and irrigation systems have been built.

Details of 20 largest dams in Southern Africa are tabled in this chapter.

MILITARY APPLICATIONS

Armscor, a http://en.wikipedia.org/wiki/South_Africagovernment-supported weapon-producing conglomerate was established in 1968, primarily in response to sanctions by the United Nations.

Sanctions were imposed, amongst other commodities, on military weapons, vehicles and aircraft. In order to overcome those sanctions capabilities were developed for the design, manufacturing and sourcing of such commodities.

ENGINEERING AND OTHER RESEARCH BODIES IN SOUTH AFRICA

Engineering and other Research Bodies in South Africa, published by Wikipedia in an article on the World Wide Web, include:

- African Centre for Genome Technologies
- African Institute for Mathematical Sciences
- Agricultural Research Council (SA)
- Astronomical Society of SA
- Bernard Price Institute for Paleontological Research
- Council for Scientific and Industrial Research
- Department of Science and Technology (SA)
- Engineering Council of SA
- Mintek
- National Research Foundation of SA
- Onderstepoort Veterinary Academic Hospital
- Operations Research Society of SA
- Royal Society of SA
- SA AIDS Vaccine Initiative
- SA Bureau of Standards
- SA Institute for Aquatic Biodiversity
- SA Institute of Mining and Metallurgy
- SA Journal of Science
- SA Marine Predator Lab
- SA Medical Research Council
- SA National Antarctic Programme
- SA National Bioinformatics Institute
- SA National Space Agency
- Technology Innovation Agency

Next month: Synopsis of Chapter 3: ENGINEERING EDUCATION IN SOUTH AFRICA.

CONTACT DETAILS:

If you are interested in obtaining a copy of the book, contact du Toit on 083 666 6855 or du.toit.grobler@gmail.com

Road to Registration for Candidate Engineers, Technologists and Technicians

Presenters: Allyson Lawless Pr Eng DEng(*hc*), John Gosling Pr Eng BSc BEng(Elec)

CETA Candidacy Phase Support Programme

SAICE Professional Development and Projects (SAICE PDP) has been at the forefront of developing civil engineering professionals. SAICE PDP has now expanded its scope of work and expertise to support the development of electrical and mechanical engineers towards registration with the Engineering Council of South Africa (ECSA).

It is on this premise that the Construction Education Training Authority (CETA) awarded funding to SAICE PDP to institutionalise formal structured workplace training programmes within organisations by providing external mentors to support the development of these programmes.

To initiate the process, SAICE PDP through the Candidate Academy presents the Road to Registration course which provides insight to the professional registration process.

SAICE PDP have partnered with the South African Institute of Electrical Engineers (SAIEE), which will be providing mentoring support and Road to Registration courses in the electrical engineering industry.

Being registered allows you to:

- Demonstrate your competence
- Gain recognition as a professional
- Boost your career prospects
- Work independently
- Add the designation Pr Eng, Pr Tech Eng or Pr Techni to your name

Attend this course and learn about:

- The level of competence required for registration
- How to plan the training that you need
- The ECSA registration process and how to fill in the forms and templates
- Your responsibilities during the candidate phase and your relationship with mentors and supervisors

CETA SAIEE saice candidate academy

the road to registration – tower above the rest

Course Content

PHILOSOPHY OF THE CANDIDACY PHASE
- Education levels
- Training opportunities per sector

COMPETENCIES
- The Project Cycle
- Core competencies
- Cross-cutting competencies
- Professional and other competencies
- The skills acquisition pyramid
- Outcomes

DEVELOPING HIGH PERFORMANCE PROFESSIONALS
- Why register?
- Becoming a high-performance professional

ROLEPLAYERS
- Candidates
- Supervising engineers/Coaches
- Mentors
- ECSA
- Mentoring vs Coaching

THE REGISTRATION PROCESS
- The registration process
- Practical training period
- Training plan
- Assessments
- The final report for submission to ECSA
- Continuing development
- Code of conduct

'This was excellent. The course came just at the right time for me.'

'The course was very well organised and very precise about the requirements of registration; I am particularly impressed with the presenter. She had tons of experience and relevant examples.'

'The course helped me to understand why I have to register, because for me it was just a matter of filling out paperwork. I now realise my responsibility in my career choice as an engineering technician.'

ABOUT THE PRESENTERS

Allyson Lawless is a civil engineer experienced in structural, municipal and mining engineering. In the year 2000 she became the first female president of the South African Institution of Civil Engineering, and during that year recognised the looming skills challenge. Since 2003 her career has been focused on skills development and she has published two books, Numbers and Needs, and Numbers and Needs in Local Government, which address skills shortages and the associated solutions in civil engineering and local government respectively.

John Gosling is an electrical engineer who spent the first 25 years of his career involved in the design, specification and commissioning of power stations, transmission and distribution networks. He then became involved in research focused on the performance enhancement and optimization of this plant. He was responsible for the establishment of Eskom's Academy of Learning and became its Chief Learning Officer. He serves on the Electrical Professional Advisory Committee (PAC) of the Engineering Council of South Africa (ECSA) and is involved in professional reviews. In 2001, John was President of the South African Institute of Electrical Engineers (SAIEE).

Benefits include:
- A detailed course manual covering all the forms and how to complete them
- A Portfolio of Evidence - Development File - for filing your workplace training plans, reports, assessments and other reference material which may be necessary for producing your final project report
- Interactive exercises to help you learn fast

For more information, send an email to academy@saiee.org.za.

The Candidate Academy's philosophy is to support candidates on their road to registration with ECSA, by helping them through the transition from theoretical training to the 'how' of engineering projects and processes.The Academy offers practical, hands-on training relevant to experiences in the workplace.

February

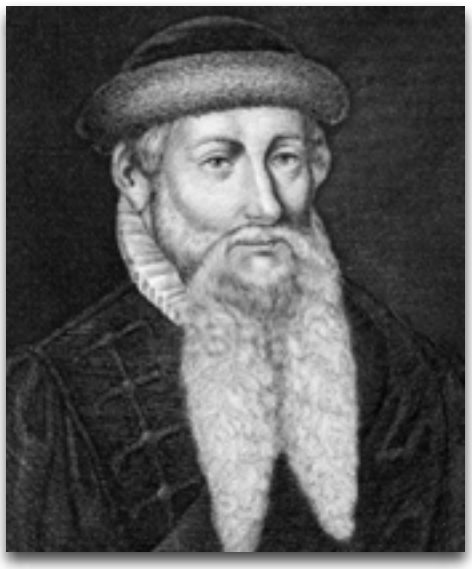
COMPILED BY | JANE BUISSON-STREET
SMSAIEE | PMIITPSA

The Roman month *Februarius* was named after the Latin term *februum*, which means purification, via the purification ritual *Februa* held on February 15 (full moon) in the old lunar Roman calendar. January and February were the last two months to be added to the Roman calendar, since the Romans originally considered winter a monthless period.

1 February

1959 Texas Instruments requests the patent of IC (Integrated Circuit).

1982 *"Producer"* Larry *"Bud"* Melman presented *"Late Night With David Letterman"* on its NBC debut. The program continues at CBS under the title *"Late Show with David Letterman."*



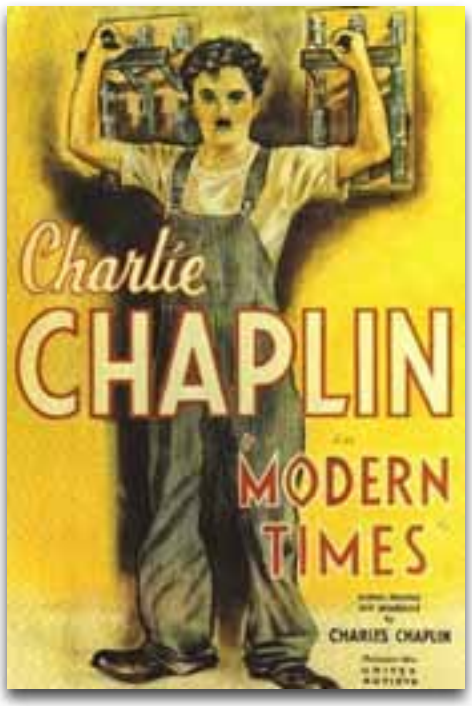
3 February

1468 Johann Gutenberg, a blind, impoverished German goldsmith has died in obscurity. It was he who developed the letterpress printing method and oil-based inks that are now making a fortune for Johann Fust and his son-in-law, Peter Schoffer. Despite Gutenberg's personal failure, his cheap method of mass-producing printed pages has freed the written word from the monopoly of the monasteries.

1815 The World's first commercial cheese factory is established, in Switzerland.

5 February

1922 Wit and wisdom in bite-sized chunks. A new monthly magazine was launched in New York today with an appealing formula – The Reader's Digest – offers 31 condensed articles *"of enduring value and interest"* from leading magazines. It is the brainchild of DeWitt Wallace, a former book salesman. Unable to find financial backers, Wallace finally published the magazine himself.



1936 The final appearance of Charlie Chaplin's Tramp character premiered in *"Modern Times,"* essentially a silent film with orchestrated soundtrack. Chaplin spoke on screen for the first time, but only in a short bit of gibberish.

9 February

1964 The US crime rate plunged dramatically as 73 million Americans cancelled everything in order to watch four lads from Liverpool on the Ed Sullivan Show. Six weeks ago nobody in America had heard of the Beatles then one week ago their single *"I Wanna Hold Your Hand"* hit the top of the US hit parade. Yesterday the British pop group arrived in New York for a ten-day tour to scenes of mass hysteria and near-riot, with police out in force to keep the peace.

12 February

1951 Cartoonist Hank Ketchum debuted his *"Dennis the Menace"* comic strip.

2012 Zambia defeat Ivory Coast 8-7 on penalties in the Africa Cup of Nations.

14 February

1822 Britain's postal services have had to employ additional postal sorters to make sure that the thousands of St. Valentine's Day messages lovers have sent each other arrive on time today. The quaint fashion is growing more popular by the year. Nobody knows how the custom arose. It may have started in 1477, when a Norfolk woman sent a note to her lover saying: *"To my wellbeloved Voluntyne."* There seems to have been two St. Valentines, both third century Italian priests, both martyred; before that came a pagan fertility festival the Romans celebrated in mid-February.

15 February

1922 Marconi begins regular broad-casting transmissions from Essex.

1971 After 1,200 years Britain abandons the 12-shilling system for decimal.

2005 YouTube, the popular Internet site on which videos may be shared and viewed by others, is launched in the United States.

17 February

1867 The first ship passes through Suez Canal.

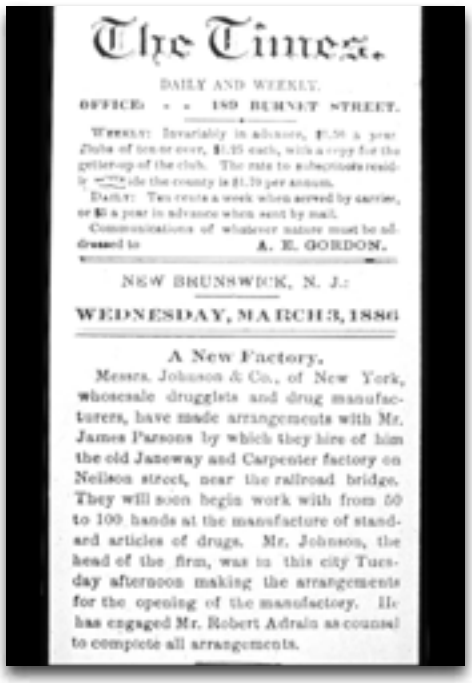
1972 Sales of the Volkswagen Beetle model exceed those of Ford Model-T.

20 February

1872 Silas Noble & JP Cooley patents toothpick manufacturing machine.

1988 Andre Hoffmann, German speed skater, skates a new world record for 1500m (1:52.06) in the Winter Olympics in Calgary.

2013 Estonia becomes the first country to establish a national system of fast chargers for electric cars.


The Times.

DAILY AND WEEKLY.

OFFICE . . 189 BURNET STREET.

A. E. GORDON.

NEW BRUNSWICK, N. J.:

WEDNESDAY, MARCH 3, 1886

A New Factory.

Messrs. Johnson & Co., of New York, wholesale druggists and drug manufacturers, have made arrangements with Mr. James Parsons by which they hire of him the old Janeway and Carpenter factory on Nelson street, near the railroad bridge. They will soon begin work with from 50 to 100 hands at the manufacture of standard articles of drugs. Mr. Johnson, the head of the firm, was in this city Tuesday afternoon making the arrangements for the opening of the manufactory. He has engaged Mr. Robert Adrain as counsel to complete all arrangements.

22 February

1886 In London, The Times newspaper runs the first-ever classified personal column.

1989 Aldo Jacuzzi, the American manufacturer of the famous baths, died today.

24 February

1923 The 640 km from London to Edinburgh today shrank to a mere day's trip as *"The Flying Scotsman"* setoff on its inaugural trip on the London and North Eastern Railway's new scheduled train service. The powerful new steam engine is said to be capable of pulling its line of carriages at 160kph.

26 February

1936 A new family car intended to rival Henry Ford's famous Model-T was unveiled today in Germany. Chancellor Adolf Hitler officially opened a factory in Saxony that will mass-produce a cheap small saloon. This Volkswagen – the *"people's car"* – has been designed by Ferdinand Porsche of Auto Union, know for more luxurious models. This new saloon is streamlined, and has a revolutionary four-cylinder air-cooled engine mounted over the rear axle.

28 February

1912 In Missouri Albert Berry made the first parachute jump.

1983 After 11 years, the two-year Korean War came to an end on the final episode of TV's "M*A*S*H." wn

Power, what power?

Most days I don't even have the power to get out of bed. My morning routine very closely resembles a scene from The Walking Dead - jerky body movements, slurred speech, crazy hair - yup that's me first thing in the morning. But I'm digressing.

BY I ANGELA PRICE

I have realised that we do not have a grip of the power situation in our household.

"Who's got the power? We've got the power!"

Remember that old school war cry? If we were to sing it in our home these days it would be more of a battle cry and sadly it would sound something like … *"Who's got the power? Eskom's got the power!!!!"*

Once a month the Evil Eskom and its co-conspirator City Power, reduce me to a quivering wreck as I anxiously open our utilities bill. Seldom am I pleasantly surprised, more often than not I am just gob-smacked. *"How the heck did we use that much electricity/water"* I find myself gabbling hysterically.

My Granny always said, "A house is a big, gaping mouth that you feed money into". Maybe a better analogy in our case would be to that of a leaky vessel or a bullet riddled bucket…either way, we are leaking and going down fast. We need a lifeline. We need to take back the power.

I want the power to no longer be a victim of Eskom's increasing tariffs and sporadic power cuts. I want the power to have tighter control over our monthly electricity and water usage. And if I really dream big, I want the power to generate our own electricity and one day 'get off the grid'.
But where does one begin?

Firstly by realising that energy efficiency is always the most affordable and environmentally sound place to start when approaching renewable energy.

What follows is my suggested (but not yet tested) approach to taking back the power – one step at a time:

1. Put a copy of your electricity bill on the fridge - with a big red ring around the total value owing- this will keep you motivated.
2. Next do a home energy audit:
- Track your electricity and water consumption at various times of day, noting the volumes and times of usage.
- Remember to look at the 3 W's (when, where and why) you are using electricity and water.
- Note: this can be quite an exercise and would require items such as a power meter. Alternatively search the net for suppliers who offer such services.
3. Analyse your results, highlighting the areas where you consume the most (I bet you will be surprised to find out where you are inadvertently 'leaking').
4. Now patch those leaks, literally:
- Repair all leaking taps, geysers and toilets.
- Identify the energy-wasters/phantom loads, which even when 'off' are consuming energy i.e. microwave ovens, cell phone chargers etc.
5. Implement tighter control over the areas that consume large amounts of energy, such as lighting, heating, pool pumps and geysers.
6. Look at improving insulation, upgrading to energy efficient appliances /electronics and installing timers on geysers and pool pumps.
7. Familiarise yourself with Eskom's peak times and their water/electricity billing sliding scale and work around them.
8. Now compare your next electricity bill to last month's one, you should hopefully see a decrease.

Having applied the basic principles of conservation and efficiency, you can now decide if you wish to look into harnessing renewable energy.

Ask yourself:

- Are you are happy to pay what you do for the convenience of having (a somewhat irregular supply of) electricity from Eskom?
- Or would you rather be generating your own power by finding an energy solution for your household that won't literally cost you (and the rest of us) the earth?

If you chose the latter, you are ready to start investigating renewable energy solutions for your home, such as:

- solar power (an obvious choice in SA) and
- wind power (suitable for rural/open areas).

So, I am now off to begin my personal energy renewal efforts – starting with a big cup of coffee! wn

"Designing a safer greener energy efficient future

Bergman Fisher Associates (BFA) are consulting electrical engineers founded in 2006, specialising in designing electrical installations to suit client requirements. The principle motivation of the company is to design electrical installations which are eco-friendly, economical to operate by means of applying the latest technology particularly with respect to energy saving, without compromising the aesthetic and corporate image of the client.

Since inception, BFA have been involved as consulting electrical engineers across a broad spectrum of projects. These include projects such as housing estate reticulation, office buildings, warehousing, shopping centres, automobile dealerships and emergency generating systems, to name a few. Each of the Partners have developed expertise in various key type projects based on experience gained over years of working with well known consulting electrical engineering companies and in the construction industry. The accumulated experience of the Partners exceeds 60 years. Since inception the company has gone from strength to strength because of the dedicated technical skill and service it offers.

The company working statement is for Clients to be able to communicate directly with the Partners of BFA and all projects are under the supervision and control of a Partner to ensure that a consistent high level of technical standard is maintained. With this end in mind, the Partners attend accredited CPA lectures, subscribe to technical journals and attend overseas engineering exhibitions. Both Partners are elected members of the South African Institute of Electrical Engineers. The company is also involved in pro bona assistance for charitable organizations. BFA was also instrumental in the design and supervision of the SAIEE new office building and the refurbishment of Innes House which will house the Institute's future museum.

On behalf of their Clients, BFA also negotiates with electrical energy and telecommunication suppliers. A close relationship is also established with the Client's Principle Agent in order to interpret the Client's requirements and to offer advice which will benefit the Client and the project. All designs are in strict accordance with the Codes of Practice and statutory regulations. Projects are supervised to ensure that these Codes of Practice and regulations are adhered to. The Partners attend site meetings as required and keep a record and evaluate the financial aspect of the installation's progress.

THE PARTNERS

Bill Bergman

Bill Bergman is a Fellow of the South African Institute of Electrical Engineers (FSAIEE) as well and sits on the SAIEE Council. He spent 25 years in the South African National Defence Force (SANDF) as a Staff Officer (Electrical Engineering Services). In the SANDF, he gained experience in electrical design over a large spectrum of electrical engineering projects including buildings, generation and reticulation, water purification, project management and training of graduate engineers. During this time, he also wrote and published articles in military journals on electrical engineering with particular emphasis on electrical safety. On retirement from the SANDF, he started a consulting electrical engineering service practice. In 2006 he was approached by Wayne Fisher and the firm of Bergman Fisher Associates was formed. In 2011 Bill was awarded the "SAIEE Engineer of the Year Award" from the South African Institute of Electrical Engineers. He has also given lectures on the Electrical Installation in Buildings at the University of the Witwatersrand.

Wayne Fisher

Wayne Fisher is a Member of the South African Institute of Electrical Engineers (MSAIEE), Member of The South African Association of Energy Efficiency (MSAEE) and an Associate Member of The Council of Measurement and Verification Professionals of South Africa (AM CMVPSA). Wayne is a member of the SAIEE Council. He has 20 years of experience in the building industry. In his career he has worked for and with some of the leading consulting electrical engineers in South Africa, where he gained experience in a variety of building types. He has overseas experience in project management, design and supervision of electrical system building works whilst working in Dubai. In 2006 he approached Bill Bergman and they formed BFA as a consulting engineering company.

Calendar of events

If you want to see your function or event listed here, please send the details to Minx Avrabos at minx@saiee.org.za

FEBRUARY 2014

18-20	Africa Energy Indaba	Sandton Convention Centre, Johannesburg	www.africaenergyindaba.com
25-27	2014 8th IEEE CIPS	Nuremberg , Germany	www.conference.vde.com

MARCH 2014

4-5	Renewable Energy Forum South Africa	Norton Rose Fulbright, Sandton, Johannesburg	www.refsaconference.com
11-12	Power and Electricity World Africa	Sandton Convention Centre, Johannesburg	www.terrapinn.com
11-12	Shale Gas World Africa	Sandton Convention Centre, Johannesburg	www.terrapinn.com
16-20	APEC 2014	Fort Worth TX , USA	www.apec-conf.org.com
17-19	PowerGen Africa 2014	Cape Town Convention Centre, Cape Town	www.powergenafrica.com
17-19	Distributech Africa 2014	Cape Town Convention Centre, Cape Town	www.distributechafrica.com
27	SAIEE AGM	Military Museum, Johannesburg	geyerg@saiee.org.za

APRIL 2014

8-9	CSP Today South Africa 2014	Southern Sun Cape Sun Hotel, Cape Town	www.csptoday.com
8-10	2014 IET 7th PEMD	Manchester, United Kingdom	www.theiet.org.com

MAY 2014

8-9	CSP Today South Africa 2014	Southern Sun Cape Sun Hotel, Cape Town	www.csptoday.com
8-10	2014 IET 7th PEMD	Manchester, United Kingdom	www.theiet.org.com

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17	Digsilent Buyisa	0860 DIGSIL	www.digsilent.co.za
19	Impact Energy	031 201 7191	www.impactenergy.co.za
21	CSP Today		www.csptoday.com
25	Parsons Brinckerhoff		www.pbworld.com
33	Aberdare Cables	011 936 8000	www.aberdare.co.za
39	Liveline Technologies	018 468 3344	www.liveline.co.za
47	Comtest Distribution	011 608 8520	www.comtest.co.za
51	Helukabel	011 462 8752	www.helukabel.co.za
61	Bergman Fisher Associates	011 679 3481	www.bergmanfisher.co.za
63	Charnaud	011 794 6040	www.charnaud.co.za
67	Power-Gen Africa		www.powergenafrica.com
68	Africa Energy Indaba		www.africaenergyindaba.com

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Mpumalanga Centre

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Bloemfontein Centre

Chairman | Ben Kotze

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Vaal Centre

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POWER-GEN AFRICA

DISTRIBUTECH® AFRICA

Conference & Exhibition

17–19 March 2014
Cape Town International Convention Centre
Cape Town, Republic of South Africa

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INVITATION TO PARTICIPATE

POWER-GEN Africa combines with DistribuTECH Africa for the first time to provide an extensive coverage of the power needs, resources, and issues facing the electricity generation, transmission and distribution industries across sub-Saharan Africa.

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