

wattnow

THE SAIEE SUPPORTS ENERGY EFFICIENCY AND THE ENVIRONMENT

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The
Touch
Technology *issue*



THE OFFICIAL MOUTHPIECE OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS | NOVEMBER 2012

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wattnow magazine

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November 2012 – and the year is nearly finished! Where has the time gone? I've had a phenomenal year, not only am I editing this wonderful publication, but I get to deal with the SAIEE's members, who keep me on my toes, as well as our supportive advertisers. Without you, this publication would not have been such a huge success. Thank you!



In this issue of **wattnow** we showcase a pictorial of the Annual SAIEE Banquet, which was another great success. For the first time, in the history of the SAIEE, were two of the three awards shared by alumni in their respective fields. Congratulations go out to those recipients – well done.

Our iPad competition came to a close, and the worthy winners are: Patrick O'Halloran, Prof David Proctor, Edwin Grobler, Dr David Jacobson and Eric Winter. Well-done gentlemen. Dr Jacobson has donated his iPad to the Institute requesting it be given as a once-off prize for the best one-to-two-page short story (preferably non-technical) to be published in **wattnow** to encourage young SAIEE engineers less than 30 years old to develop their writing skills. We will publish details in the next issue of the **wattnow** magazine and keep you informed on the developments and criteria on how you can win this iPad.

Our feature in this issue focuses around Touch Technology, and you will find two articles on this on pages 20 & 24 respectively. "Appliance Interfaces" talks about the key to designing user interfaces for the latest generation of appliances which is to keep it simple.

In the Power Section, Dale Pudney talks about Voltage Dip Mitigation which is a major power quality problem for modern industrial processes, causing millions of dollars' worth of plant outages (page 32).

The next issue of **wattnow** will be distributed at the beginning of January 2013 – so watch your post box for your copy.

I would like to take this opportunity to wish all our readers a wonderful festive season. Once again – thank you for all the compliments & advice during the year – they were very much appreciated.

Enjoy the read.



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

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reetings to All.

October was once again a very busy month – especially the second half.

The AMEU held its annual Convention at Emperors Palace in Ekurhuleni, as the incoming President, Mr Hannes Roos, is from Ekurhuleni. We congratulate Hannes and wish him well with his term of office over the next two years. At the same time we congratulate and thank the outgoing President, Mr Michael Roode for a job well done over the past two years. We look forward to increased co-operation between the Association and the Institute.

The theme for the Convention was the “Solutions for a Smart Industry”. The keynote speaker, the Department of Energy’s Minister E D Peters, addressed the Convention. In her address, she informed the Convention that the Department will be running a pilot project on ADAM (Approach to Distribution Asset Management). This project was initiated by the now defunct EDI Holdings. The pilot project will be run in two Metros and ten Municipalities.

Over the 3 days there were 14 papers relating to the smart grid, 5 papers on operations and equipment, 5 papers on safety, and 2 papers on renewable energy. The papers were of a high standard, and gave one a good insight to the changing industry, especially the role of the smart grids to manage an increasingly energy hungry world, with scarce generation resources.

The day after the Convention, I attended the CIGRE South African National committee’s annual dinner at the Birchwood – a very pleasant evening. CIGRE – which means

– “International Conference on Large Electrical Systems”, is a unique organisation which operates through 16 Study Committees consisting of a total of over 2500 members from across the globe. The Committees cover equipment, through to markets, and also the environment.

The following day – Friday the 19th was our big day! The SAIEE Annual Banquet was once again held at the Wanderers. We departed from tradition by not having a speaker, but were royally entertained by a Comedian, Mr Ndumiso Lindi. All the comments that I heard were very favourable! One of the highlights of the banquet is the presentation of the three prestigious awards. There was much competition this year, and as a result, two of the awards were shared. The Keith Plowden Young Achievers award sponsored by Powertech Power Transformers went to Thandiwe Nkambule, and Megan Russel. The SAIEE Engineer of the Year award sponsored by Actom was shared by Jane Buisson-Street and Paul van Niekerk. The President’s award sponsored by Rotek Engineering was presented to Andrew Etzinger. Well done to all the recipients – worthy winners indeed!

I would like to record my heartfelt thanks to Gerda Geyer, who once again organised a very well run event. Thank you to those who assisted Gerda, and for the sponsors of the gifts and the flowers. Thank you too, to Ian McKechnie, a very competent Master of Ceremonies who ensured that the evening went off without a hitch.

The next edition of the **wattnow** is the December/January issue, due for publication in January. I would like to wish all of our readers a peaceful and happy Christmas, and a successful and healthy 2013.

Mike Cary | SAIEE President 2012



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In this issue, we showcase Festive Season gifts for her, for him and the family!

For Her

Nothing speaks more of the Festive Season than the joyous anticipation of opening gifts. Choose your perfect gift from our variety of décor accessories or home fragrances and wrap it up with our complimentary gift-wrapping service to spoil her.



Christmas decorations from R90
Candles from R130
Candle holders from R250



Silverware from R165



Hurricane lanterns from R520

Our Home Fragrances by Greenleaf consists of nine tantalising scents - something to spoil every nose, from the elegant Signature Candle with its smooth, satin finish to the refreshing Room Spray, Greenleaf fragrances make the perfect holiday gift for her.



Fragrance Sachets from R25
Home Fragrance Oil 10ml R110
Room Spray 177ml R140
Reed Oil 250ml R200
Signature Candles R230



For Him

Leatherman Skeetool/Style CS Combo 3

At a mere 100 grams, the Leatherman Skeetool has a stainless steel combo blade, pliers, bit driver, removable pocket clip and carabiner/bottle opener. The Skeetool is just what you need in one good lookin' package. + The handy Style CS is one unique clip-on multi-tool. With spring-action scissors, a file, knife, tweezers, bottle opener and mini-screwdriver, you'll never be without your most necessary tools. Fits in a pocket or clips on your pack or bag for easy portability. So stylish it's almost a shame it fits so easily in your pocket. R975.00



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Bells Whiskey Hamper

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DStv Mobile Walka Handheld TV

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Dewalt 800Watt 115mm Grinder & 650Watt Impact Drill & Toolbox & Drillbit Set

800W, 10,000 rpm provides high power and speed for 100mm grinding applications Advanced fan system provides maximum airflow prolonging motor life. R1,399.00



Cognac Glasses - 2pcs

These exclusive Cognac glasses break with the classical convention of design and is a beautiful combo of function and pure pleasure. Place glasses on the table and enjoy how it gently turns, exposing the fine aroma of your favourite cognac! R 440.00

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For the Family

WHO'S THAT?

This fast and furious name guessing game involves describing famous people - celebrities, sports personalities or historical characters - for your team to guess. The spinner decides. Presented in a retro-inspired gift box that makes it an ideal Christmas present. Suitable for 8 years +, 4 or more players, packed with over 470 personalities. R79.95 (incl.)



HIGH FIVE

Out-think your opponents and beat the clock to stand a chance of winning this game of witty wordplay. Presented in a retro-inspired gift box that makes it an ideal Christmas present. Suitable for 8 years +, 4 or more players. R 99.95 (incl.)



AGAINST THE HAMMER

Go head to head with friends and family in a duel of word association. Presented in a retro-inspired gift box that makes it an ideal Christmas present. Suitable for 8 years +, 4 or more players. R 99.95 (incl.)

FAMILY CHARADES

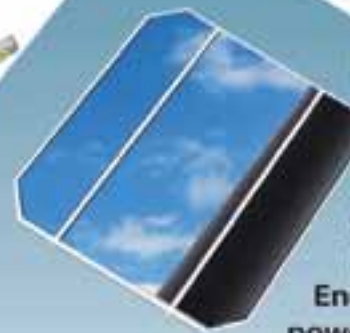
It's a race against mime as you show off your acting skills. Teams take turns using the spinner to determine which subject to mime. Presented in a retro-inspired gift box that makes it an ideal Christmas present. Suitable for 8 years +, 4 or more players, packed with over 300 charades. R 79.95 (incl.)



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SAIEE Charity Golf Day

The annual SAIEE Charity Golf day took place at the prestigious Royal Johannesburg and Kensington Golf Club at the end of September.

The SAIEE would like to thank the following sponsors: RWW Engineering, Zest WEG Group, Parsons Brinckerhoff, Royal Johannesburg and Kensington Golf Club. Even though the golfers challenged gale force winds, it was a day enjoyed by all.



Winner for Nearest to Pin, Rudolf Binneman, accepted a prize from Gerda Geyer.



Mr Tuson accepted the award on behalf of Mr Michael Raal who won a prize for the Longest Drive.



Matome E. Modipa, from Sebata who won in the lucky draw.



Minx Avrabos with Lourenz Consalves - our winner in the lucky draw.



Paul Tuson from Parsons Brinckerhoff, - another lucky draw winner with Minx.



The team from the Zest WEG Group were Brett von Brandis, David Spohr, Dillon Govender & Graham Cox.



Bailey Rencken & Lourenz Consalves from Powertech.



The team from RWW Engineering were Billy van Wyk, Joel Williams, Jeremy Wood & Kyle Lass.



The team from Actom; Mark Daniels, Manne Fourie, Ettiene Joubert & Alan Buchholtz.



The team from Parsons Brinckerhoff: Paul Tuson, Ronaldo Marais, Mike Raal & Reggie Naidoo.



The team from PPA Energy were Graeme Chown, Rudolf Binneman, Anura Perera & Dean Redelinghuys.



Ettiienne Knipe, Nhlanhla Maphalala & Chris Ndlovu from Sebata.



Nico Xolo, Ben Shango & Motemo Modipa from Sebata.

SAIEE Annual Banquet

The who's who of the electrical engineering fraternity gets together at the SAIEE Annual Banquet in a neutral convivial atmosphere that facilitates professionals interacting outside of the competitive working environment. Captains of industry can let their hair down and be themselves while younger members have the opportunity to meet and greet the doyens of industry.

Networking with engineers one would never normally have the opportunity of meeting in normal working life is one of the many privileges of being a member of the SAIEE.

The SAIEE is privileged to have among its members, engineers who value professionalism but more importantly give of their own time and expertise to maintain an institution that serves the fraternity. These engineers honour the history and tradition, begun more than 100 years ago, of acknowledging proficiency and capability in engineering, initially for mining the riches in South Africa but today spanning a wide spectrum of research and application, reaching into every part of our daily lives. They give of their time and money to foster good practice, integrity and professionalism and so in reality the Institute celebrates the real winners - the members of the SAIEE.

At this occasion, the Institute's 3 top awards are presented and this year the difficulty of choosing between the nominations resulted in awarding the prizes to two engineers, in each of two of the categories. Thus 5 awards were made instead of the usual three.

The Keith Plowden Young Achievers Award went to Dr Megan Russel and Thandiwe Nkambule. The Engineer of the Year Award went to Paul van Niekerk and Jane Buisson-Street. The President's Award went to Andre Etzinger.

One of the highlights of the evening was when SAIEE President, Mike Cary awarded certificates to the members of 50 years standing. This year, 12 members were presented with 50 year membership certificates and the Institute has no less than 297 members among the 6000 strong who have achieved this milestone.

A memorable time was had by all and next year arrangements will have to be made to accommodate more guests.



Our MC for the evening, the enigmatic Ian McKehnie.



Mike Cary (SAIEE President) with Martin Brink who received a 50 Year Membership Certificate.



Mike Cary with Prof Mike Case who received his 50 year Membership Certificate.



Mike Cary with Mervyn Emms who received his 50 year Membership Certificate.



Mike Cary with the recipient of the Keith Plowden Young Achiever's Award, Dr Megan Russel and Bernard Meyer, CEO, Powertech.



Andre Hoffman accepted on behalf of Thandiwe Nkambule her Young Achievers Award from Mike Cary and Bernard Meyer, CEO, Powertech.



Mike Cary with André Etzinger who received the President's Award with Johnny Dladla, CEO, Eskom.



Mike Cary with Paul van Niekerk who won the Engineer of the Year award with Jack Rowan, Executive Chairman, Actom.

WATTSUP





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Candice Manning, recipient of the "Rising Green Star Award".

Aurecon's Candice Manning wins the Green Building Council's first Rising Green Star Award

During the annual GBCSA convention and exhibition which took place at the Cape Town International Convention Centre in October, Candice Manning, a consultant in Environmentally Sustainable Design (ESD) at Aurecon's eThekweni's office, won the 'Rising Green Star Award.' This acknowledges her steadfast commitment to the green building movement and the part she has played thus far in the transformation of sustainable building design.

In response to the commendation, Manning said, "It is an honour to be recognised by the GBCSA and receive this award. As an environmentalist, it has become a personal challenge to change the way developers and engineers think about the design, construction and operation of their buildings. I hope that in some way, my contribution to the green movement will make a small difference."

Manning has been involved with green building developments for almost three years. She joined Aurecon in January 2011 to continue with the Shepstone and Wylie 'As Built' rating and has since been involved in achieving Green Star Ratings. Ermis Marques, Aurecon's Property Industry Director, adds, "My congratulations to Candice Manning on her Rising Green Star award. The Aurecon group is committed to designing and executing sustainable buildings and infrastructure for our clients. Our teams consist of registered and industry-recognised green building professionals whose joint experience ensures that our solutions are innovative, environmentally responsible and commercially viable. I'm proud to note that Manning's well-deserved achievement proves this commitment."



Viv Crone (Chairman Publications Committee), Patrick O'Halloran, winner in the Power Category with Minx Avrabos, (Managing Editor, wattnow).

iPad Competition Winners

We had the pleasure to announce the winners of the iPad competition at the recent SAIEE Banquet. They are:

- Category: Power - Patrick O'Halloran entitled "Live-Line Transmission Lines;
- Category: General Interest - Edwin Grobler entitled "Looking back on Apprentice days";
- Category: Communications - E Winter entitled "The mystery of EMC"
- Category: Computers & Software - D. Jacobson entitled "Emerging Developments in EIM";
- Category: Science - D.E. Proctor - entitled "Radio Pictures in Lighting".



*Sacha Matulovich
CEO | Fat Budgie*

Taking The Pain Out Of PBX

As an entrepreneur, your focus should be on generating new business and then deploying the capacity and funding required in order to deliver a great product or service to the customer. But in today's economic climate, one of the absolute keys to a business' survival is managing overheads, and this is something that is often overlooked, or conversely is given more attention than it deserves.

This rings especially true when it comes to your telephony system, arguably one of the biggest overheads of a company. Nobody is more aware of this than Sacha Matulovich, CEO of

leading Cloud Telecoms company, Fat Budgie. A successful entrepreneur many times over, Matulovich has had first-hand experience of the critical CAPEX factors that can hugely affect-up business and learned the hard way when it came to his telephony providers. Through misinformation and highly incentivised salesmen, Matulovich is still paying off a PBX system he purchased in 2008 and no longer uses.

It's through his own bad experience that he was prompted into investing in the Cloud PBX space and is pioneering to save other companies and entrepreneurs from the same misfortune.

Deloitte Finds Winning Recipe with Sage ERP X3 in the Mining Sector



Johan Theron
Director | Deloitte Consulting

Labour issues recently made headlines as one of the major challenges facing the South African mining landscape. "Rising labour costs as well as increasing electricity costs are just some of the obstacles facing the sector," says Johan Theron, a Director at Deloitte Consulting.

"Many operators in the industry are currently focusing their efforts internally to stabilise the business, with a very strong emphasis on cost. Effective cost management can however create opportunities for growth when armed with tried and tested business processes and a business software solution such as Sage ERP X3," says Theron.

As one of South Africa's leading professional services firms, Deloitte provides audit, tax, consulting and financial advisory services through nearly 3 600 people in all the major cities in South Africa and Southern Africa.

During 2011 Deloitte embarked on a partnership with Sage ERP X3 that was

aimed at the delivery of a cost efficient Enterprise Resource Planning (ERP) solution to its Mining Shared Services Division. Sage ERP X3 effectively forms part of a Deloitte service delivery model that allows mining companies to co-source and/or outsource transactional and knowledge processes and take advantage of the cost benefits offered by consolidating and streamlining back office processes. Deloitte's mining industry expertise coupled with Sage ERP X3's sector specific software capabilities are the two core ingredients to a winning recipe.

Organisations within the mining sector utilise ERP solutions for a diverse number of reasons. "Smaller companies may only utilise an ERP solution to manage its finance and purchasing, whereas bigger operators need to structure their business solutions around a more complex collection of needs. A scalable ERP solution is therefore essential to adapt to the business' needs however they may expand or change," explains Theron.



An aerial view of the Portside project which is being undertaken by Murray & Roberts, Western Cape.

IMS Cape Embarks on Complex Order at Portside Project

IMS Cape, part of the Zest WEG Group, has embarked on one of its most complex orders for generator sets to date, poised for installation in the R1.6-billion Portside Project in Cape Town, a new 35 storey commercial office tower that encompasses an entire city block on the Foreshore.

Portside, developed by Eris Property Group and Old Mutual Property, will become

the provincial headquarters for the three divisions of FirstRand Bank – First National Bank (FNB), Rand Merchant Bank and Wesbank. Co-owners Old Mutual will offer an additional 25 000 square metres in the tower for leasing to corporate office tenants.

The order was placed with IMS Cape in July 2012 by Murray & Roberts Western Cape, the principal contractor on the Portside project, and is scheduled for delivery in November this year, with installation in April 2013 and final commissioning in October 2013.

Zest Electric Motors Achieves ISO 9001 Certification

Zest Electric Motors, part of the Zest WEG Group, has been awarded ISO 9001 certification after an aggressive implementation programme which started in January 2011.

"From a local perspective, the Zest WEG Group understands that we compete in a very dynamic business environment that demands world

class quality management systems," Fernando Ribeiro, projects and logistics director at Zest WEG Group, says.

"The ISO 9001 certification is an endorsement of Zest Electric Motors' commitment to continuous improvement, as it calls for a highly customer-focused approach to business.

Achieving the certification was a smooth and natural progression for the company, because it essentially formalised the structures, standards and processes we already had in place."



Incoming product sample inspection at Zest WEG Group.

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Ben Kotze, lecturer at the School of Electrical and Computer Systems Engineering, Dr Nick Frydas and Mike Cary, President of the SAIEE.

Small Suppliers Can Make Big Difference In Electricity Delivery

Central University of Technology, Free State (CUT) recently hosted the annual Bernard Price Memorial Lecture in association with the South African Institution of Electrical Engineers (SAIEE).

Dr Bernard Price was a well-known Chief Engineer and General Manager of the Victoria Falls & Transvaal Power Co. He developed the Merz Price method of power circuit protection and was instrumental

in the formation and endowment of both the Bernard Price Institute of Geophysical Research, and the Bernard Price Institute of Paleontology at the University of Witwatersrand

Renowned engineer, Dr Nick Frydas, a Power Systems Engineer and Energy Economist living and working in the UK, presented the memorial lecture. He heads the Energy Markets & Regulation practice at international Consulting Group Mott MacDonald Ltd. which is an international consulting group mainly involved in energy policy, power sector reforms and market design advising governments, utilities, developers, lenders and regulatory agencies. Mike Cary President of the SAIEE remarked, "We are pleased to have such a renowned speaker for this prestigious lecture". Dr Frydas is increasingly involved in the Southern Africa region, having advised the Government of Botswana (2009-2010) in setting the framework for its independent energy & water regulatory agency and more recently advising South Africa in their Independent Power Producer (IPP) programme and energy sector reforms.

His lecture entitled "*The power system of tomorrow – definitely not business as usual!*" gave insight into the small electricity supplier potential. Small-scale electricity supply is a very new concept in South Africa; in Europe it has already been widely adopted. Small suppliers can include farmers, businesses and even households that generate power through solar panels and other methods and then they sell the electricity to larger entities such as Eskom. Another issue that was discussed was the large-scale integration of Renewable Energy Systems (RES) into power systems.

"With renewable energy capacity steadily growing worldwide, issues around integration are an increasing concern, carrying reserve for response, uncertainty of wind and solar output and curtailing renewable energy systems when 'spillages' can't be managed. These are all problems which keep dispatchers awake at night." said Frydas.

The real challenges of climate change and the security of supply leading to the decarbonisation of the power system was a key focus during the lecture.

The Minerals Education Trust Fund

The Minerals Education Trust Fund or METF as it is known, was constituted in 2000 with the primary objective of ensuring sustainable tertiary minerals education in South African higher education institutions. Over the year a number of socio - economic factors ranging from decreased government subsidies paid to tertiary institutions to the world wide skills shortage in the mining industry had resulted in a depletion of teaching staff at tertiary education institutions. This shortage was aggravated by large numbers of poorly prepared students entering the system and resulted in a situation whereby

the flow of suitably qualified graduates, necessary for the sustainability of the industry as a whole, was at risk.

The METF therefore seeks to address this situation by attracting, retaining and developing undergraduate teaching staff at key tertiary departments offering minerals education in the disciplines of Mining and Metallurgical/Minerals Processing Engineering as well as Geology. It does so by way of salary subventions which aim to bring academic salaries to within a range of 66 -80% of salaries being paid in industry. This not only provides incentives for existing staff to stay on in academia but also makes it feasible for individuals with industry experience and junior academic

staff to consider an academic career. Over the years the poor pay levels in the academic institutions had also resulted in a skewed age profile in many departments headed by older staff but lacking younger middle level staff as these had been lured into industry by more lucrative salary packages and improved career prospects.

The subventions have proved to be highly successful in achieving their objective with most departments either fully or nearly fully staffed and a marked decline in staff losses. Many departments also show improved staff profiles in terms of age, race and gender.

For information refer to www.mETF.co.za

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Winner of the Most Promising Designer award - Solomon Van Belling with Tree of Light



Jan (left) and Justus Liebenberg - winners of the Professional category with their L.E.T Light Emitting Trucking design.



Winner of the Student category - Tanya Smit with her design Tri-Lum Luminaire.

Eskom honours winners of the Energy Efficient Lighting Design Competition

After months of competition, nail-biting regional finals and intensive examination and appraisal by a panel of expert judges, South Africa's latest group of energy efficient lighting designers were honoured with a total of R214 000 in prize money for their achievements at the awards breakfast of the 2012 Eskom Energy Efficient Lighting Design Competition held at The Saxon in Johannesburg.

Walking away with the top award for South Africa's leading Innovative Energy Efficient Lighting Design, for professional designers, electrical engineers and researchers was Free State architect Justus Liebenberg and his brother Jan Liebenberg with their L.E.T Light Emitting Trucking design, which won them R40,000 and the prestigious Sparks Trophy.

A student from the Greenside Design Centre, Tanya Smit's design, Tri-Lum Luminaire, was declared the top Residential Luminaire Design (student category) earning her R30,000 and her educational institution, R10,000.

Visually impaired Solomon van Belling,

representing a group-community project from Emmaus in George, a centre for adults with mental and physical disabilities, was awarded the Most Promising Designer special award with prize money of R10,000; and nine year old Thomas Granig, a grade three learner from Dunkeld West received R10,000 for the Most Promising Young Designer special award.

The awards were presented by Andrew Etzinger, Senior General Manager, Eskom: Integrated Demand Management (IDM), the Executive Sponsor for the Eskom Energy Efficient Lighting Design Competition; along with Ms Mokgadi Modise, Chief Director: Clean Energy at the Department of Energy.

Mr Etzinger said that the competition had been characterised by an increased number and higher standard of entries than previous years. In many cases, he said, the entries had been inspired by an pressing need for lighting within communities and are extremely relevant in the South African context, especially for rural areas, and are flexible and cost effective. "Many of the entrants addressed the need for light in low cost housing creatively and devised ingenious solutions. The competition proved beyond doubt that South Africans are embracing energy efficient residential lighting and not just for the more affluent market. All the participants demonstrated



Nine year old Thomas Granig received R10,000 for the Most Promising Young Designer award. His Design - LED Enviroilight

that efficient lighting technologies such as fluorescent technology and LEDs can be used in ultramodern and attractive luminaires for residential lighting."

"We acknowledge that South Africa's development and future growth is inextricably linked with our power supply. The creative and innovative among us harbour the potential to generate new systems and luminaires which are energy efficient, functional as well as aesthetically appealing," concludes Mr Etzinger.

CONLOG launches a new prepaid meter

One device does it all – prepaid, postpaid and smart! The world's leading prepayment solution provider, has raised the bar again with the launch of a new prepaid electricity meter.

The new device is built on a long-standing heritage which began when Conlog launched the world's first single phase DIN rail mounted prepaid meter, called the BEC44, more than 15 years ago.

The new meters carry the same brand name and again have the smallest dimensions in the industry, but functionally these meters are light years ahead of the original BEC44.

The range comprises two distinct products, being a wired and integrated wireless solution, and herald a new level of functionality and practicality for utilities and consumers alike. The most radical enhancement is the ability for the meters to operate in both prepayment or post-payment mode.

This means that the utility is able to change a consumers' service from post-payment, to prepayment and back to post-payment, simply through the use of a token.

This will result in massive infrastructure and capex cost reductions, as previously the deployment of prepayment necessitated a complete swap out of the existing metering infrastructure and devices.



Derek Hanekom Presented With SAIEE Certificate of Membership

Mike Cary and Stan Bridgens have presented Minister of Science and Technology, Derek Hanekom, the prestigious Companion Certificate of Membership of SAIEE. The presentation took place in the ministerial offices of the CSIR complex, Pretoria East, on Friday 09 November 2012.

The status of Companion is by invitation of Council to any person who has rendered important services to electrical engineering in commerce, finance, law or science. This criterion has certainly been exceeded by the recent successful bid by government to acquire the lion's share of the international SKA (Square Kilometre Array) project and is indicative of the tremendous achievement for South Africa and the huge contribution it will be making to science in the future.

The SAIEE has had a long relationship with the Department of Science and Technology during the previous reign of Naledi Pandor and has enjoyed the company of both Derek and Naledi at its many official functions. Long may this relationship continue with the SAIEE which stand to support the new Minister in his endeavours in any way he may deem appropriate.



Serving up a POWER-GEN-sized slice of colossal Kusile

As part of the inaugural POWER-GEN Africa, which took place at the Sandton Convention Centre from 6-8 November, an intrepid group of delegates had a unique opportunity to visit Kusile, which once operational will be the fourth largest coal-fired power installation in the world.

By its scheduled 2018 completion date the station, located in Mpumalanga province, will have a total capacity of 4800 MW. The first of its six 800 MW units is due to commence operations in 2014.

Under development by South African state-owned utility Eskom, Kusile is the country's most technologically advanced coal plant and will be the first to feature flue gas desulphurisation (FGD), a key environmental objective for Eskom.

A base-load facility, Kusile forms part of Eskom's plan to increase its total generation capacity by some 40 GW by 2025, almost doubling its existing generation portfolio.



APPLIANCE INTERFACES: one size fits all

Keeping it simple is the key to designing user interfaces for the latest generation of appliances

BY I STEPHEN PORTER I MICROCHIP TECHNOLOGY INC.



A state-of-the-art user interface used to be a couple of knobs on the front of a television screen giving the user the power to get out of their chair and adjust the volume and the channel. Now, users don't even need to get off the sofa to

control simulated surround sound or high-quality video.

As appliances become more complex and users expect more from the user interface, designers are faced with increasingly complex

decisions such as: what information to include; how to display the information; the type of interface technology; and whether to include touch screens and graphics.

Appliance interfaces have to work

The key to success is simplicity. Take microwaves for example. Just a few years ago, microwaves featured buttons for functions as diverse as popping corn, re-heating pizza, or melting butter; or they used buttons to drive submenus of alphanumeric displays. Rather than making life easier to use, these often just added more complexity and confusion. Today, the microwave interface is typically a graphical display, with either a simple set of buttons, or perhaps even a single button.

GOING GLOBAL AND GRAPHICAL

The need to sell products across different countries, with different languages, means that a common trend is to use buttons with universal symbols. For example, washers and driers are replacing multiple buttons with words such as 'stop' and 'start' with a single button with the universal symbols for 'play', 'pause' or 'power', as shown in Figure 1.



Figure 1: Universal symbols on a button using mTouch™ Metal Over Cap touch-sensing

SOFT BUTTONS

There is, however, one thing that replacing words with symbols cannot do for the user interface: it cannot make the buttons 'soft'. A soft button makes use of the product's display to label the button's functionality. This allows the button to have many different functions; or for the same functions to be displayed in different languages. Soft buttons are as useful as universal symbols in allowing appliances to go global.

The concept of soft buttons also helps to make the user interface crisper and cleaner. Take, for example, a fridge-freezer with an integrated ice/water dispenser. Not so long ago, there would have been different mechanical buttons for crushed ice, cubes and for the light in the ice/water dispenser area. Inside, there would have been a rotating knob that set the temperature of the freezer and the refrigerator. The user had no way of knowing what the temperature was inside the refrigerator, and no way of customising the lighting inside of the unit. For the designer,

on many levels. They must certainly give the user easy access to every function that the appliance has to offer, but it is just as important that the interface is attractive. A good-looking interface helps to sell the appliance because, whilst end-users may have a wish-list of functions, immediate visual impact, and the ability to complement its surroundings when they get it home, can be just as important.

APPLIANCE INTERFACES: one size fits all

continues from page 23

each of the buttons and knobs would have meant a different circuit board and, for the manufacturer, labels printed in different languages for users in different countries.

Now, all of these buttons can be replaced with a single user interface just above the ice/water-dispenser on the outside of the refrigerator. The new user interface, shown in Figure 2, will consist of no more than two fixed buttons and a graphical display. Users

become too much information? If all of the information discussed above were displayed at the same time, then the details would be lost to the user. The goal is to combine the high-level information that users will want to see most often, with intuitive drill-down menus that will quickly provide the user with additional information when they need it, as well as a simple route to return to the home screen.

important reason is that it provides the ability to upgrade or change information as new developments are introduced. Today's embedded microcontrollers, which drive much of the technology discussed in this article, support connectivity which can be used by manufacturers to update the firmware in the appliance. This could be as simple as providing the end-user with a USB port that would allow them to download updates from the manufacturers' web-site. Alternatively, it could mean wired or wireless paths which automatically send updates to the appliance. Figure 3 shows an example microcontroller that provides these connectivity options.

Imagine that a manufacturer invents a new algorithm that could prevent the build-up of lint in a washing-machine. For end-users with machines equipped with the latest interfaces, an upgrade would be as simple as receiving an email from the manufacturer which explains how to push a few buttons on the machine to receive the updated software. The new programme would also provide an updated display menu, which would have been impossible to update with an older, fixed display.

BUTTON DESIGN

Designers have a choice of several technologies for the display and for the external buttons. First, the latest displays are getting larger and offer higher resolutions, or pixels per inch. Previously, resistive touch screens were used over the display, but their polyester film surfaces were prone to scratches and had low levels of light, making the displays look dull. The latest technology uses projected-capacitive sensors that are sputtered on the reverse of the glass and then mounted in front of the display. This provides greater light



Figure 2: Soft buttons in a simple interface give users more information and control

will be able to see the current temperature in both the freezer and the refrigerator, and adjust them individually; they will be able to check the status of the water filter and do so much more, without even opening the door.

INTERFACE DESIGN

Soft buttons allow designers to give users significantly more information and control but, eventually, designers must ask themselves: when does enough information

In Figure 2, for example, the water-filter soft button could be green if the filter still has 30% life, and change to yellow and then red as it approaches the end of its life. Touching the button could provide the user with additional information, such as the time left until the filter needs to be changed.

There are other reasons why a designer may want to use display technology with one or two simple buttons, rather than fixed displays or multiple buttons. The most

Capacitive-touch technology eliminates the need to push the button, but physical contact must be made to change the capacitance and register a touch, so there are tradeoffs.

transmission which, in turns, makes the display look brighter and also supports multi-touch inputs on the display.

For the external buttons, standard capacitive-touch buttons can include a non-conductive covering plate, such as glass or plastic. These buttons are found on almost all of today's products. Capacitive-touch technology eliminates the need to push the button, but physical contact must be made to change the capacitance and register a touch, so there are tradeoffs. They cannot, for example, be activated by gloves or by the end of a wooden spoon, so using them on a cooker could mean that users would have to take off their oven gloves every time they wanted to change a temperature.

Some users also like to have tactile feedback from their buttons. For many designers, this has meant staying with mechanical buttons or, alternatively, using the 'Metal Over Cap' technology shown in Figure 1. Metal Over Cap measures the deflection of

the front service panel through a capacitive sensor and a target mounted above it. Now, the user can use an oven glove or the end of a wooden spoon to activate the button. However, unlike standard capacitive-touch technology, these buttons do require a definite push.

INTERFACES OF THE FUTURE

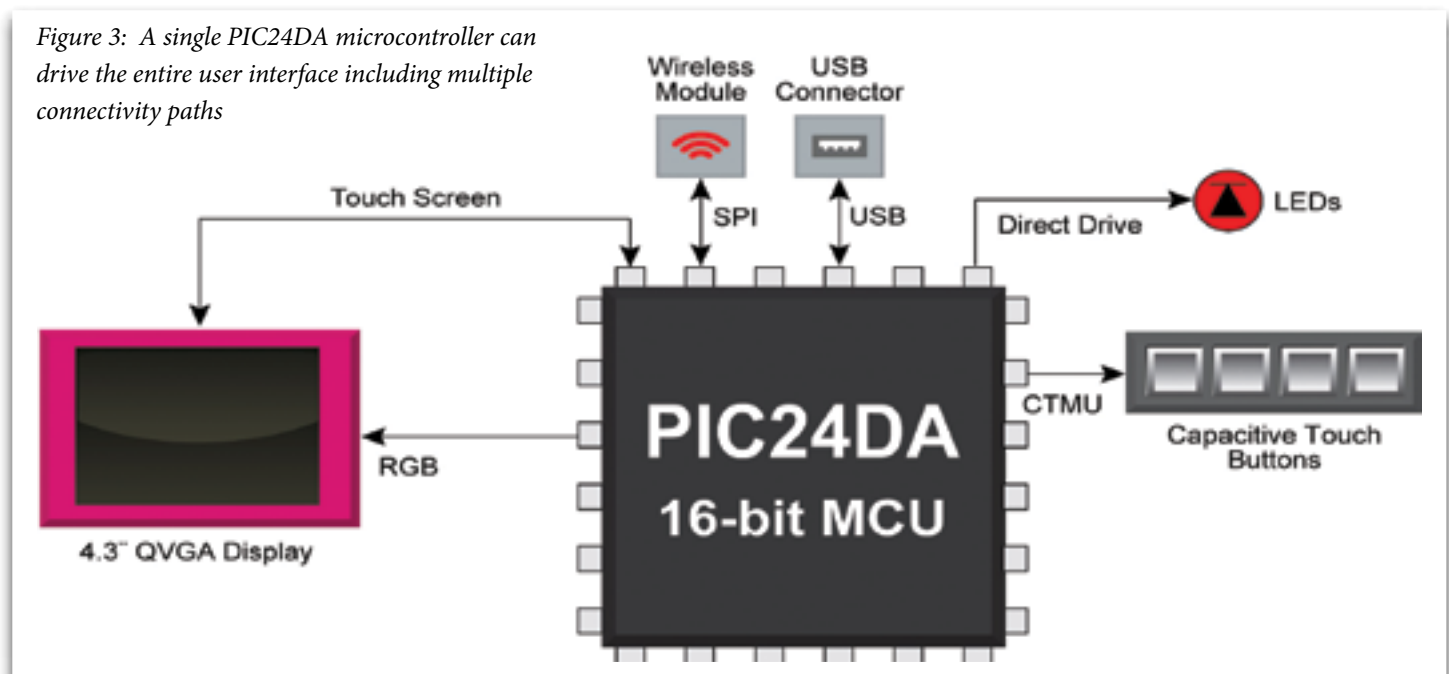
Initiatives such as Smart Energy and the Smart Grid will have a big impact on what and where information is displayed. Standards are currently being developed which will introduce appliance interoperation, allowing the refrigerator to communicate with the oven as well as with the energy meter, the thermostat, hot water heater, washer, dryer, and other appliances.

Some regions have already introduced tiered energy prices which are based on average use and demand. This could mean, for example, that turning on the dishwasher immediately after dinner may not be the most cost-effective way to get the

dishes done. In future, users would know this because the dishwasher display would give them real-time information which would allow them to compare energy costs now or in a few hours time. Real-time information provided by appliances could, therefore, drive real-world choices over energy use.

The microcontrollers that drive the latest interface technologies help end-users and the manufacturers to cut costs. They allow manufacturers to streamline production processes by eliminating the need to manufacture different versions for different regions, as well as providing remote diagnostics and product upgrades.

For end-users, they provide interfaces which combine high levels of control with real-time information feedback, allowing them to make more informed decisions on their energy consumption and to take more control of their appliances and their energy costs. **Wn**



How do touch-screen monitors know where you're touching?

COMPILED BY I MINX AVRABOS

Touch-screen monitors have become more and more commonplace as their price has steadily dropped over the past decade.

There are three basic systems that are used to recognize a person's touch:

- Resistive
- Capacitive
- Surface acoustic wave

The resistive system consists of a normal glass panel that is covered with a conductive and a resistive metallic layer. These two layers are held apart by spacers, and a scratch-resistant layer is placed on top of the whole setup. An electrical current runs through the two layers while the monitor is operational. When a user touches the screen, the two layers make contact in that exact spot. The change in the electrical field is noted and the computer calculates the coordinates of the point of contact. Once the coordinates are known, a special driver translates the touch into something that the operating system can understand, much as a computer mouse driver translates a mouse's movements into a click or a drag.

In the capacitive system, a layer that stores electrical charge is placed on the glass panel of the monitor. When a user touches the monitor with his or her finger, some of the charge is transferred to the user, so the charge on the capacitive layer decreases. This decrease is measured in circuits located at each corner of the monitor. The computer calculates, from the relative differences in charge at each corner, exactly

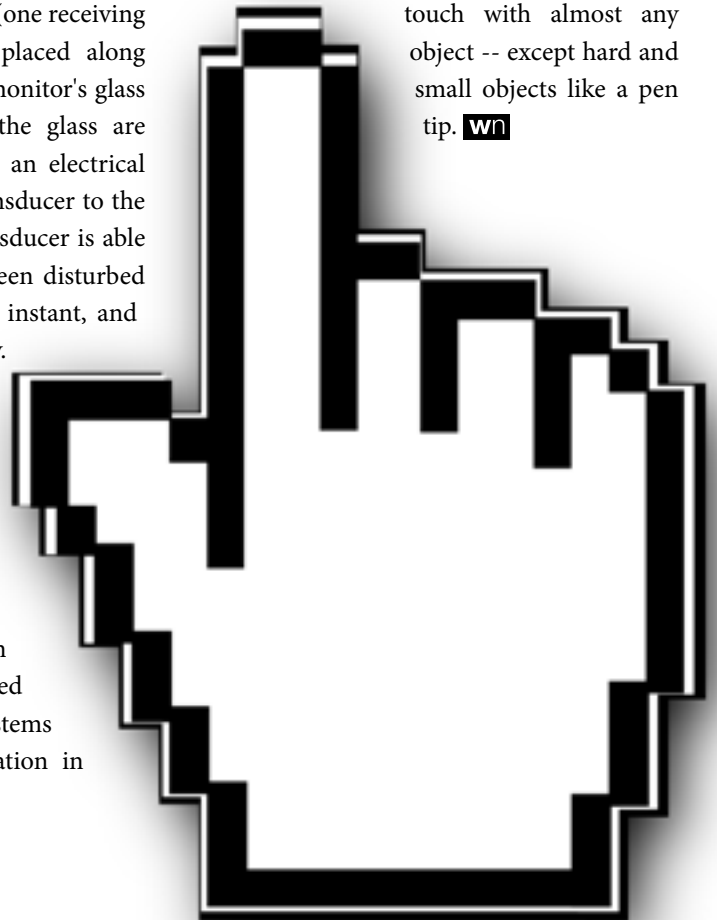
where the touch event took place and then relays that information to the touch-screen driver software. One advantage that the capacitive system has over the resistive system is that it transmits almost 90 % of the light from the monitor, whereas the resistive system only transmits about 75%. This gives the capacitive system a much clearer picture than the resistive system.

On the monitor of a surface acoustic wave system, two transducers (one receiving and one sending) are placed along the x and y axes of the monitor's glass plate. Also placed on the glass are reflectors -- they reflect an electrical signal sent from one transducer to the other. The receiving transducer is able to tell if the wave has been disturbed by a touch event at any instant, and can locate it accordingly.

The wave setup has no metallic layers on the screen, allowing for 100-percent light throughput and perfect image clarity. This makes the surface acoustic wave system best for displaying detailed graphics (both other systems have significant degradation in clarity).

Another area in which the systems differ is in which stimuli will register as a touch event. A resistive system registers a touch as long as the two layers make contact, which means that it doesn't matter if you touch it with your finger or a rubber ball. A capacitive system, on the other hand, must have a conductive input, usually your finger, in order to register a touch. The surface acoustic wave system works much like the

resistive system, allowing a touch with almost any object -- except hard and small objects like a pen tip. **wn**



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Recommendations for periodic inspection and testing of the system

Some analogue addressable fire detection and control systems include automated test procedures that identify system faults and individual detector conditions by checking the detection device's analogue values and comparing these with algorithms which determine the condition of the sensing chamber. Where these type of systems are deployed, routine testing under this sub clause may be modified to omit testing which is proven to be unnecessary by the equipment manufacturer, provided it can be proven that the automatic monitoring achieves the same objective as the appropriate test recommended within this document.

In the case of detectors (all types), tests should ensure that products of combustion are capable of passing unhindered from the protected area to the sensing chamber/elements of the detector and not simply test the ability of the detector to sample/verify the status of the atmosphere already in the sensing chamber.

The recommendations in this clause should be carried out by a competent person as described above, the period between successive inspection and servicing visits should be based upon a risk assessment, taking into account the type of system installed, the environment in which it operates and other factors that may affect the long-term operation of the system. The recommended period between successive inspection and servicing visits should not exceed six months.

If a risk assessment shows a need for more frequent inspection and servicing visits, then all interested parties should agree the appropriate inspection and servicing schedule. If this recommendation is not implemented, it should be considered that the system is no longer compliant with this standard.

THE FOLLOWING ARE APPLICABLE:

- The system log book should be examined. It should be ensured that any faults recorded have received appropriate attention.
- A visual inspection should be made to check whether structural or occupancy changes have affected the compliance of the system with the recommendations of this standard for the siting of manual call points, automatic fire detectors and fire alarm devices. Particular care should be

taken to verify whether:

- All manual call points remain unobstructed and conspicuous;
- Any new exits have been created without the provision of an adjacent manual call point;
- Any new or relocated partitions have been erected within 500 mm horizontally of any automatic fire detector;
- Any storage encroaches within 300 mm of ceilings;
- A clear space of 500 mm is maintained below each automatic fire detector, and that the ability of the detector to receive the stimulus that it has been designed to detect has not been impeded by other means;
- Any changes to the use or occupancy of an area make the existing types of automatic fire detector unsuitable for detection of fire or prone to unwanted alarms;



-Any building alterations or extensions require additional fire detection and alarm equipment to be installed.

- The records of false alarms should be checked. The rate of false alarms during the previous 12 months should be recorded. Action taken in respect of false alarms recorded should comply with the recommendations of the Standard.
- The standby battery should be disconnected and full load alarm should be simulated.
- Batteries and their connections should be examined and momentarily load tested with the mains disconnected (other than those within devices such as manual call points, detectors and fire alarm sounders of a radio-linked system), to ensure that they are in good serviceable condition and not likely to fail before the next service visit. Vented batteries should be examined to ensure the fire alarm functions of the control and indicating equipment should be checked by the operation of at least one detector or manual call point on each circuit. An entry should be made in the log book indicating which initiating devices have been used for these tests.
- The operation of the fire alarm devices should be checked.
- Batteries and their connections should be examined and momentarily load tested with the mains disconnected (other than those within devices such as manual call points, detectors and fire alarm sounders of a radio-linked system), to ensure that they are in good serviceable condition and not likely to fail before the next service visit. Vented batteries should be examined to ensure that the standby battery should be disconnected and full load alarm should be simulated.
- All controls and visual indicators at control and indicating equipment should be checked for correct operation.
- The operation of any facility for automatic transmission of alarm signals to an alarm receiving centre should be checked. Where more than one form of alarm signal can be transmitted (e.g. fire and fault signals), the correct transmission of each signal should be confirmed.
- All ancillary functions of the control and indicating equipment should be tested.
- All fault indicators and their circuits should be checked, where practicable, by simulation of fault conditions.
- All printers should be tested to ensure that they operate correctly and that characters are legible. It should be ensured that all printer consumables are sufficient in quantity or condition to ensure that the

can you spot the difference?



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Recommendations for periodic inspection and testing of the system

continues from page 25



printer can be expected to operate until the time of the next service visit.

- Radio systems of all types should be serviced in accordance with the recommendations of the manufacturer.
- All further checks and tests recommended by the manufacturer of the control and indicating equipment and other components of the system should be carried out.
- On completion of the work, any outstanding defects should be reported to the responsible person, the system log book should be completed and a servicing certificate issued.

NON-ROUTINE ATTENTION

The arrangements described above are intended to maintain the system in operation under normal circumstances.

However, from time to time, the fire alarm system is likely to require non-routine attention, including special maintenance. Non-routine maintenance includes:

A special inspection of an existing fire alarm system when a new servicing organization takes over servicing the system;

- Repair of faults or damage;
- Modification to take account of extensions, alterations, changes in occupancy or false alarms;
- Action to address an unacceptable rate of false alarms;
- Inspection and test of the system following a fire.

RECOMMENDATIONS FOR SPECIAL INSPECTION ON APPOINTMENT OF A NEW SERVICING ORGANIZATION

THE FOLLOWING RECOMMENDATIONS APPLY;

- When a servicing organization takes over servicing arrangements for an existing system, a special inspection should be carried out, and existing records, where available, should be studied, to obtain sufficient information to be documented for effective future servicing of the system.
- Major areas of non-compliance with the Standard should be documented and identified to the responsible person appointed by the user. The classification of a non-compliance as major is subjective, but the following non-compliances should be regarded as major:
 - It is not implied that non-compliances need to be rectified; this is a matter for the user to determine, based on the advice of the servicing organization, the enforcing authorities, the insurer and any third-party advisers engaged by the user, as appropriate.
 - An inadequate number of call points;
 - Inadequate provision of fire detection to comply with the recommendations of this standard for the Category of system that the system was designed to meet;
 - Sound pressure levels that fail to comply with the recommendations of the Standard;
 - Standby power supplies that fail to comply with the recommendations of the Standard. The absence of any standby power supply should be highlighted to the responsible person;
 - Cabling with fire resistance that fails to

comply with the Standard;

- Monitoring of circuits that fail to comply with the Standard;
- Standards of electrical safety recommended by the Standard;
- Exposure to, or experience of, false alarm;
- Changes in the use, layout and construction of the protected premises that may impact on the effectiveness of the system.
- If no log book suitable for enabling compliance with the recommendations exists, a suitable log book should be provided by the servicing organization.

RECOMMENDATIONS FOR ARRANGEMENTS FOR REPAIR OF FAULTS OR DAMAGE

THE FOLLOWING APPLIES

Where maintenance is carried out by a third party, such as a fire alarm maintenance organization, there should be an agreement for emergency call out to deal with any fault or damage that occurs to the system. The agreement should be such that, on a 24 h basis, a technician of the maintenance organization can normally attend the premises within 8 h of a call from the user.

It is accepted that the above response times are not be possible in very remote areas, in which case this should be regarded as a variation from the recommendations of this standard in respect of maintenance arrangements. This variation should be recorded in the system log book.

The name and telephone number of any third party responsible for maintenance of the system should be prominently displayed at the main control and indicating equipment, and the records and

WARNING: Carbon monoxide is a highly toxic gas, and suitable precautions should be taken.

documentation as identified elsewhere in this document should be kept updated.

- The user should record all faults or damage in the system log book, and should arrange for repair to be carried out as soon as possible.

MODIFICATIONS TO THE SYSTEM

Modifications to the system can arise for a number of reasons. Examples include:

- Extension of the system to protect areas of the building previously unprotected or newly constructed;
- Change of detector type as a result of changes in occupancy or the occurrence of false alarms;
- Re-siting of, or increase in the number of, detectors and/or fire alarm devices to take account of changes in the layout of the building;
- Reconfiguration of the system (in hardware, software or both) to change the cause and effect logic in order to facilitate filtering of false alarms.

Since modification of a system effectively involves an element of re-design, responsibility for modification of a system needs to rest with a person who has a sufficient degree of design competence.

Even simple modifications can give rise to the need for significant re-testing of the system. This is particularly true of software-controlled systems.

For example, a software change to facilitate a different cause and effect for a single automatic fire detector can result in the

introduction of software errors that affect the operation of entirely non-related parts of the system.

It is possible, in some systems, for modification of the system configuration to be carried out remotely, via a modem. Great care needs to be taken, regardless of whether modifications are undertaken on site or remotely, to ensure that:

- The system continues to comply in full with this standard, or that existing non-compliances are not made more non-compliant; if new variations are introduced, it needs to be ensured that a new certificate, reflecting the variations, is issued;
- Suitable tests are carried out at the protected premises to confirm that, after modification, the system operates as intended and that errors have not resulted in changes to other parts of the system;
- "As fitted" drawings and other records are updated as appropriate;
- Details of the modification are documented and provided to the responsible person.

Although the modifications may often be carried out remotely by the maintenance organization, it will be appropriate for a competent person from the maintenance organization to visit the premises before the modification is carried out, to confirm the validity of the modification and consider its effect on compliance with this standard. It might also be necessary to visit the premises to undertake certain tests immediately after the modification has been carried out. **wn**



*Watch this space - in the next issue of **wattnow**, we feature more information on Fire Standards.*



Voltage Dip Mitigation

Voltage dips are a major power quality problem for modern industrial processes, causing costly plant outages. Static Synchronous Compensators (STATCOM) are the latest generation of dynamic reactive power compensating equipment that can be used to effectively mitigate voltage dips.

BY I DALE PUDNEY

HVT POWER SYSTEMS AND LUO WEI I NR ELECTRIC CO

In this article, we consider the nature and impact of voltage dips, STATCOM technology and compare it to other alternatives.

UNDERSTANDING VOLTAGE DIPS

Voltage dips are the most important power quality problems faced by many industries and utilities. They contribute more than 80% of power quality (PQ) problems experienced. By definition, a voltage dip is an RMS (root mean square) reduction in the AC voltage at the power frequency, for duration from a half-cycle (10ms) to a few seconds (they are also known as voltage sags in America). Voltage dips are defined by the residual voltage (eg: 0.6pu) and duration (eg: 100ms).

Dips are mostly caused by high fault currents, which cause volt drops due to the various system impedances that act as voltage dividers. The most common causes of overcurrents leading to voltage dips are motor starting, transformer energising, overloads and short-circuit faults. The location of the cause of the dip in the system determines the severity. The duration of the dip is normally determined by the time that it takes to clear a fault or the characteristic of plant being energised.

Voltage dips are not tolerated by sensitive equipment used in modern industrial plants such as computers, process controllers, programmable logic controllers (PLC), variable speed drives



(VSD) and robotics. This type of equipments can trip out if the voltage goes below the allowable level or beyond a particular duration. Hence this type of equipment has a “dip ride through” capability curve similar to the example in Figure 1. These loads are not normally the bulk of the power demand, but they control many of the other processes in the plant.

Motors are affected by a dip in that they slow down or reduce their effectiveness but do not stop if the dip is short enough. Therefore



these loads normally return to full output when the voltage recovers, however high internal mechanical stresses could result in costly motor failures.

REDUCING COST OF DIPS

In order to minimise the cost of dips, we need to prevent sensitive equipment tripping out. It is therefore needed to analyse the dips being experienced in problem situations. Table 1 indicates the dips experienced at an industrial customer who are experiencing a severe impact on

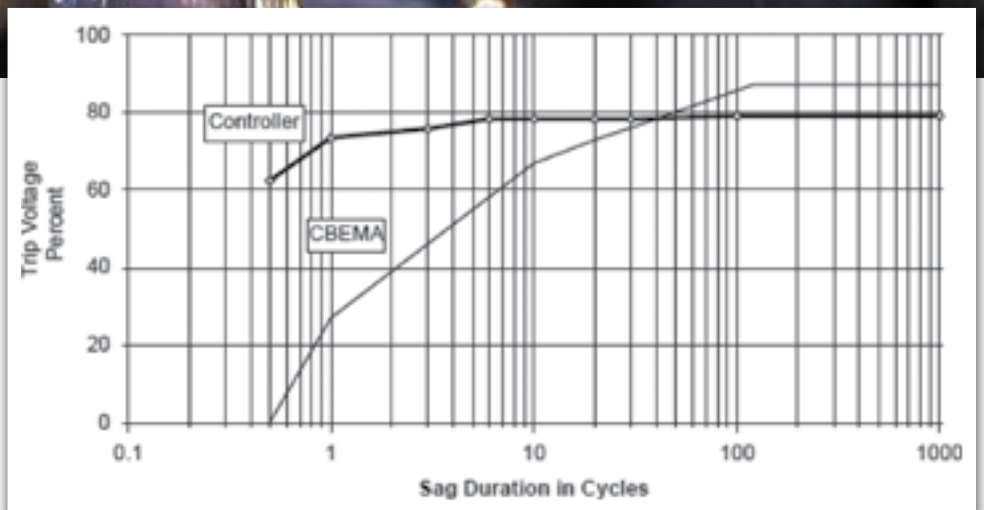


Figure 1: Typical dip ride through capability curve

Voltage Dip Mitigation

continues from page 33



Dip Classification	Number experienced	Probability of Drive Trip	Probable Trips
Y	457	10%	45.7
X1	9	25%	2.25
Z1	3	75%	2.25
S	54	75%	40.5
X2	2	75%	1.5
Z2	1	100%	1
T	1	100%	1

Table 1: Dips Experienced and Probability of Drive Tripping

variable speed drives in their plant. With the frequent tripping of critical drives, production is compromised and valuable hours lost. By reducing the depth of the dip, the probability of the dip causing sensitive equipment to trip will reduce the number and cost of dips.

USING REACTIVE POWER TO REDUCE DIPS

The voltage drop in the line mainly depends on the current taken by the load (I_L) as well as the resistance and inductance in the line. It can also be seen that the angle between the voltage and the current is playing a major role in maintaining the voltage. Consider the supply voltage is E_{gen} . A volt drop develops due to $I_L R$ and $I_L X$ to get the voltage at the load V_L .

By introducing a capacitive current I_C , we change the magnitude and phase angle of the current flowing through the line

impedance to I_R . Therefore, we are able to increase the voltage V'_L at the load.

To effectively reduce the depth of the dip, we need dynamic reactive power compensation systems that will have a fast response time and controlled to inject the correct amount of reactive power for the required duration. The dynamic reactive power source injects the 'missing voltage', to correct for the depth of the dip. The network diagram can be considered at the source voltage and residual voltage V_{dip} at the load during the dip. The reactive current source adds ΔV to the V_{dip} which is effectively $I_C Z_s$.

The voltage boost at the point of compensation will be more notable at the distribution level due to the higher source impedances. Therefore dip mitigation is usually done at the medium voltage distribution level.

PRINCIPLE OF STATCOM

STATCOM is the latest generation of reactive power compensation. STATCOM generates a sine wave from a voltage source converter (VSC) with the voltage source typically being a DC capacitor. STATCOM is effectively like an inverter with a battery connected to it. STATCOM use IGBT or IGCT semiconductors which can be controlled to switch off. A series of cascaded and individually controlled voltage sources are turned on or off, as required, to generate the voltage waveform desired by the controller. Full inverter bridges are bi-directional and the number of modules determines the smoothness of the output voltage waveform. The output waveform can be also be adjusted to dynamically inject or filter harmonic currents for active filtering. Figure 3 illustrates the principle.

The STATCOM is shunt connected to the supply through a reactor. Therefore the STATCOM acts like a controlled reactive current source depending on the voltage waveform that is developed (U_C). The response time of the STATCOM is between 3ms and 5ms, which is much faster than other alternatives.

The voltage U_C is developed independently of the supply voltage, based only on the voltage across the DC capacitor voltage sources. When $U_C > U_S$, then the current injected into the system is capacitive. When $U_C < U_S$, then the current injected into the system is inductive. The amount of "missing voltage" injected by the STATCOM and the duration that it is able to do so, is determined by the "energy" in the DC capacitors, similar to the capacity of the batteries connected to an inverter. A 30 MVAR STATCOM therefore can output from 30 MVAR inductive to 30 MVAR



Figure 2: Volt Drop Vector Diagrams

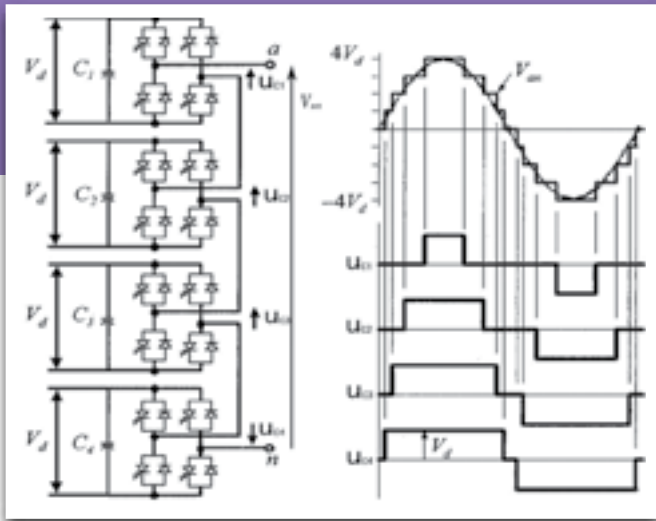


Figure 3: STATCOM Principle of Cascaded Voltage Sources

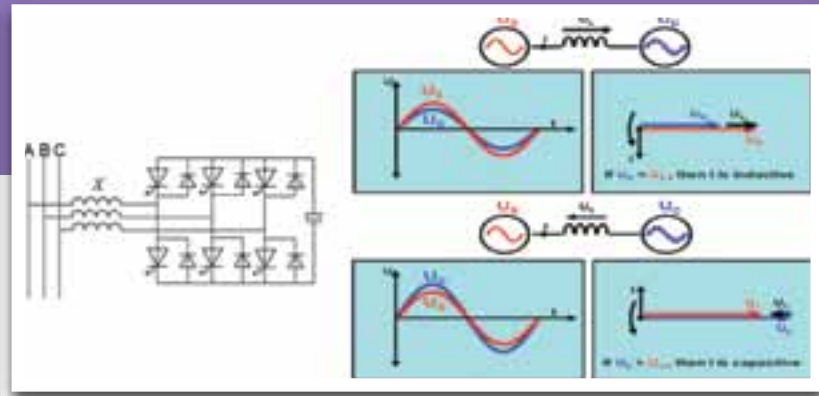


Figure 4: Controlled Reactive Current Source

capacitive continuously. The STATCOM can also output real power by changing the phase angle of the voltage waveform, depending on the "energy" available. In most cases the DC voltage support for the VSC will be provided by DC capacitors of relatively small energy storage capability - hence, in steady state operation, active power injected has to be maintained at zero.

As well as being used for voltage dip mitigation, STATCOM can also provide power factor correction to maintain the power factor near unity and / or voltage support to maintain the voltage at the target level. This will typically serve to improve the productivity and output of the customer's industrial processes.

STATCOM does not have any rotating parts, so maintenance requirements are low. It is modular, so transport, installation and maintenance are relatively easy.

Previously, STATCOM were installed at low voltage and connected to the supply via a transformer. Now the level of technology is such that the STATCOM are able to connect directly to medium voltages up to about 66kV. Because they are becoming more commonplace, the price levels make STATCOM more cost effective than other alternatives.

PERFORMANCE OF STATCOM FOR VOLTAGE DIPS

Various load types require varying amounts of real and reactive power. Therefore the response and capacity of the STATCOM can be affected by the load type. Transient simulations are necessary to predict the performance of the STATCOM in the real situation. For example, a 30 MVAR STATCOM was proposed; and EMTDC* simulations were conducted to determine that it would improve dips with a residual voltage of 0.6pu to about 0.87pu and 0.72pu to 1pu. Figure 5 shows the results of these simulation studies.

* - Electro-Magnetic Transients for DC

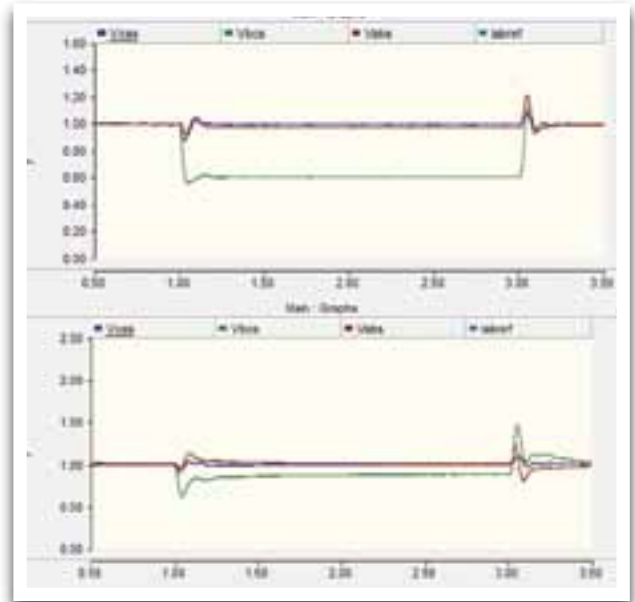


Figure 5: Dip Improvement Simulation Results

The proposed STATCOM moves dips of T to X1/X2, Z2 to Z1, X1 to Y, X2 to Y, S to Y, while eliminating Y and Z1 dips. The following table shows the predicted reduction in drive tripping probabilities.

Dip Classification	Predicted Improvement	Probability of Drive Trip	Probable Trips
Y	40	10%	4
X1	1	25%	0.25
Z1	1	75%	0.75
S	5	75%	3.75
X2	1	75%	0.75
Z2	0	100%	0
T	0	100%	0

Table 2: Trip Improvement Prediction

Voltage Dip Mitigation

continues from page 35



Therefore the proposed STATCOM is expected to reduce the predicted number of trips from about 95 without the STATCOM to about 10 with the STATCOM, a reduction of about 90%.

ALTERNATE SOLUTIONS FOR VOLTAGE DIP MITIGATION

There are several alternative methods to mitigate voltage dips:

- Improve the network design to reduce the number of faults and the fault-clearing time, e.g.: strengthening the network, reducing system impedances, improving insulation levels and using faster protection;
- Increasing equipment immunity, e.g.: change the dip ride through capability, install capacitors on the DC side of VSDs, install dip mitigating equipment at critical loads (in this article, we will consider the Dynamic Voltage Restorer (DVR));
- Mitigation equipment at the interface, e.g.: STATCOM, Static Var Compensator (SVC), Synchronous Rotating Machines.

Modifications in the process equipment itself tend to be the cheapest to implement but are not always possible because manufacturers have not made suitable equipment readily available in the market.

STATIC VAR COMPENSATOR

A Static VAR Compensator (SVC) normally comprises fixed reactive power output in the Form of Capacitor (FC) banks or harmonic filter banks and a Thyristor Controlled Reactor (TCR) (with variable output). Closed loop response times are typically around 20ms.

During normal operation, the output of the SVC is controlled to ensure the power

factor is near unity or the voltage is near the target level. If the SVC is designed for voltage dip mitigation, then there would be significantly more FC capacity available and the TCR output would be increased to "offset" this spare capacity.

SVCs have a number of disadvantages compared to STATCOM as follows:

- Slower response time
- Larger space requirements
- The TCR generates significant harmonics across the spectrum.
- The FC introduces a risk of harmonic resonance.
- The output of the FC is proportional to the square of the supply voltage (the output capacity is lower at low voltages).

SHUNT CONNECTED SYNCHRONOUS MACHINE

Shunt connected synchronous machines can be used for voltage dip mitigation. During normal operation they act as a spinning reserve. During a dip, the spinning of the machine tends to generate real and reactive power output, but without any other power source, the machine will slow down until it loses synchronisation (below about 0.6pu). While spinning, the reactive power output can be increased by changing the excitation of the generator. Additional rotational energy can be provided by a flywheel, which can improve the capability to several seconds. Therefore the synchronous machine can regulate the voltage through real and reactive power during the disturbance.

Synchronous machines have a number of disadvantages compared to STATCOM as follows:

- As a rotating machine, it is noisy and requires significant maintenance.

- It is large and heavy, and therefore difficult to transport and install.
- Because it is always spinning, the losses are high and continuous.

DYNAMIC VOLTAGE RESTORER (DVR)

A DVR is effectively a low voltage STATCOM, is series connected and provides individual unit compensation. During a dip, the DVR opens a "quick switch" to temporarily connect the DVR in series with the load. The response time is about 5ms. During a voltage dip, the DVR adds the missing voltage through a series connected impedance, and therefore DVR compensation capacity is not dependent on the system capacity or supply impedance. The load remains connected to the grid and the DVR calculates the "missing part" of the voltage waveform, and corrects it.

The DVR output is up to 1.5MW, depending on the energy storage capacity, and can compensate for 100% dips for up to about 3s. Connected at the 400V level, it is small, safe, fast to manufacture and easy to connect. It is therefore a rapid solution that can be implemented in an emergency and is a well established technology. Due to the size and voltage limit, DVR is only suitable for individual unit compensation.

Figure 6 shows the DVR connection diagram.

In some instances an overall plant solution may not be the most economical solution and a combination solution may be recommended. For the example above, the 30 MVAR STATCOM solution is expected to reduce the number of plant trips due to dips by about 85% to 90%. However, the recommended STATCOM

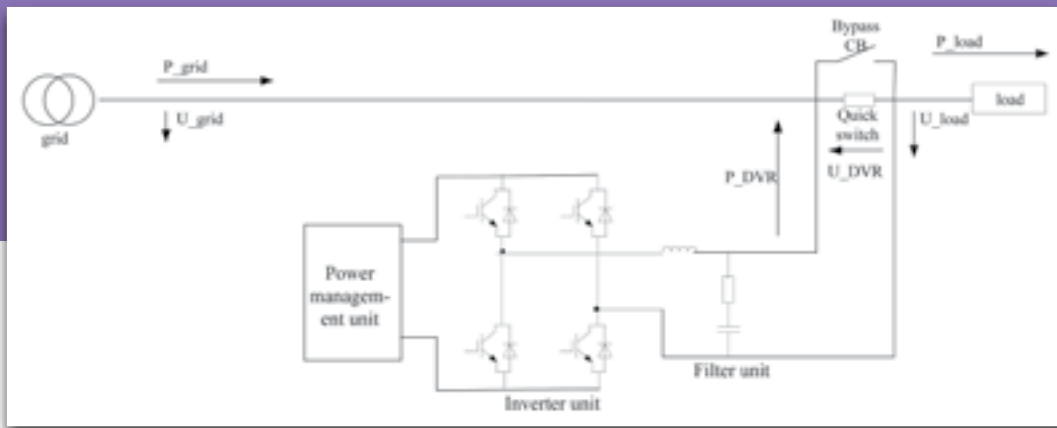


Figure 6: DVR Connection Diagram

size would probably need to be doubled to eliminate all the trips due to dips. A more economical solution would be to provide the most economic overall plant solution, and then provide DVRs for individual unit compensation on the most critical drives that have a high cost and time impact on plant outages for the remaining dips.

CONCLUSION

STATCOM is the latest generation of dynamic reactive power compensation technology that is best suited to voltage dip mitigation because of its fast response time less than 5ms and independent reactive current generation capability. STATCOM provides a shunt connected

controlled current source using a voltage source converter. STATCOM offers many advantages over older technology alternatives such as SVCs and synchronous machines. As STATCOM become more common, the price levels have also decreased to levels where they are now more economical than alternatives. Therefore STATCOM is now the technology of choice for voltage dip mitigation from both technical and economic points of view.

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NYNAS





Panama Canal Locks Project

BY I EPHRAIM KADEC

The Panama Canal, the waterway between the Atlantic and Pacific Oceans, provides transit service to vessels of all nations, some 13-14,000 per year. This number accounts for approximately 5% of the commercial world trade. The canal uses a series of locks, as well as a tow track with a fleet of locomotives to transit vessels through the canal.

The Panama Canal had problems due to a weak grid over 90 years old. The locomotives that pull the ships through the canal had extremely heavy and fast changing loads caused by the many starts and stops, thus creating power quality and voltage stability issues. The locomotives require delivered power to be free of transients, over- and-under voltage, unbalanced voltage and current and maintain a stable frequency to ensure a safe transit. The hilly terrain added to the existing complications. Locomotives would cease to function on uphill-climbs and plummet backwards, crashing in to oncoming locomotives. The canal had many technicians and maintenance crew on staff, 24 hours a day.

The Panama Canal Authority (ACP) searched for a solution to their Power Quality (PQ) problems with the following objectives in mind:

- Improve the electrical quality in the Panama Canal Locks;
- Reduce the impact of the fluctuations and disturbances of voltage on the equipment and machinery in both the Locks and Locomotives;



- Implement a monitoring system in a local and remote methodology;
- Reduce or avoid delays at the Locks due to electrical disturbances.

In the ACP's own words, they chose to use Elspec technology because of "the cycle-by-cycle" compensation speed, in addition to a large experience developed by the company in this field through applications for all type of industries such as Wind Turbine Generation, Port Cranes, Electric Trains, Cement, Plastic, High Rise Buildings, Hotels, Hospitals, Car Assemblers, etc., as well as other industrial applications that an electrical provision for quality for its continuous and reliable operation requires."

"This company also showed a world-wide leadership in the development of equipment of electrical measurement interconnected remotely with an innovative product called ELSPEC G4K (BLACKBOX) which is able to record up to a year of electrical parameters continuously."

Initially, four (4) prototype Equalizer systems were installed by ACP personnel in the Miraflores Lock central east wall in the four transformers that feed the locomotives. The Equalizers were then monitored for three months before the entire project was implemented. An additional 44 Equalizer systems were then installed by ACP personnel on both the Pacific and Atlantic sides of the canal with a final inspection made by the ACP with system start-up performed by Elspec.

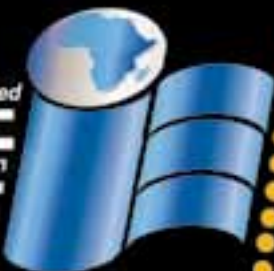
Immediately upon installation, the three Locks (Miraflores, Pedro Miguel and Gatun) saw a significant improvement in voltage disturbances. Machinery, which may have gone off-line because of the disturbances, continued running smoothly, eliminating the costly delays in traffic flow. In addition, harmonic distortion, especially the 5th and 7th, was drastically reduced.

All 48 Equalizer systems were also equipped with the ELSPEC G4K BLACKBOX and connected to the ACP's SCADA system, enabling the ACP to monitor continuously the electrical network of the Locks. Says the ACP, "The ELSPEC G4K has many advantages, one of the most important being the capacity to record all of the electrical parameters cycle-by-cycle with no need to establish limits (thresholds). Elspec properly fulfilled the requirements demanded in the contract and its amendments for the compensation of reactive energy, voltage control, harmonic filtering and power monitoring in the Locks of the Panama Canal." **wn**

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Herschel's reception of RF energy from the cosmos with his newly developed sending and receiving equipment in 1898 (well before Marconi), aroused little interest and was generally regarded with disbelief. He was nevertheless convinced that the signals he received were from extraterrestrial civilization and he spent much time trying to establish communications, becoming the first scientist to launch a SETI (Search for Extraterrestrial Intelligence) project. It was subsequently discovered that energy encompassing the entire electromagnetic spectrum is received from the cosmos. This laid the foundation for radio astronomy.

A major advance in radio astronomy came with the establishment of the Jodrell Bank observatory in 1945 and the development of long baseline interferometry. Radio astronomy has since developed into a significant component of terrestrial astronomy. The largest radio telescope dish on earth is the 305 metre dish at Arecibo, Puerto Rico. A major addition to the radio telescope scene is the Allen 42 dish array near Mount Shasta, California, which will be used to a large extent on SETI projects. Huge advances have been made in utilizing the higher frequencies of the electromagnetic spectrum by terrestrial and space observatories working in the submillimetre, infrared, visible, ultraviolet, X-ray and gamma ray wavelengths. In July 2012 astronomers achieved phenomenal results in very long baseline interferometry by linking submillimetre arrays in Chile, Arizona and Hawaii, and observing distant quasars in the 1,3 mm wavelength. An angular resolution of 28 microarcseconds was achieved rivaling the large optical telescopes. The ALMA RF (centimetre to submillimetre wavelengths) array in Chile is at present one of the largest ground based astronomical projects under construction. This is due to be surpassed by the vast SKA (Square Kilometre Array) project when this reaches its construction stage. The vast volume of SKA data is to be processed by supercomputers working in the exaflops range in Cape Town and Perth. The speed of exaflops processing is beyond human comprehension – 10^{18} floating point operations per second which is equivalent to 3300 computer instructions performed in the time taken by light to travel one millimetre. The SKA headquarters will be at Jodrell Bank, Manchester.

CONTINENTAL DRIFT

Wegener's theory of continental drift proposed in 1912 was regarded with ridicule. This was despite the similarity of coastline, geology and fossil records between Africa and South America. Wegener's



theory received strong support from geologist Alexander du Toit of Wits University. Decisive proof came later with the mapping of the Atlantic seabed and the discovery of the mid Atlantic ridge. Overwhelming proof came with video material showing magma welling up between the tectonic plates and eventually the movement could even be measured by means of the GPS. Tectonic plate movement in the Earth's crust has since become one of the most fundamental and far reaching theories of geology. It has been established that the Earth's crust consists of eight major plates

Great Discoveries

The great discoveries of science and engineering do not always meet with instant acclaim and fame for the discoverer. Let us take a look at three contemporary cases at the beginning of the 20th century, which were far ahead of their time, and where major discoveries were made. These met with disbelief and brought the discoverers little but ignominy, and even in some cases ridicule.

BY I.D.A.O. BASSON

and several lesser plates. The movement is astonishingly slow – a few centimetres per year, which is equivalent to the rate of growth of one's fingernails. Tectonic plate subduction around the Pacific Rim has made this the most violent seismic part of the Earth resulting in catastrophic earthquakes, volcanoes and tsunamis.

MAGNETIC ROPES

Birkeland spent much time in the early part of the 20th century studying the auroral flares around the Arctic. He was

particularly interested in the magnetic substorms in the magnetosphere which could greatly influence the Earth's magnetic field. As an aid to his studies he constructed a magnetized model of the Earth on which he could demonstrate the Aurora Borealis. In 1908 Birkeland deduced that enormous currents (of up to a million amperes) were flowing from the Sun to the Earth's magnetic poles, and interfering with the magnetosphere. These became known as Birkeland currents. These must, of course, be instantly discharged as the Earth's

capacitance (about 700 microfarads) could not contain this charge even for a microsecond. The currents flowing through the Earth from the point of entry to the point of exit are known as Pedersen currents. Birkeland currents are a class of plasma phenomena called z-pinch because of azimuthal magnetic fields produced by the current. These pinch the current into a filamentary cable. Initial proof of Birkeland's currents came in 1963 with the launch of a US Navy probe which carried a magnetometer above the ionosphere.

Great Discoveries

continues from page 41



Birkeland was nominated seven times for the Nobel physics prize. He was also renowned for his discovery and development of the process for electrically producing nitrate fertilizer at the Norsk Hydro power station which ominously also produced heavy water as a by-product. Another of his inventions was the magnetic coil gun (or rail gun). This could not however be fully developed by Birkeland due to the lack of an adequate current source. Coil guns have subsequently been developed to achieve accelerations comparable to those of artillery shells.

It is interesting to consider what happens when a stream of charged particles is ejected into space. This would be a current which is surrounded by a circular magnetic field. (mathematically, an electric current and its magnetic field are a single tensor quantity.) One might expect the particles to quickly spread out as a result of their mutual repulsion, but the surrounding magnetic field would keep them focused.

This current will then form itself into a spiral. Birkeland sought assistance with the complex mathematics from his former tutor, the mathematical giant Henri Poincaré. When several streams are ejected from the Sun they can twist themselves together like the strands of a marine hawser. These are known as magnetic ropes which can connect the Sun to the Earth and reach immense size.

They can be as thick as the diameter of the Earth and carry huge electrical currents. Despite the scale of this current, the current density is extremely low. When charged particles are ejected into a magnetic field they will spiral along the direction of the field. As they approach a region of higher

magnetic flux density they will penetrate the region to an extent depending on their energy and then rebound spiraling back in the direction from which they came. Electric currents moving in space without voltage, resistance or even a physical conductor and then rebounding backwards inside a magnetic field are a matter of great complexity and abstruse mathematics.

The Earth's magnetosphere is well known for its ability to deflect charged 'solar wind' particles to the magnetic poles thus causing aurora flares visible in the night sky at the polar regions.

NASA's THEMIS space mission (Time History of Events and Macroscale Interactions during Substorms) is designed to study energy releases from the Earth's magnetosphere known as substorms, magnetic phenomena that intensify auroras near the Earth's poles. THEMIS launched on 17 February 2007 originally comprised a fleet of five spacecraft of which two were subsequently placed in halo orbits at Lagrangian points of the Moon's orbit.

The satellites each have a mass of 77 kg, carry 49 kg of fuel and have a power consumption of 37 W. The satellites each carry identical instrumentation: a fluxgate magnetometer, an electrostatic analyser, a solid state telescope, a search-coil magnetometer and an electric field instrument.

From 15 February to 15 September 2007 the five craft coasted in a string-of-pearls configuration after which they were repositioned for data collection in the magnetotail. In 2007 a most remarkable result was achieved when evidence was found of magnetic ropes connecting Earth's upper atmosphere directly to the Sun. It

was estimated that the ropes pump 650 000 amperes into the Arctic! On 26 February 2008, THEMIS probes were able to determine, for the first time, the triggering event for the onset of magnetospheric substorms. This was found to be a magnetic reconnection event 96 seconds prior to auroral intensification.

The THEMIS mission made an additional remarkable discovery – magnetic portals called “electron diffusion regions” which occur where the magnetic fields of the Sun and the Earth connect. These are typically located a few tens of thousands of kilometres above the Earth's surface. These portals allow huge quantities of solar wind particles to move unhindered from the Sun to the Earth, causing geomagnetic substorms and intensifying auroras. The magnetic portals are very difficult to locate and can be small and short lived or vast, yawning and sustained. NASA's planned Magnetospheric Multiscale Mission (MMS) is due to be launched in 2014. This will be a fleet of four spacecraft equipped with energetic particle detectors and magnetic sensors. These will spread out in the Earth's magnetosphere to observe portal activity.

Magnetic fields, as we experience them on Earth, seem quite feeble compared to those that occur in the cosmos. The Earth has a field strength of about 60 microtesla at the poles. In industrial electrical machinery, a field strength of between one and two tesla is commonly used. The world record for a sustained magnetic field stands at present at 45 tesla. Much higher transient fields can be obtained from explosive devices but these destroy themselves in the process.

In work on the Tokamac nuclear fusion reactor, Andrei Sakharov developed

exploding pumped flux generators which achieved fields of 2500 tesla and currents of 100 million amperes. Magnetars, or soft gamma repeaters in the cosmos, can achieve sustained fields of an unbelievable 80 gigatesla. There are many millions of these stars in our own Milky Way galaxy.

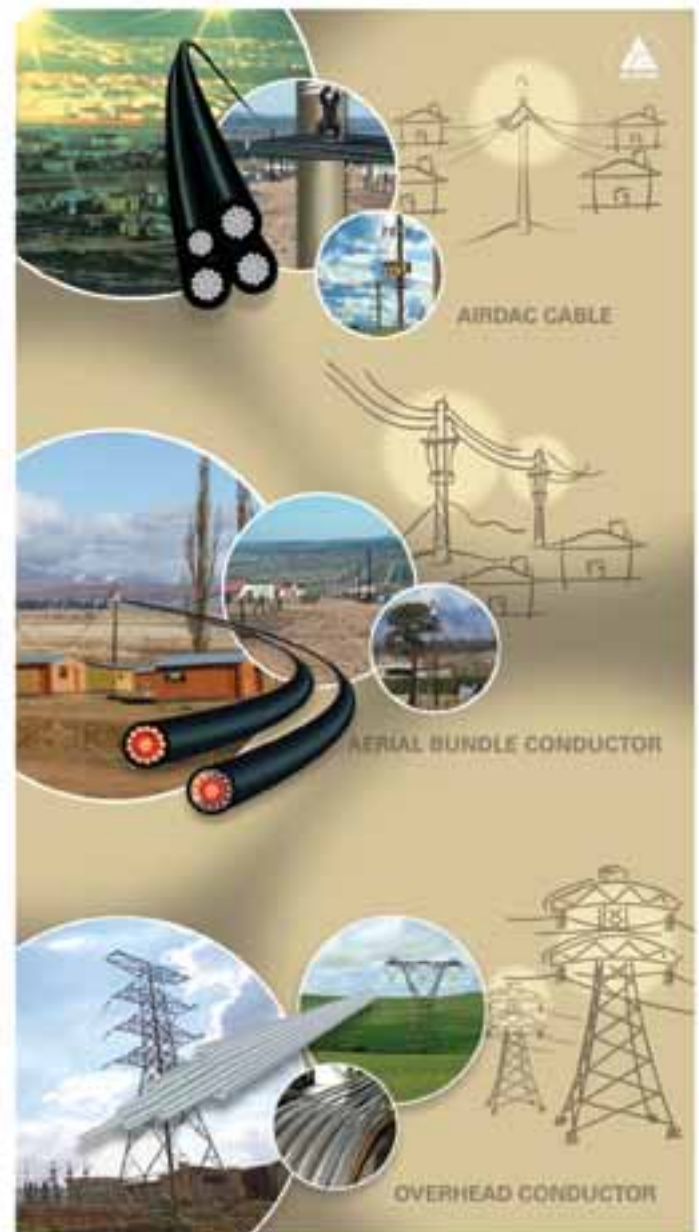
In a single burst, the magnetar can release more gamma ray energy than the Sun's total output in 1000 years. The magnetic field is so intense that the atoms in the star material are deformed into needle shapes. The magnetic field is not produced by electron currents but by a proton-superconductor phase of matter within the star. A magnetar typically has a diameter of twenty kilometers and a mass similar to that of the Sun.

Coronal Mass Ejections (CME) from superstorms on the surface of the Sun are a matter of great concern, as these can have devastating consequences for the inhabitants of the Earth. NASA's Solar Terrestrial Relations Observatory (STEREO) was launched in 2006. This consisted of two spacecraft, the one leading and the other trailing the Earth in its orbit. By late 2009 they had passed the L4 and L5 Lagrangian points of the Earth's orbit. The craft are equipped with suites of highly specialized instruments to monitor CME bursts, in stereo, on their way to planet Earth.

STEREO obtained sensational images of comet Encke as it passed through a solar storm while within the orbit of Mercury and encountered a CME. The CME first deflected the tail of the comet and then detached it completely, leaving the comet with the indignity of flying without a tail. The largest solar superstorm ever recorded occurred in August/September 1859. This is known as the Carrington Event, named after the discoverer and recorder, Richard Carrington.

The CME was so severe that aurorae were seen around the world and even over the Caribbean. Telegraph systems all over Europe and North America were disrupted, in some cases shocking the telegraph operators. The auroral light intensity was greater than that of a full moon. A repeat of this CME would result in a catastrophe for which few countries are prepared. **wn**

This article is based on selected extracts from "Dudley's Universe" by D.A.O. Basson.



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SA 'Pedal Power' Invention wins International Design Award



South African product design consultancy, IDESO, has beaten thousands of international products to win the coveted Red Dot 'Best of the Best 2012' Design Award for its transportable PowerPac invention that stores human-generated energy generated during cycling for later use, for charging or providing power to household and personal electronic devices.

Established in 1955, the Singapore-based Red Dot awards recognises world-class design achievements and is one of the world's most sought-after international seals of design quality.

While human power generation and storage is not new, IDESO's PowerPac is the world's first product to offer a removable power storage unit that becomes a portable charging unit for use anywhere in the home or office.

"With 58 countries competing, it's great to receive this prestigious accolade, especially as we are the fourth South African

company ever to win in the last 57 years," says IDESO MD, Marc Ruwiel.

"Our aim was to create an aesthetically pleasing, user friendly and functional design that marries the fluidity of cycling with dynamic power generation," he explains. *"It can be used by avid cyclists who can reduce CO₂ emissions and generate their own electrical power, while enjoying a good workout at home."*

He points out that an average cyclist could fully charge the battery from empty with 80 minutes of cycling and 132Wh of charge/potential energy can be stored in the battery which, for example, can be used to fully charge or power an iPhone, a power tool, a PC, a tablet and a camera, all from this stored personal energy.

The PowerPac features two housings to contain the required components. The larger housing is split into a front and a back cover that contains the permanent magnet DC generator and the charge controller. The smaller battery housing is split into a top and a base cover and

contains the 12V battery with a capacity of 11Ah, a DC to AC inverter and various energy output options: 220V AC (conventional plug), 12 DC (cigarette lighter) and 5V DC (USB).

"Industrial design does not get a lot of recognition or support in South Africa, even though we do great design work here," says Ruwiel, whose company designs for a range of well known local and global brands including Shell, GE, Tellumat, Addis and British American Tobacco (BAT), to name a few.

Ruwiel says that the award gives the PowerPac concept and IDESO a great deal of credibility and it comes at a good time, as Cape Town prepares to host the World Design Capital year-long event in 2014, which will put SA on the global design map.

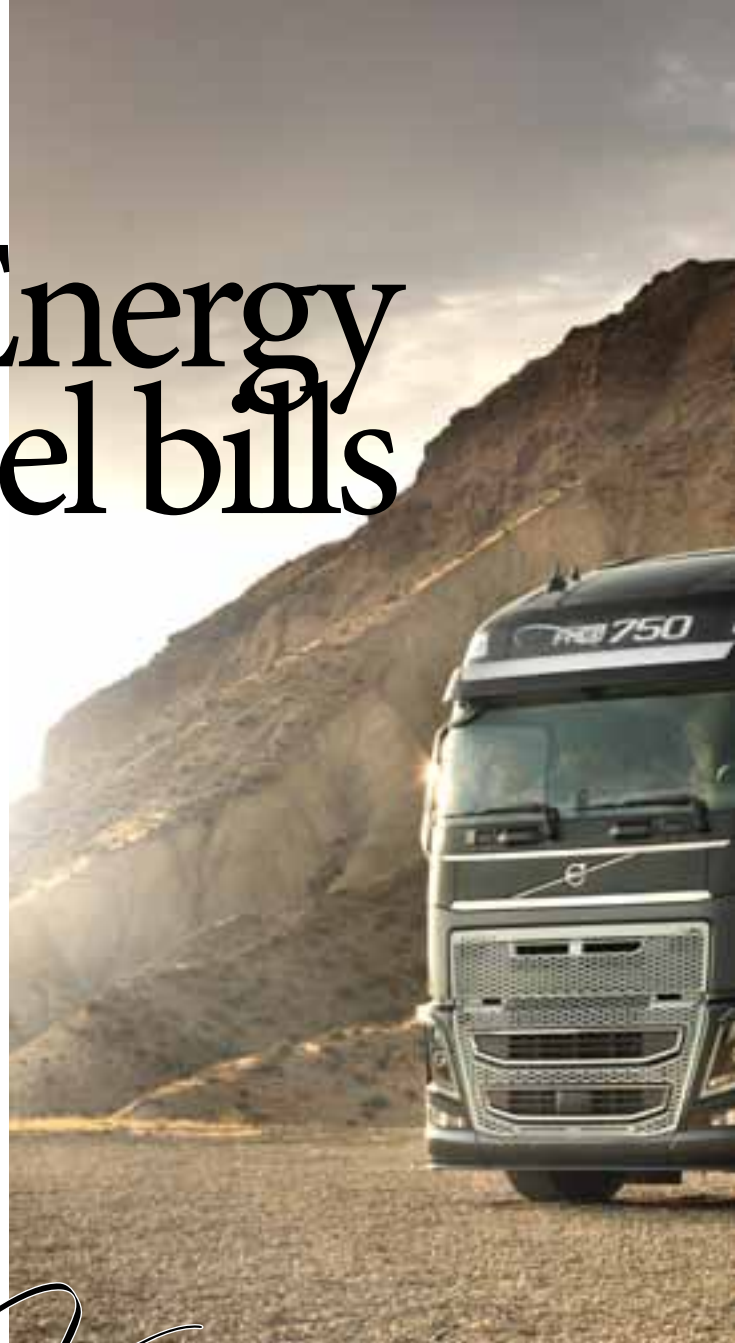
IDESO is now seeking an investment partner with an existing brand in the cycling industry to enable it to develop the PowerPac product further and get it into mass production. **wn**

Kinetic Energy to cut fuel bills

The truck industry is searching high and low for solutions that cut fuel consumption. One method is to use the vehicle's kinetic energy to propel the truck. Now Volvo Trucks has developed I-See, which operates like an autopilot and takes over gearchanging and utilises gradients to save fuel.



Anders Eriksson, Product Developer at Volvo Trucks.



Kinetic energy is the mechanical work needed to reduce an object's speed to zero. When an object in motion is slowed down, its kinetic energy has to be transformed into some other form of energy. When a vehicle brakes, its kinetic energy is converted into heat. Many manufacturers in the automotive world are now examining solutions for harnessing kinetic energy instead of releasing it as surplus heat.

"If kinetic energy can be exploited to a greater extent, it may help cut fuel consumption. This will benefit both the environment and the industry's economy, something that is very important today as fuel costs are becoming an increasingly heavy burden on many haulage firms," relates Anders Eriksson, product developer at Volvo Trucks.



And it is precisely this that Volvo Trucks has succeeded in developing with its new I-See solution. The system harnesses the truck's own kinetic energy to "push" the vehicle up hills. On downhill gradients the same energy is used for acceleration.

KINETIC ENERGY CAN SAVE 5 %

I-See is linked to the transmission's tilt sensor and obtains information about the topography digitally. The fact that the system is not dependent on maps makes it more dependable since it always obtains the very latest information. I-See can recall about 4000 gradients, corresponding to a distance of 5000 kilometres.

"I-See is an autopilot linked to the truck's cruise control, taking over and handling gearchanges, throttle and brakes on gradients, ensuring they all operate in the most fuel-efficient way possible.

I-See freewheels as much as possible – so on certain stretches of road no fuel is used at all," explains Hayder Wokil, product manager at Volvo Trucks.

"In this way fuel consumption can be cut by up to 5%. This figure is based on the results of simulations and tests on public roads. I-See requires use of the cruise control, and we know that on average drivers use cruise

control about half the time. For a truck in normal operation, covering 140,000 kilometres a year, the saving will be about 1000 litres of fuel annually.

This makes a big difference to the haulage firm's profitability," says Hayder Wokil.

BIGGEST EFFECT ON SMALL HILLS

I-See carries out six different operations to utilise the kinetic energy to the very maximum. For instance, I-See accelerates up hills, remains in a high gear for as long as possible and freewheels on descents to exploit the truck's weight as a propulsion motor.

Kinetic Energy to cut fuel bills

continues from page 47



"I-See works best in undulating terrain. With moderately long and steep slopes, I-See ensures that you can freewheel for long distances without using the engine," explains Anders Eriksson, who was responsible for the development of I-See.

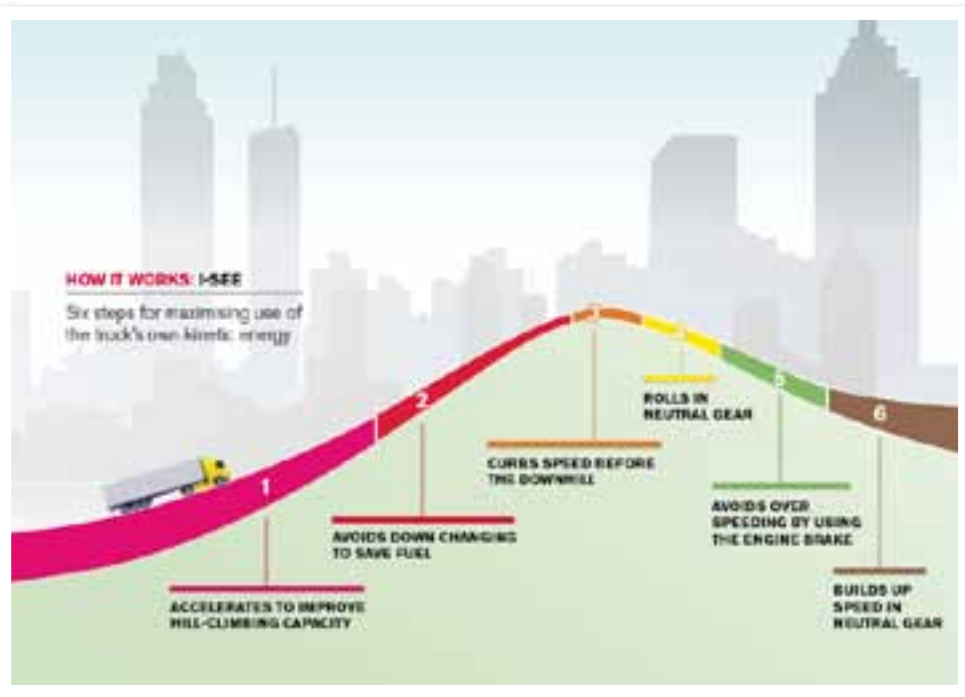
"It is this freewheeling capability that makes the system special," he adds. When the truck rolls freely, virtually no fuel is used. But in order to freewheel, a whole lot of data is required.

"It imposes high demands on precision. For instance, you have to know whether your speed will drop or increase over the next stretch of road. A gradient of just a few per cent can be the decisive factor," reveals Anders Eriksson.

Other factors that make a difference are air resistance and the truck's weight. All told the system has to keep track of and process a lot of information. Many truck drivers who test I-See will recognise the driving style it adopts.

"I-See imitates the driving style of good drivers. They utilise the vehicle's kinetic energy, accelerate in time and avoid unnecessary gear-changing," says Hayder Wokil, and continues: "But unlike a driver, I-See never gets tired – it's like an autopilot."

This allows the driver to focus more on the surrounding traffic and other aspects



I-See has functions for six different scenarios on a gradient

of the journey. What is more, progress on the road is more relaxed. "And an alert driver is a better driver. That's something we know for sure," says Hayder Wokil. Anders Eriksson also points out that it is not only fuel that is saved. "I-See reduces brake and tyre wear, for instance. And that naturally benefits the environment," he says.

I-See will become available on the market in 2013. See a film about I-See on www.youtube.com/VolvoTrucks.

FACTS:

I-See has functions for six different scenarios on a gradient:

- It accelerates before the incline starts.
- If you are near the brow of a hill, the system avoids changing gear if possible. Every gearchange means a drop in speed.
- It does not accelerate when approaching a descent, but instead waits and utilises gravity.
- It starts freewheeling ahead of an approaching descent.
- It starts braking well before the downhill slope ends, but:
- It releases the brakes at the end of the slope to pick up speed ahead of a new ascent. **wn**

This allows the driver to focus more on the surrounding traffic and other aspects of the journey. What is more, progress on the road is more relaxed.

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Energy Management for Industry

REALIZING FULL POTENTIAL THROUGH INTEGRATED PROCESS AND ENERGY ARCHITECTURES

Energy management initiatives have taken on a greater sense of urgency than at any time in the past. Rising and fluctuating energy costs, stricter environmental regulations, energy supply constraints in some regions and corporate sustainability programs are some of the drivers of this change. The industrial sector, especially energy-intensive industry, faces significant challenges in managing energy use strategically.



While the opportunities for energy efficiency improvements are many, it requires an 'integrated system' approach to unlock the full potential of energy savings. The use of an open, collaborative architecture that links process and energy monitoring systems, supported by expertise from energy management specialists, will go a long way towards helping industry optimize productivity and profitability, while at the same time meet energy efficiency goals.

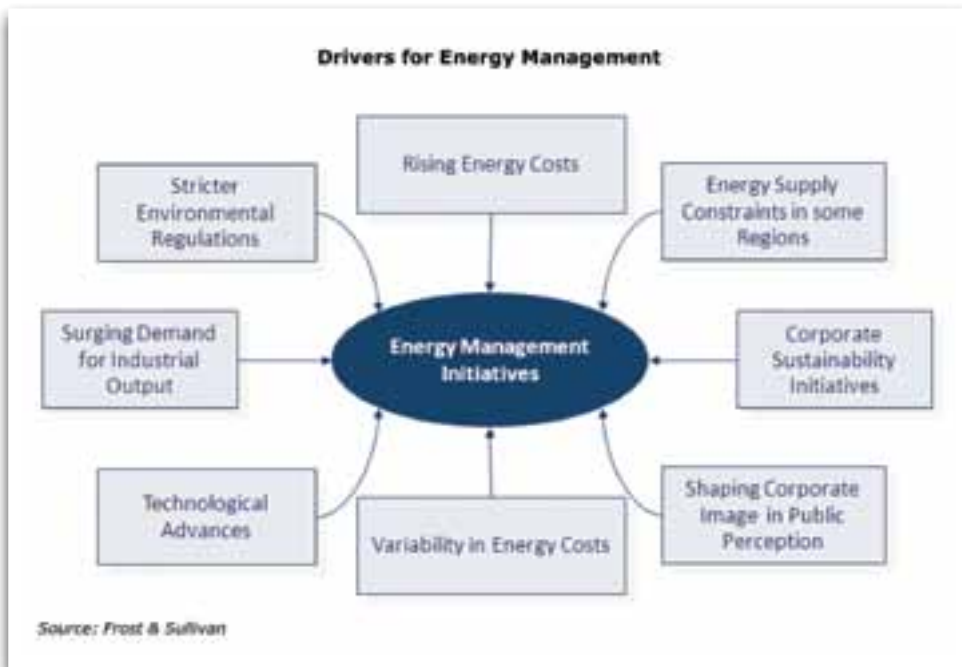
data becomes more sophisticated - across sectors and across nations - there has clearly been a shift away from ambiguous rhetoric to finding actionable ways of improving energy management. This is the result of several key drivers.

The industrial sector is critical to addressing the challenge of climate change as it accounts for close to 40 percent of global carbon dioxide (CO₂) emissions. Worldwide industrial energy consumption (electricity, coal, natural gas, renewables,

use is expected to see the most significant growth amongst fuel sources used by industry.

Energy-intensive² industries (the major ones being mining, metals and minerals (MMM), chemicals and pulp & paper) consume about half of the energy used in the industrial sector. For these industries, energy accounts for a significant portion of operating costs (for example, energy is around 60 percent of the chemical industry's operating costs, 15 percent of the iron and steel industry's production costs and between 20 to 40 percent of the cement industry's production costs³).

This makes energy management for industry more than just a buzzword. In fact, the surge in electricity prices in most regions globally has brought energy management clearly to the top of the agenda for industry. (For example, the EU-27 saw average electricity prices for industrial consumers rise from 0.0672 €/kWh in 2005 to 0.0918 €/kWh in 2010⁴.)

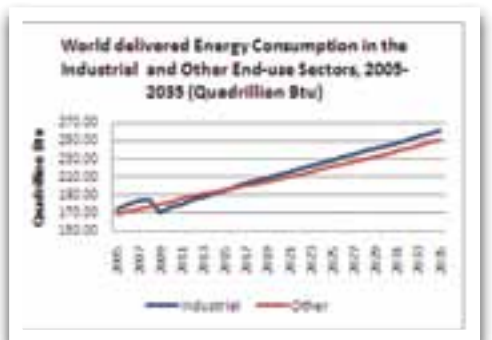


As businesses strive to find fresh ways of building competitive advantage, meeting customer expectations, attracting the right skill sets and improving profit margins, a new challenge is also being added - the challenge of managing energy use strategically. This is not a new area of focus, but the sense of urgency and importance around it is certainly recent.

liquids and other petroleum) is expected to grow from 174.5 quadrillion Btu in 2005 to 261.7 quadrillion Btu in 2035¹. While in 2009, as a result of the global financial crisis, delivered energy consumption in the industrial sector dropped lower than that in other end-use sectors combined, this position is expected to be reversed by 2016 and the gap to widen even more thereafter.

As the collection of energy consumption

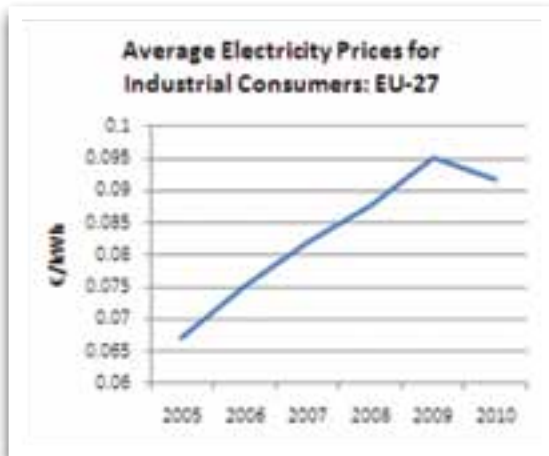
Over the period 2005 to 2035, electricity



Aggravating the problem is volatility of electricity prices in some markets. For example, the electricity price for large industrial consumers in the UK was 35 percent higher in Jan 09-Jun 09 compared to the same period the previous year⁵.

Energy Management for Industry

continues from page 51



Unfortunately, for most industrial firms, energy has not been top-of-mind historically.

In some regions, industrial energy consumers also have to contend with a further level of uncertainty; potential supply limitations.

Beyond these supply-demand and price factors, stricter regulatory compliance obligations with regard to environmental sustainability are prompting industry to proactively launch energy management initiatives. This can take the form of holistic energy consumption reductions or specific actions to comply with energy efficiency standards. In Canada, the regulation of most 1 to 200-horsepower motors (introduced in 1997) has led to savings of 9.5 petajoules annually in the industrial sector by the year 2010.

CHALLENGES IN ACHIEVING ENERGY MANAGEMENT GOALS

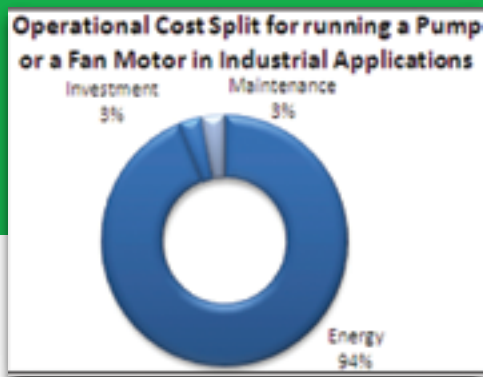
The obvious difficulty in the industrial sector is the complexity of processes and outputs in industrial operations that make accurately measuring, verifying and tracking energy use a formidable task in itself. But there are more important and persistent barriers.

Unfortunately, for most industrial firms, energy has not been top-of-mind historically. Perhaps, this low mind-share was the result of the lower energy price levels of the past. Perhaps, it is the result of conflicting priorities. Or perhaps, the lack of senior management buy-in or support. In some instances, even with the right level of senior management sponsorship, energy management goals are hard to achieve because some companies have not managed to break away from a silo approach to operations. This prevents a holistic approach from being taken. In other instances, regulatory uncertainty (especially around carbon pricing) can be a disincentive.

Whatever the reasons, the low priority given to energy management is obvious from the fact that very few organizations have specialist professionals who are responsible for and dedicated full-time to energy management⁶.

The priority given to energy also varies from region to region. Local conditions, energy shortages and compliance requirements create a greater sense of urgency in some regions than in others. In addition, the drivers for energy management tend to vary based on the industry vertical. In some verticals, energy costs are a focus because they help reduce opex (e.g. the water and wastewater industry). In some verticals, the driver for energy management is primarily productivity and compliance (e.g. the mining industry)⁷.

What all of this means is that while production and its sub-processes have over time evolved in their nature and scope, managing the energy used for these processes now has to play 'catch up'. This task is made more difficult by the significant shortage of skilled personnel (internal and from third-parties) who can monitor, manage



and optimize energy use effectively. Added to that, the paucity of robust case studies that accurately represent cost and savings in energy efficiency improvement projects weakens the impetus for new initiatives.

IDENTIFYING OPPORTUNITIES FOR ENERGY EFFICIENCY IMPROVEMENTS

Typically, motor-driven applications account for around 60 percent of total industrial energy consumption. Since energy accounts for most of the operating cost of motors in industrial applications, energy efficient methods of running motors (with soft starts and variable speed drives) can make a significant difference to total energy consumption and operating costs. Even the simple act of choosing the correct rating for each application will ensure that there are fewer instances of oversized motors resulting in lower efficiency and power factor.

Human factors play a key role in energy management as well. For example, operators who are not sensitive to the energy impact of conveyors left running with no load can significantly impact energy consumption. Looking at energy use in the context of time is also a useful avenue for savings. That is how high-cost non-essential processes can be shifted to off-peak times to take advantage of dynamic pricing arrangements with energy utilities. Similarly, location-driven opportunities (within a processing area, plant or across sites) can be identified and pursued; for example, where surplus stock is held, or where waste heat is excessive.

However, effective energy management in the industrial environment is better achieved through an ‘integrated system’ approach, rather than by following a ‘component based’ approach. That is why optimizing process control (which works as an integrated system on site and across sites) is being seen as a more significant energy efficiency improvement opportunity than most other options. As the chart indicates, ‘process control’ had the second highest savings amongst identified opportunities through the Australian Energy Efficiency Opportunities (EEO) program⁸.

With the focus on optimizing control systems for energy efficiency gains, companies are then able to assess and reduce energy cost per unit produced rather than total energy used. To do this, industrial companies need the right set of tools in the form of collaborative systems and the right level of expert advice.

CONCLUSION

Minimizing energy cost while still achieving overall production objectives is a formidable undertaking. Industry response has been uneven this far, and for the most part, ad hoc and incomplete. ‘Business-as-usual’ scenarios are no longer sustainable. While there have certainly been some sector-wide gains in energy intensity, this should not distract from the fact that even greater potential remains.

Industrial companies, seeking to unlock this potential, would do well to adopt an integrated system approach, leverage open, collaborative energy management solutions

and work with specialists who understand energy management technologies and practices.⁹ **WIN**

REFERENCES

- 1 International Energy Outlook 2010, U.S. Energy Information Administration
- 2 Energy intensity is energy consumed per unit of output.
- 3 International Energy Outlook 2010, U.S. Energy Information Administration
- 4 Eurostat
- 5 Eurostat
- 6 Only a miniscule proportion of these personnel have the word ‘energy’ in their job title.
- 7 Mining and petrochemical industries have traditionally not been very proactive in energy management (except for the aluminium sector, which has a much higher cost of energy as a proportion of total opex)
- 8 Department of Resources, Energy and Tourism, Australia (as of November 2010)
- 9 The importance of working with solution providers who know best practice cannot be over-estimated. According to the International Energy Agency (IEA), if best available technologies and practices were deployed globally, industrial energy use could be reduced by 20 to 30 percent.

*Article courtesy Schneider Electric.
For more information, visit
www.schneider_electric.com*



Seek equity, property to earn real returns

There have been two meaningful changes in the global investment landscape over the past few months.

BY I PAUL STEWART | GRINDROD ASSET MANAGEMENT

Firstly, various economic and corporate earnings data, both globally and in South Africa, have started to show signs of deterioration.

Secondly, the labour unrest and violence-ravaged strikes in South Africa have raised the political temperature in the country ahead of the ANC's elective conference in Mangaung in December 2012. Pessimism about the future prospects for South Africa and the world abounds.

Nevertheless, our investment outlook and asset allocation have not perceptibly changed at this stage. Are we being irresponsible and complacent by not adopting a more cautious or conservative approach for our clients' hard-earned cash? The answer is no.

We emphatically believe the larger risk to investors, particularly retirees, is inflation risk. Our starting point for portfolio construction is always to seek

Corporate bond yields are slightly more attractive, but are still insufficient to offer a meaningful improvement in the outcome.

assets that can deliver returns in excess of inflation over the medium to long term. Yet when we look at asset classes globally, fewer and fewer of the mainstream asset classes are able to jump this basic hurdle rate for inclusion in the portfolio.

The policy aftermath of the global financial crisis drove short-term interest rates sharply lower and they have remained at record low levels since 2009. Importantly, they are likely to remain at these levels until sometime in 2015.

In South Africa, the South African Reserve Bank has adopted an aggressive monetary policy with the repo rate at 5%. In both instances, these interest rates are below the respective official inflation measures, meaning that negative real interest rates are on offer.

In the bond market, yields are not much more attractive. In the US, 10-year Treasury bond yields are below CPI and in South Africa, bond yields are marginally above CPI.

Corporate bond yields are slightly more attractive, but are still insufficient to offer a meaningful improvement in the outcome. Unless we see further declines in bond yields, investors are going to struggle to deliver CPI-matching returns from bonds, let alone the CPI + 5% return outcomes the liability profiles of many investors require.

Therefore, two important sources of positive real returns over the past 10 years will be the source of negative real returns for the next three to five years. Accordingly, investors will have to focus their attention on asset classes that at least have a fighting chance

of beating CPI in the future. Investments in listed equity, listed property, private equity and hedge funds may provide the potential inflation-beating return solution.

The Grindrod Asset Management approach remains focused on seeking good quality equity and listed property shares that have strong dividend/distribution payment histories, attractive current yields and are going to grow the dividend/distribution income stream in the future.

While this approach may be somewhat more volatile in the short run, it is the only sensible course of action looking forward three years and beyond in a world starved of yield and increasingly exposed to unintended consequences of aggressive policy risks. **Wn**

Article courtesy www.cover.co.za

Perhaps perfection

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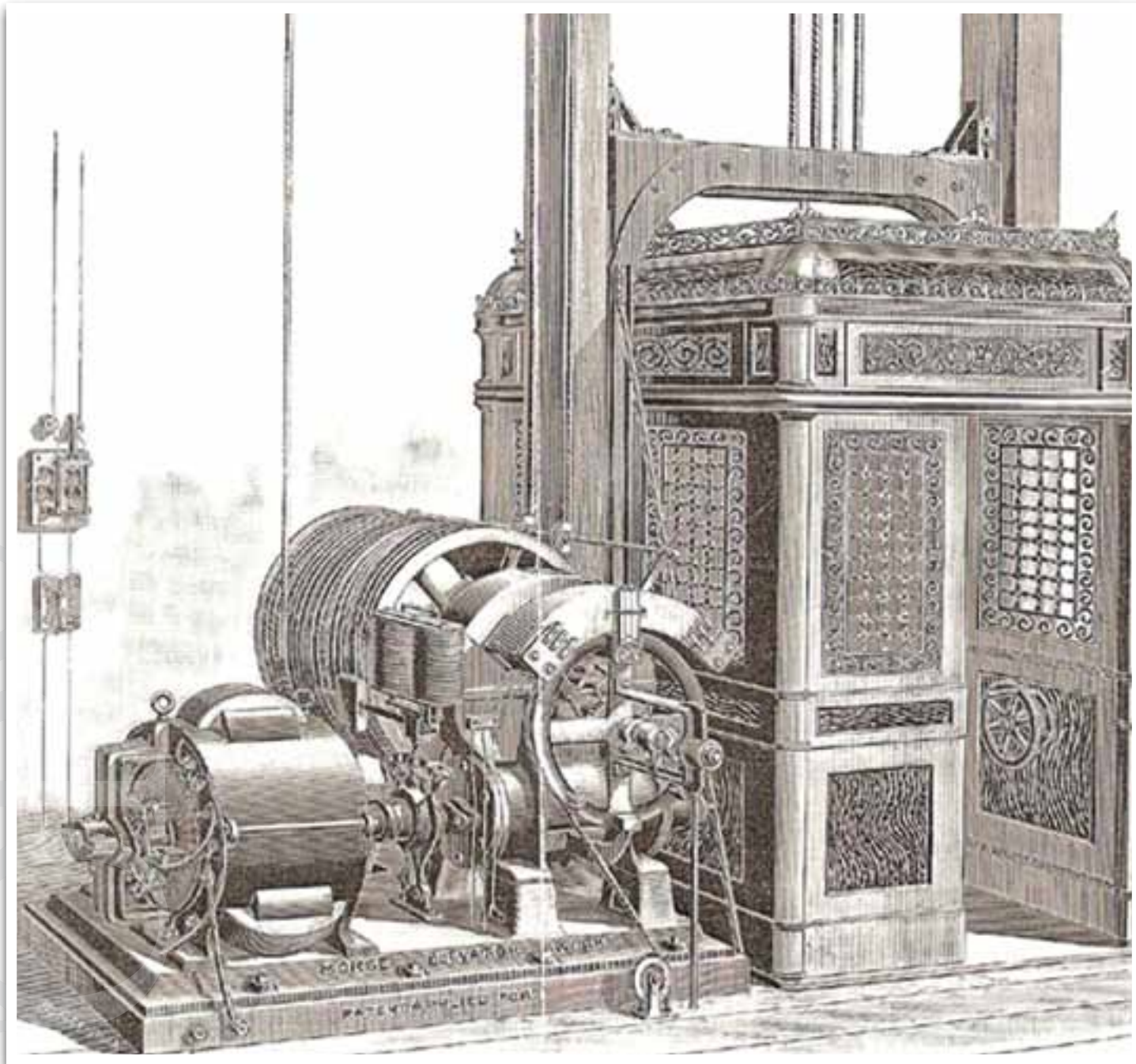
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Electrically Operated Mechanical Appliances

During a recent trip to Europe, the writer visited several electrical factories and works, and in response to an invitation from the Council of the Institute, presented the following notes, dealing briefly with some of the 'modern' machinery inspected.

WRITTEN BY | MR H. COLLENS (MEMBER - 1912)
COMPILED BY | ALAN MEYER | FSAIEE

I am dealing with R. Waygood & C's electrically operated passenger lift. A lift which can be operated either by a pilot car or by throwing over a switch so it can be operated from the floors or from the car by push buttons.

There are two different speeds for the car. When it is being operated by the pilot the speed is 250 feet per minute; and when operated by the push button it is 135 feet per minute.

The interesting points in connection with the automatic working will now be examined. Above the main circuit breaker are the relay coils corresponding to the various floors, and just above these are the limit switches. There are two limits for each relay, and they are operated by a chain drive direct from the winding drum, so that their action is positive. I am trying to obtain some photographs of these, so as to show their operation clearly, as it is quite a neat device, and it is so constructed that as the up limits are taken out of commission the down limits are put in, so that if the car is on say, the third floor, the limits above that are in down side.

The apparatus here detailed is positive in its action and smooth in running and the dual control certainly appeals to one as being a very convenient method operation, as a pilot can be employed during the day, and work the elevator to its maximum capacity, and then during light load periods it can be changed over and operated by the passengers.

While on the subject of cranes, I see the G.E.C. have introduced rather a neat appliance in the form of a self-propelled jib crane. This is driven from a battery and will handle loads up to one ton and transport them while on the hook. It is also suitable for hauling a truck. The following are a few particulars:

- Speed, light – 9 miles per hour
- Speed, one ton in hook – 7 miles per hour

- Speed, five tons on trailer – 5 miles per hour
- Battery capacity, 168 ampere-hours
- Motor, 85 volts, 28 amps, 1200 revolutions
- Wheelbase, 60 inches

It occurred to me that this might be useful in certain localities in the Transvaal.

An interesting, and at the same time one of the most complicated electrically operated mechanical appliances of the present day is the automatic telephone exchange. In America there are exchanges being worked with 40 000 subscribers. It is a marvellous system that can automatically connect any one subscriber out of 40,000 to any other. It does away with the possibility of error by the operator and places the responsibility on the subscriber, because if he rings for the correct number the selector does not make a mistake. Another point is the subscriber called may be engaged. If so the selector gives the calling subscriber the engaged signal. It may also occur that two subscribers ring up the same number at the precisely same time. This is quite possible in a large exchange. There is a special discriminating device to meet the case, which gives one-number precedence over the other, and the second one then receives the engaged-signal. From the time that a subscriber rings up until the line is normal again, there are about thirty-five distinct operations performed, and yet the actual time spent in getting to a number is less than it takes with the manually operated board. As far as first cost goes the exchanges are about the same when the number of subscribers is over 10,000. The automatic exchange will be more expensive for maintenance charges, but to offset that you have the fact there are no operators required.

In conclusion, I wish to emphasise the fact that I am sure a great number of the members of this institute could follow these few examples up with many more, and, in many instances, apply a particular mechanism to a totally different apparatus with economical results. **Wn**

SAIEE Membership Benefits

Members of the SAIEE now enjoy the following a wide array of benefits:

You simply cannot afford not to be a member!

- A discount of up to R1110 on their ECSA registration fee, which is due in April every year, provided that they join the SAIEE before the end of March that same year.
- Upon joining the SAIEE there is a standard entrance fee of R700, an annual membership fee of R923 for Members, and between R1129 and R1223 for Senior members depending on age. Most of this will be recovered through the ECSA discount.
- SAIEE members receive 11 issues of the wattnow magazine valued at R330.
- The SAIEE Africa Research Journal (ARJ) our peer reviewed research publication (which incorporates the SAIEE Transactions) is also available to SAIEE member's quarterly upon request.
- The real rewards of being a member can be realized through attending monthly lectures, debates, tours and site visits organized by the SAIEE. These are mostly free of charge and provide refreshments at no extra cost. Members are awarded valuable CPD credits for attending these events.
- Membership has significant career benefits, as membership holds prestige and recognized status in the profession. SAIEE gatherings provide excellent opportunities for members to interact with normally inaccessible captains of industry.
- SAIEE letters after your name indicate your membership grade and are a useful measure of your experience.
- Members receive generous discounts on the SAIEE run CPD courses and earn (category 1) CPD credits. Members also have the option of joining the wattnow online CPD program at a fraction of the cost.
- The SAIEE mentorship program assists members to gain professional status through the Institutes large database of mentors.
- SAIEE members are awarded 1 CPD credit (Category 3) for being a member of the SAIEE.
- Members are able to serve on organizing committees and gain valuable experience and professional networking in doing so.
- Use the electrical engineering library at SAIEE House.

APPLICATION REQUIREMENTS FOR SAIEE MEMBERSHIP

It is always exciting to receive an application as it means that we will soon be welcoming another new and valuable SAIEE member to our family of nearly 6000 members. However, more often than not the application is incomplete. To avoid unnecessary delays in the process it is important to highlight the problems regularly experienced within the administration with received applications:-

Many applicants do not read the list of requirements.

WE REQUIRE THE FOLLOWING DOCUMENTS:

- Copy of the applicants ID;
- Certified copies of achievement certificates;
- A copy of the applicants latest CV;
- The completed application form;
- Proof of payment for the application and membership fee which are required upfront. *Please use surname and initials as payment reference.*

Copies of the required documentation should accompany the application forms but unfortunately we still find application forms are sent in without it.

A number of applicants do not complete the application forms adequately, *please complete the form in full.*

Payment of both application fees and membership fees are frequently not paid timeously.

Only once all the above requirements have been met is the application considered complete, enabling the process to continue efficiently.

Please, help us to help you receive the many benefits of SAIEE Membership sooner rather than later!!

2013 Membership fees

Rates as from 1st January 2013

Grade of Membership	Annual Subscriptions paid by 28 February 2013		Annual Subscriptions paid after 28 February 2013		New Members FEES * see Notes 1 & 4 below.	
	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)
Student	117	82	130	92	130	92
After 6 yrs study	752	526	835	593	835	593
Associate	752	526	835	593	835	593
Member	831	582	923	648	923	648
after 6 years	972	680	1,079	765	n/a	n/a
after 10 years	1,016	711	1,129	801	n/a	n/a
Senior Member	1,016	711	1,129	801	1,129	801
after 6yrs/age 40	1,102	771	1,223	868	1,223	868
Fellow	1,102	771	1,223	868	1,223	868
Retired Member (By-law B3.7.1)	465	326	515	365	n/a	n/a
Retired Member (By-law B3.7.3)	nil	nil	nil	nil	n/a	n/a

NOTE

1. Entrance fee for all grades of membership is R700 (except Students which is free)
2. Transfer fee to a higher grade is R400.00 for all grades of membership (except Student within 3 months of qualifying).
3. Members are encouraged to transfer to a higher grade when they qualify. It will be noted that the fees of Member and Senior Member grades after 10 and 6 years respectively are equal to the fees at the next higher grade.
4. Members elected after June 2013 pay a reduced subscription fee.

By-law B3.7.1 reads “a member in good standing who has been a member of the Institute for at least ten (10) consecutive years, has reached the age of sixty (60) and who is no longer actively engaged in the profession, may apply to Council for an adjustment in the amount of his subscription.

By-law B3.7.3 reads “any member complying with the conditions of B3.7.1 but who has been a member of the Institute for not less than 25 consecutive years, shall be exempt from the payment of further subscriptions.” Members who comply with the requirements of By-Law B3.7.3 may make written application to Council for exemption from paying subscriptions.

By-law B3.9 reads “any member in good standing who has been a member for fifty (50) consecutive years shall be exempt from the payment of further subscriptions.”

Members not in good standing by failing to pay their subscriptions by end of June of each year will be struck-off the SAIEE membership role - subject to Council decree.

Members in good standing and no longer in substantive employment and do not receive payment or salary for work done may apply to Council for a reduction in their annual subscriptions.

Mentorship

The offer comes at a time when our country is suffering a shortage of skills, and we believe that mentoring is an essential requirement in the training and development of the next generation of engineers. If, as a member of the SAIEE, you believe that you need a mentor you can request a mentorship service from the Institute.

The service will be of particular benefit to those young engineers working under the leadership of busy and pressurized Professional engineers, who may not have the time to assist young engineers in discussing and planning their career paths.

This initiative is particularly relevant to young engineers who are working in an environment devoid of engineers or with non technical managers. The young engineer may feel frustrated because he or she cannot benefit from the wisdom of an experienced engineer.

It will give a young engineer, the mentee, a chance to talk to a mentor, who will be his or her advisor, teacher and role model, away from the work environment. His or her mentor, matched to a similar profile, will understand the mentee's work and personal situation, having been there him- or herself.

The mentee will be able to discuss problems and frustrations with his independent mentor, who would have no stake in the outcome, and who would be able to provide an unbiased opinion and advice. The mentee might not be able to do so with his superiors, particularly if he is unhappy, and is considering an

alternative career. The mentor and mentee could arrange to meet regularly, on terms that would suit both parties. The goal is to ensure both Mentee and Mentor have enough time to communicate any concerns or advice they have.

The mentor could recommend to the mentee what course of action to take without being too prescriptive while the final decision and the consequences remain with the mentee.

Among its more than 5500 members the SAIEE has many experienced engineers who are willing to act as mentors. They are spread across the country and include engineers who are experienced in steelworks, furnaces, rolling mills, mining, manufacturing, electrical generation, transmission and distribution, through to light industrial, process control, instrumentation, telecommunication, robotics, automation, software development and engineering management of these sectors.

So if you feel that you would benefit by talking to a mentor, please contact Sue Moseley on the number below. She has a database to match the profiles of mentors and mentees. **wn**



PROSPECTIVE SAIEE MENTORS

If you feel you that you have the time and interest to help mentees, please contact Sue Moseley on 011 487 9047 or suem@saiee.org.za.

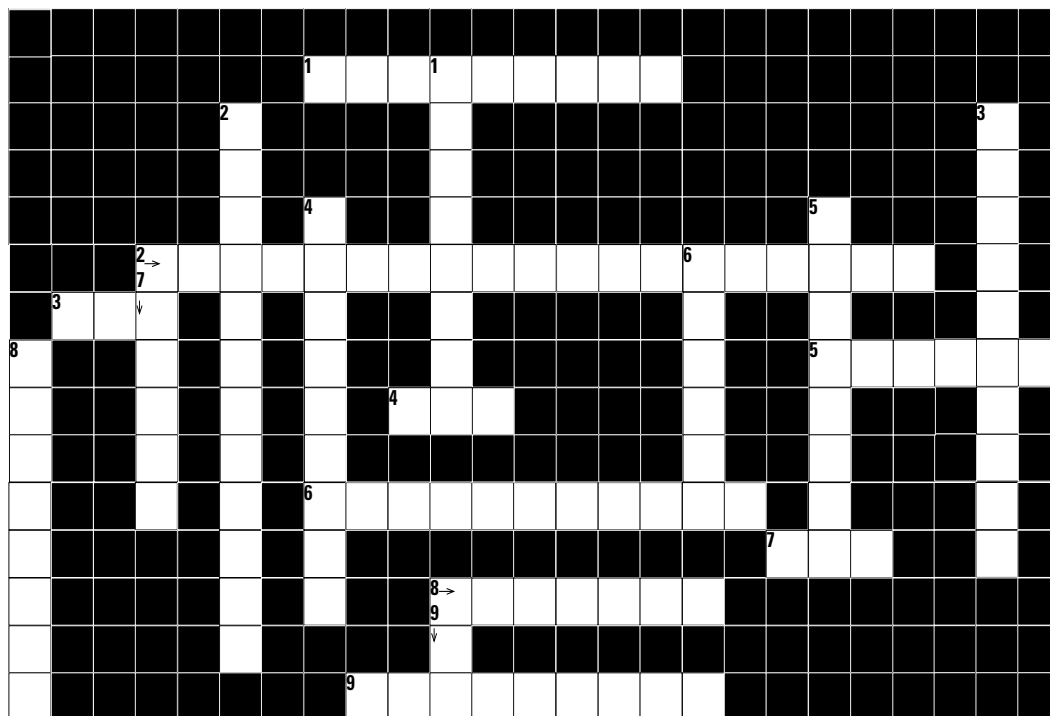
In addition you gain CPD credits for when you are required to re-register.

Have some fun and stand a chance to win R1000. Complete the November issue crossword puzzle and send it with your name, surname and contact details to: *Managing Editor, November Crossword Puzzle, P.O. Box 751253, Gardenview, 2047* or email it to *minx@saiee.org.za*. The completed crossword puzzle should reach us by no later than **31 December 2012**. The winner of R1000 will be announced in the March 2013 issue of the **wattnow** magazine.

BERGMAN FISHER ASSOCIATES, DESIGNERS OF A SAFER GREENER ENERGY EFFICIENT FUTURE, ARE THE PROUD SPONSOR OF OUR CROSSWORD PUZZLE.

R1000

win



DOWN

- This touchscreen uses an array of X-Y infrared LED and photo-detector pairs around the edges of the screen to detect a disruption in the pattern of LED beams. (8)
- From 1979–1985, this device was a high-end musical sampling and re-synthesis workstation that utilized light pen technology. (9,3)
- See 8 across.
- According to Historians, who invented the first capacitive touch screen? (2,7)
- Who developed the 'touch sensor' in 1971? (3,5)
- What is dubbed as the king of smart phones? (6)
- In computing, what do you call a small pen-shaped instrument that is used to input commands to a computer screen, mobile device or graphics tablet? (6)
- Which sensor did the University of Kentucky patent in 1971? (8)
- Surface Acoustic Wave (abbr.)

ACROSS

- This touchscreen panel comprises several layers, the most important of which are two thin, transparent electrically resistive layers separated by a thin space. (9)
- This technology uses ultrasonic waves that pass over the touchscreen panel. (7,8,4)
- Cathode Ray Tube (abbr.)
- Personal Digital Assistant (abbr.)
- What type of response system causes the device to vibrate when a button on the touchscreen was tapped? (6)
- Which revolutionary communication device were introduced in the nineties? (11)
- Indium Tin Oxide (abbr.)
- This touchscreen panel consists of an insulator such as glass, coated with a transparent conductor such as indium tin oxide. (10,7)
- What did Apple launch in 1993, which is equipped with handwriting recognition? (6,3)

September issue winner:
Esther Stavropoulos from Pretoria

ACROSS 1 Transformer **2** SCADA
3 Koeberg **4** SAIEE **5** Station
6 HVDC **7** James Bowman Lindsay **8** Matimba
9 Franklin **10** Faraday

DOWN 1 Eon **2** NERSA **3** Powergrid
4 War of Currents **5** First Solar **6** Benjamin
7 PUHCA **8** Michael **9** Street **10** Pearl

Terms and conditions: 1. Only one entry per person. 2. Winners will be notified via email. 3. Incorrect information will automatically disqualify the entrant. 4. Anybody may take part except the office staff of the SAIEE, their family members and members of the Publications Committee. 5. **wattnow** magazine and the SAIEE cannot take any responsibility for lost entry forms or any damage, losses or injuries related to the draw of the prize. 6. The winner must be prepared to be photographed and such photograph will be published in the relevant issue of the **wattnow** magazine. 7. Closing date for entry is 31 December 2012. 8. The winner will be announced in the March 2013 issue of the **wattnow** magazine. 9. The Managing Editor's decision is final and no correspondence will be entered into.



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

Calendar of events

JANUARY 2013

24-25	2013 SAIEE Presidents Summer Colloquium	SAIEE House, Observatory, JHB	www.saiee.org.za
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FEBRUARY 2013

4-5	CSP South Africa 2013	Pretoria, RSA	www.csptoday.com
4-7	African Mining Indaba	Cape Town International Convention Centre	www.miningindaba.com
21-26	16th Biennial International Symposium on Toxicity Assessment	MSC Opera, Cape Town	www.naturalscience.co.za
25-28	2013 IEEE International Conference on Industrial Technology	Cape Town International Convention Centre	www.icit2013.org

MARCH 2013

12-16	2013 IEEE International Conference on Orange Technologies	Tainan, Taiwan	conf.ncku.edu.tw/icot2013
13-14	4th annual IT Leaders Africa Summit	Johannesburg, RSA	www.kineticerevents.net
13-15	iEECON 2013 : International Electrical Engineering Congress	Chiang Mai, Thailand	www.ieecon.org
19-22	Conference on Systems Engineering Research 2013	Georgia Institute of Technology, Atlanta, USA	cser13.gatech.edu

APRIL 2013

8-11	Power & Electricity World Africa	Sandton Convention Centre	www.terrapinn.com
8-11	Power Generation World Africa	Sandton Convention Centre	www.terrapinn.com
9-10	Sustain & Build Africa	Sandton Convention Centre	www.terrapinn.com
9-10	The Lighting Show Africa	Sandton Convention Centre	www.terrapinn.com

MAY 2013

4-6	Led Expo Mumbai	Mumbai, India	www.biztradeshows.com
8-9	Electrical Manufacturing and Coil Winding Expo	Frontier Airlines Center, Milwaukee, USA	www.biztradeshows.com
14-16	Pumps Valves & Pipes Africa Exhibition	Gallagher Convention Centre, Midrand	www.biztradeshows.com



4-5 FEBRUARY 2013
PRETORIA | SOUTH AFRICA

For more info, visit

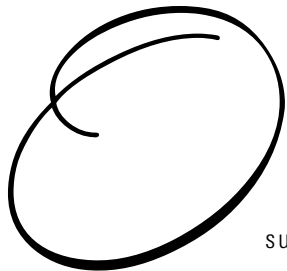
www.csptoday.com/southafrica/index.php
or Jack Ahearne: jack@csptoday.com

CSP SOUTH AFRICA 2013 2nd Solar Thermal Power Conference & Expo

This is the only event dedicated exclusively to the South African CSP industry that will bring together leading local and international experts to help you overcome the key financial and technological roadblocks that will guarantee the future growth of your business.

PAGE	COMPANY NAME	CONTACT DETAILS	WEBSITE
2	Symbiosis	011 300 2200	www.symbiosis.co.za
5	Cummins	011 321 8700	www.cumminspower.com
7	ZEST WEG Group	011 723 6000	www.zest.co.za
11	ACDC	010 202 3300	www.acdc.co.za
19	Heather McCann Photography	011 682 3298	www.mccannphotography.co.za
29	Fire Detection Agency	087 808 7527	www.fdia.co.za
37	Nynas South Africa	010 590 1052	www.nynas.com
39	Impact Energy	031 201 7191	www.impactenergy.co.za
43	Aberdare Cables	011 396 8000	www.aberdare.co.za
49	Reliable Transformers	011 421 2333	www.reltrans.co.za
55	Strike Technologies	011 635 8000	www.strike.co.za
61	Bergman Fisher Associates	011 679 3481	www.bergmanfisher.co.za
68	Schneider Electric	011 254 6400	www.schneider_electric.com

BOOK GIVEAWAY



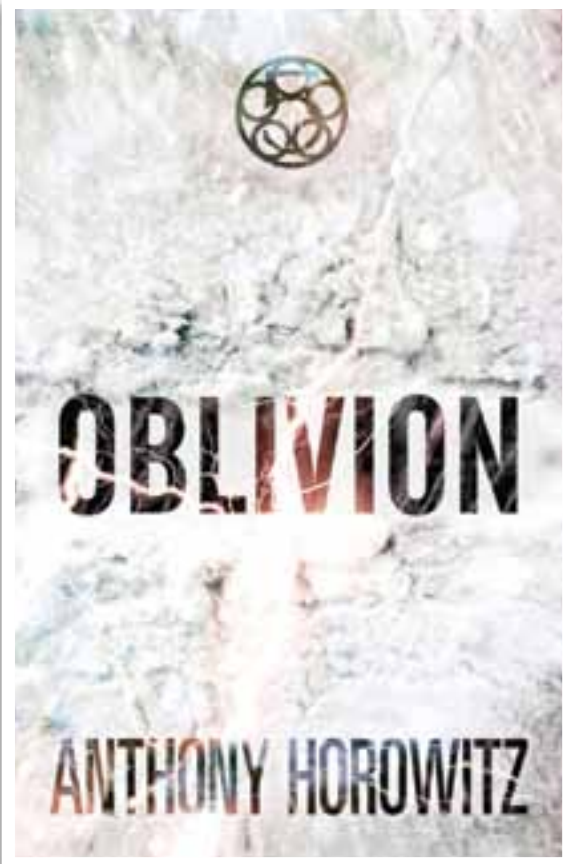
OBLIVION is the chilling conclusion to the epic supernatural series, **THE POWER OF FIVE**, by Anthony Horowitz. It is, without question, Horowitz's most ambitious book to date. **OBLIVION** reflects many of the author's own deepest fears and concerns but - no surprise here - it is primarily a gripping read-it-all- night apocalyptic page - turner.

The earth has almost been destroyed by the forces of darkness. Those who have survived are barely human, drifting in a world ruled by famine, terrorism and war. Anylasthope now rests with five extraordinary teenagers: the Gatekeepers.

The five must find each other and make

a final stand against Chaos, King of the Old Ones... but Chaos is everywhere. He calls to them from Antarctica, where he is gathering his forces, preparing for a last battle in the frozen wasteland of Oblivion. And one of the Five has turned traitor. The others know that, without him, they cannot win. Chaos beckons.

Oblivion waits. **OBLIVION** is not only the must-read finale to the **POWER OF FIVE** sequence, but an epic book in its own right. The **POWER OF FIVE** books are darker and edgier than Horowitz's **ALEX RIDER** novels; they more closely reflect Horowitz's political and philosophical views and offer intriguing reading for his millions of fans of all ages. **OBLIVION** depicts a brutalized world, which can only be redeemed by the young. You could say that Anthony Horowitz has written the last word in dystopian fiction. It's a big book in every sense.



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