WATTnow

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Green building – is it a lot of South African hot air?

Eskom's new build programme – a reason to unite?

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Official Magazine of SAIEE

September 2010

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Engineers must help to rebuild our cities

I do think it's a noble idea to embrace the 'green' building concept and create more environmentally-friendly office blocks, shopping centres or apartments for our cities. But do any of them actually provide a 'green' solution?

I think that the real secret lies in getting the engineers, the architects and the scientific community behind the concept of green building because it is these people who can, and will, provide the real solutions to the many engineering problems created by our built environment.

And in South Africa, I think that the process begins with the site selection, because what is the point of creating a marvellous new building in the middle of nowhere? The impact of getting people there and then getting them out of there alone will undermine the environmental savings that might be achieved through installing solar water heaters.

What I would really like to see is that the potential re-development nodes, such as the central business districts within each of the cities around South Africa, become the focus for green building initiatives. For this is where the existing infrastructure can readily be found.

It is in these areas that we need to invest our ideas, our efforts and our scientific or engineering solutions.

Take, for instance, the rat-infested communities living inside the many hijacked buildings in Hillbrow for starters: these properties represent ideal projects for rebuilding and there is no doubt that the costs of doing so will be high.

But if Hillbrow was to be the focus of a major re-development programme (it is the focus of some re-development at the moment) then the engineers could turn their minds to coming up with green solutions for existing buildings.

That might seem like a tall order but in reality most of the hijacked buildings in this suburb need to be gutted anyway. What advantages does Hillbrow offer?

Well, it has a history of being a high-density living area so the sewerage systems are in place (although dilapidated), the transport infrastructure is there, the electrical reticulation systems, (although damaged perhaps) exist and there are even the underground systems to provide natural gas for the heaters and stoves in many of those old buildings.

So all the engineers would have to do is find economical ways of repairing what already exists and then install new environmentally-friendly appliances, widgets and dingbats to rebuild the suburb completely.

The same thing applies to the city centres of Cape Town, Durban, Pretoria and Port Elizabeth – and they all share the same problems too: most big business has moved out and there are thousands and thousands of empty offices, abandoned shops and forgotten warehouses being wasted.

I recently wrote an article about the government's 'discovery' of some 33 000 buildings in various parts of the country that it didn't actually know belonged to them.

If you just consider, for instance, that you could create say 50 housing units per building then these existing government buildings alone could resolve the bulk of the low-income housing backlog currently facing the country.

Admittedly, it would be up to the engineering community as a whole to come up with a plan to convert these buildings and turn them from being abandoned and rat-infested blots on the city skyline into affordable and comfortable homes with green building systems in place that make them truly sustainable.

Surely that is where we should be looking when it comes to building new, and major developments, rather than creating a brand new monstrosity like Menlyn Maine that is not serviced by existing infrastructure at all?

Just think how many thousands of new homes have gone up in outlandish areas over the last few years and then consider that the existing infrastructure is standing idle and unattended in high density areas where it was designed to cope.

It really doesn't make much sense does it?

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Why would BlackBerry call it a PlayBook?

I wonder whether the remarkable success of Apple's iPad, which sold more than a million units the first month after its release, influenced other manufacturers to release their own versions of tablet devices.

Research in Motion, the manufacturers of BlackBerry, has released details of its new tablet device that they claim is aimed at the professional enterprise market. How that provides the company with a competitive edge escapes me. The other thing that I find surprising is the choice of name for the new "professional, enterprise device". It's called a PlayBook. In keeping with the iPad, it promises uncompromised web browsing, true multitasking (as opposed to untrue multitasking?) and high performance multimedia.

BlackBerry says that it has out-of-the-box enterprise support (meaning that it can connect to Microsoft Exchange Server) and typically has advanced security features. It uses the BlackBerry operating system.

The device offers a seven-inch (17,78 cm) high resolution display, weighs 400 grams, has a built-in micro-USB connector and built-in Wi-Fi, an on-screen keyboard and 1080 HD video. It has dual cameras (one facing forward, the other to the rear) for video conferencing and recording although it would be an unwieldy process to use this tablet as a roving video camera I guess.

It is powered by a 1 GHz dual-core processor, has a gigabyte of Random Access Memory, provides HDMI video output. At some time in the future RIM will include 3G and 4G connectivity. No prices have been released at this stage. It will be available to customers in the United States early next year but international buyers (including South Africans) will have to wait until the second quarter of next year to get their hands on a unit.

I suppose that's not too bad considering that I am still waiting for a test unit of the iPad that was promised to me some time in May. Perhaps there'll be a review unit of the PlayBook and I wouldn't be surprised if it arrives before the iPad too.

WATTnow's editor wins Vodacom Award

WATTnow's editor, Paddy Hartdegen has won the regional Vodacom Journalist of the Year for Community Media for the second year running.

Chairman of the Publications' Committee of the South African Institute of Electrical Engineers, Ian McKechnie says the award is "further evidence that WATTnow is not just for our membership but is being appreciated by a much wider readership and that's exactly what we intended."

Jenny Warwick, managing director of Crown Publications and the Publisher of WATTnow says that this award is evidence of the high standards of editorial excellence that are a hallmark of the magazine.

"It's a wonderful honour for the magazine and one that makes us extremely proud. The reality is that, editorially, we are providing strong, informative and relevant editorial material that is important for the entire engineering community. "What we would like to see now is that we get the same kind of backing and support from the many advertisers that need to reach the engineering market. WATTnow is a really informative read and it does not publish the sort of advertorial puffery that so many companies want to pass off as editorial. "WATTnow publishes facts; it publishes articles that are relevant to all readers involved in engineering and it does so in an informative, easy-to-read but accurate manner. And, its readers appreciate this and even demand it. Our two editors, Paddy Hartdegen and Antonio Ruffini have set extremely high editorial standards for the magazine and I'm sure that both of them will maintain these standards.

"Hartdegen winning the Vodacom award for two years in a row and Ruffini winning the Siemens award for journalistic excellence prior to that are a true reflection of the editorial standards that this publication maintains. "Now we need to see those advertisers showing us the same kind of commitment to journalistic excellence by supporting the magazine and advertising their products, services and solutions in a publication that is read because it is excellent," says Warwick.

She points out that over and above the awards that WATTnow has won consistently for the past three years, it is also the only publication that is accredited by the Engineering Council of South Africa for Category One credits for Continuous Professional Development. "All engineers, technicians and technologists must participate in the CPD programme in order to maintain their professional registration and WATTnow's editorial material provides them with a vehicle to do so. This is a further endorsement of the value of excellent editorial in an overtraded business-to-business publishing market where discretion in advertising spend is essential," says Warwick.

"What I fail to understand is why advertisers continue to spend money in magazines that are less informative and less well read because they are promised some form of advertorial to support the advertising.

"We have achieved editorial excellence in WATTnow. Now we need to achieve advertising excellence too. I challenge all those companies out there that want to reach engineers to come up with excellent advertising material that will complement the editorial we produce," she says.

Women in Engineering and the Built Environment (WiEBE)

The University of Johannesburg and Group Five have launched the first national annual competition for Excellent Women in Engineering and Technology in South Africa in 2010. The purpose of the competition is to acknowledge and recognise the contribution that women make in the engineering and built environment sectors in this country.

The competition criteria comprise a technical contribution and an evaluation of personal attributes with nominations in three categories:

- Excellence at sector level.
- Excellence at company level.
- The most promising young woman engineer or built environment professional.

A total of twelve candidates were invited to the annual WiEBE Summit which was held at the Johannesburg Country Club in August and the winners were chosen after in-depth interviews were conducted.

The Excellence at Sector Level category was won by Danai Magugumela, chief executive of BKS, who holds a master's degree in civil engineering. BKS is a multi-disciplinary engineering firm that employs 850 people at 22 offices throughout Africa. Her focus is on strategic management and leadership, dealing with skills shortages, human capital management, growth, global competitiveness and implementation of BKS's annual business plan.

The Excellence at Company Level award was won by Madeleen Engelbrecht, a traffic and transportation engineer at Arup. She holds an honour's degree in transportation and has been involved in various disciplines within the consulting civil engineering industry. Her expertise has been applied to transportation engineering, public transport planning, special event transport planning, micro-simulation modelling, road planning and design, contract documentation, storm water drainage, road rehabilitation, road management systems, materials investigation and infrastructure management systems.

Over the past 11 years Engelbrecht has focussed on traffic and transport engineering-related work, mainly for new developments and public transport related planning.

The most promising young engineer or built environment professional award was won by Faith Mokhonoana, a design engineer at Eskom. She has a degree in electrical engineering and joined Eskom's power delivery section in 2006 as an engineer-in-training. She is currently a design engineer for lines.

She is also registered with the Engineering Council of South Africa as a candidate engineer and will be submitting her application for registration as a professional engineer later this year.

Anti-theft kit for classic cars

LoJack Corporation has developed a stolen vehicle recovery system that is specially designed for classic cars. The system does not draw power from vehicle's battery and does not need to be connected to the vehicle's electrical system. It uses radio frequency technology that is integrated with the police's radio network, probably rendering it completely useless in South Africa.

Ted Saraf, LoJack's law enforcement liaison official claims that thefts of vintage cars are a lucrative business, most often carried out by professional thieves, who stand to make several hundred thousand dollars on these stolen vehicles.

He says that since the recovery rate of stolen vehicles in the United States is at a 25-year low, it is even more critical now to protect these valuable cars from theft. This system provides classic car owners with a powerful means to protect their vehicles and to get them back if they're ever stolen.

Saraf claims that classic cars are "stolen to order," (as most cars in South Africa appear to be as well) in which case a buyer has specified a make and model and the thief targets and steals only that particular vehicle.

He says thieves can typically disengage anti-theft devices such as alarms and kill-switches, change the Vehicle Identification Number and re-sell the vehicle in a different state. Alternatively cars are disassembled, shipped overseas and then reassembled and re-sold.

Of course, LoJack doesn't tell anyone how the system works but considering that it costs just $695, it seems like a bargain-basement protection method rather than a fail-safe, hard-to-break solution. Frankly, the existing tracking devices (and there are many different ones available in South Africa) sound like a much more reliable option anyway.

Extravagant claims from the company include the fact that they invented stolen vehicle recovery (I thought that's what the police do without charging you); that they are the global leader in finding vehicles (I thought the police were) and that they have recovered vehicles worth $5-billion (I wonder what the police figures are by comparison).

South Africa's REFIT Programme – key outstanding issues

By Scott Brodsky

The tremendous need for South Africa to secure its power generation and supply capacity translates into tremendous opportunity for Independent Power Producers (IPPs), particularly in renewable energy and transmission projects. Opportunities exist not just here but throughout the region.

The feed-in tariff, and there are many successful programmes operating around the world, is a way of encouraging growth in renewable generation. Feed-in tariffs set fixed rates for renewable power, usually dependent on the particular renewable technology being used. Programmes guarantee long-term off-take of the power generated and also guaranteed priority grid connection and access to the grid – the basic elements of any successful programme.

The South African programme began with the publication of the White paper on renewable energy back in 2003, which set the targets for renewable energy connections to the grid by 2013. It seemed a long way away then, but 2013 is now only two years away and getting any substantial renewable power onto the grid by that target date is becoming increasingly challenging as each day passes.

From November 2003, until last year, not an enormous amount happened. But since then, a huge amount of progress has taken place. This progress includes:

- NERSA consultations followed by the March 2009 publication of the Regulatory Guidelines setting out: the basic structure of the REFIT programme; the roles of parties including NERSA and Eskom; and the proposed feed-in tariffs for four technologies, landfill gas, Small hydro (less than 10 MW), wind and concentrated solar power (CSP) with storage (6 hours).
- NERSA issued another consultation paper in July 2009 setting out a further six technologies to be included in the REFIT Programme. Following consultation, NERSA issued its REFIT 2 on October 30, 2009.
- Electricity Regulations on New Generation Capacity were promulgated on August 5, 2009, dealing with both IPPs and REFIT.
- The revised Integrated Resource Plan 1 (IRP1) was published on January 29, 2010.
- An Inter-Ministerial committee on energy was established in February 2010 with an objective to develop a 20-year integrated resource plan (IRP) for new generation capacity.

Both Nersa and the Government stakeholders should be congratulated on the bold strides that they have taken in the last 18 months to get us as far as we have got but we are not over the finish line yet.

It is not clear who the buyer of power under the REFIT power purchase agreement (PPA) will be and whether there will be more than one buyer. Eskom currently has multiple roles and, while the Government has announced the intention of appointing an Independent System Operator (ISO), timing is unclear. As an interim measure, a 'fully ring-fenced' Independent Systems and Market Operator (ISMO) was to be established within Eskom by the end of August. This will initially be a division within Eskom and not a separate legal entity. It is an interim solution taken because an independent ISMO will take much longer to establish. I don't think this is a bad interim solution as the setting-up of an independent operator is a big job, likely to take 2-3 years.

The eventual role of the ISMO, beyond the purchasing power from independent power producers (IPPs), also still needs to be clarified. The legal party signing initial PPAs is therefore likely to be Eskom. There is no doubt in my mind that Government support of off-take obligations is going to be crucial to the success of the programme and the bankability of the PPAs. But the good news is that both the Government and Treasury understand this, and are taking this onboard. The most important thing is that the Government support obligations are legally binding in order to get these projects financed.

On the question of procurement, the Regulatory Rules on Selection Criteria for Renewable Energy Projects under the REFIT Programme were promulgated by NERSA and published on February 19, 2010. NERSA received some 66 written submissions and 25 pre-

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sentations as part of the subsequent public consultation – an indication of the huge interest in the programme.

March 2009 Guidelines had suggested a first-come, first-served approach, but regulations and the draft selection criteria make it clear that selection will involve a tender process, albeit not one based on price. The criteria include a combination of gate-keepers (pass/fail criteria) and point-based weighting. These rules raise a number of questions:

- The technology preferences or caps need to be clarified – how many megawatts will be available for each different technology?
- The minimum project sizes? 20 MW for wind has been suggested for example, but why will slightly smaller projects be automatically excluded?
- Will selection be done under a single procurement process or in phases?
- A number of the project evaluation criteria are forward looking, eg, jobs per MW. The obvious questions are how you compare two projects and how you verify the claims made during tendering? What happens if claimed criteria are not met, if a project is late or jobs are not created?
- There is a requirement to meet connection costs in full and up front, which will have obvious financing and cost implications. The traditional Eskom approach has been to give projects an option either to pay upfront or to pay over the life of a project – and most financiers will tell you that it is always better, economically, to pay over time.
- Preference will be to projects with fully underwritten financing, but you are only likely to get financing after being awarded a project. Nobody will have legally binding finance in place when they put the bid in. That can only come later.
- There is a preference for projects that can achieve commercial operation date (COD) within 10 months. But I think it is unlikely that any projects will meet this objective. You need to get financing onboard and that is before a single shovel goes into the ground to start building, and 10 months is already very short for any construction period. Projects are likely to take much longer.
- It is not yet clear if acceptance of a standardised PPA will be a gatekeeper or mark-ups will be allowed. Either approach has pros and cons. It is understood that the current thinking within the IMC Working Group is that mark-ups will be allowed.
- It seems clear that there will be a first mover advantage. This creates a dilemma for sponsors. On the one hand those projects that are most advanced when the tender process takes place will be the most likely to succeed. On the other hand there is an obvious risk for developers investing money before the final criteria and PPAs emerge.

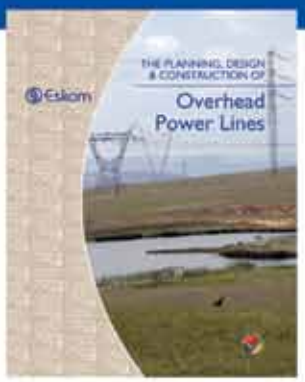
The Energy Regulation Act, 2006 and the Regulations refer to the IRP, which is to be taken into account by NERSA as one of the criteria for the selection of IPPs (Regulation 7(3)(a)). The Integrated Resource Plan (IRP), promulgated for consultation in January, defines as a policy objective that 10 000 GWh of energy shall come from renewable energy sources by 2013, approximately 4,0% of the energy mix and a very modest target. In fact, very few projects are likely to be up and running by 2013. IRP1 is a very brief document and only covers the period until 2013.

IRP2/2010 preparation is well underway and expected to increase targets substantially. The draft IRP2010 was due to be published for public consultation this month, ie, in September 2010, with a view to getting it promulgated by November this year. Extensive consultations have already been carried out and 81 submissions and 831 inputs submitted, a high proportion related to renewables. Respondents are calling for between 20 and 75 percent renewables by 2050.

The DoE made a presentation to the Parliamentary Committee on Energy in August but a complete copy of the presentation has not yet been published. However the base case parameters are encouraging. These include: 500 MW of wind by 2013 and 1000 MW per year thereafter; 500 MW of CSP per year from 2018; and 100 MW of PV per year from 2018.

The PPA document underpins the success of any power project. It is the only document that defines project income and is therefore crucial to bankability. The Nersa document published last year favours the buyer and raises several issues related to bankability. We haven't got time to go through all of them but we have put in some 55 pages of comments as part of the public consultations on the PPA.

To highlight a few issues: there is limited protection for the seller for risks outside of its control; there is no stabilisation clause for law changes; there are hair trigger termination rights for the buyer; and there is no termination compensation regime. In addition, the PPA



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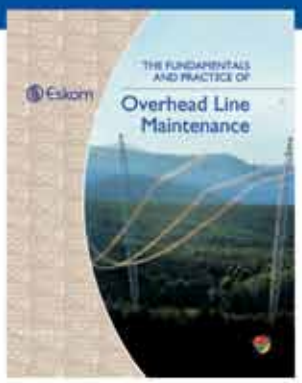

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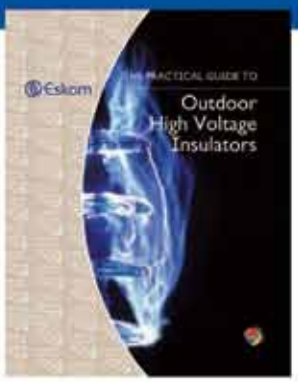

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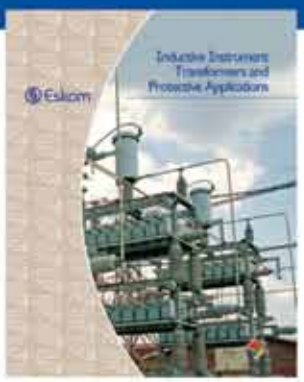

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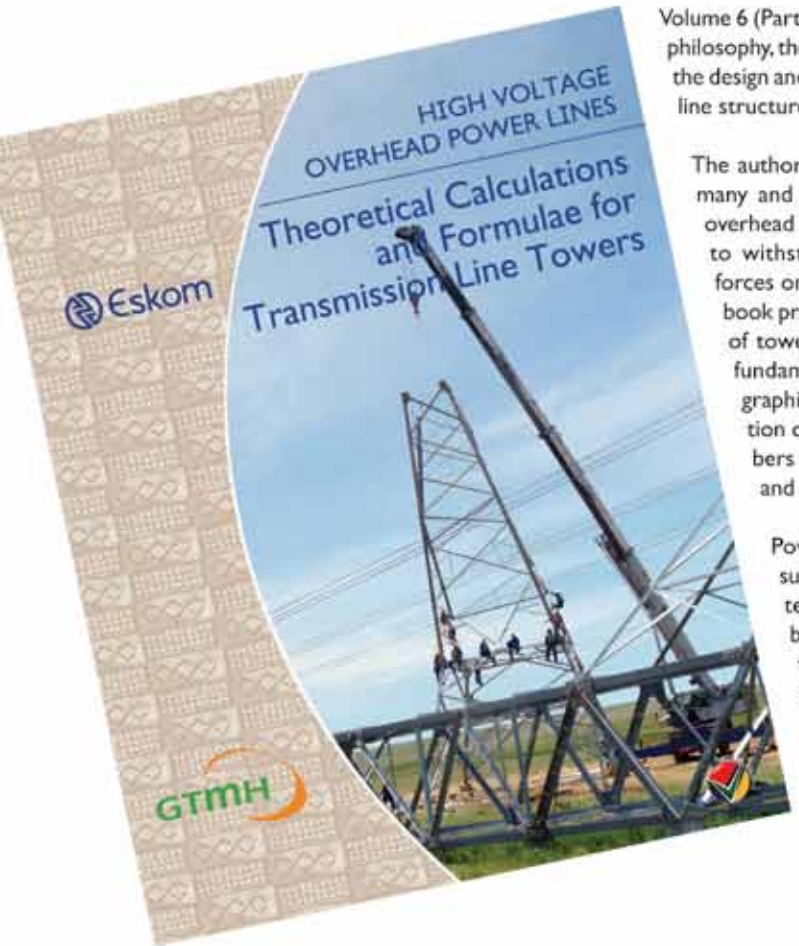

Volume 6 (Part 2) takes the reader through the philosophy, theory, principles and practices of the design and fabrication of overhead power line structures.

The author begins with an analysis of the many and varied mechanical forces that overhead power line towers are required to withstand. Once the nature of the forces on the towers is understood, the book proceeds to discuss the geometry of towers. It moves on to discuss the fundamentals of force diagrams and graphical techniques for the calculation of the forces in the tower members and introduces finite elements and computer methods.

Power line towers are routinely subjected to full scale mechanical testing and the book concludes by describing the procedures followed at major test stations around the world.

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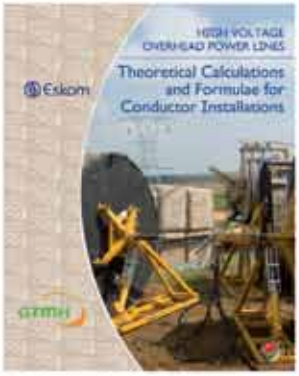

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does not deal adequately with the possibility of any industry restructuring – such as the creation of ISMO, which affects the buyer – nor does it contemplate phased completion.

As a clear example of the hair-trigger termination rights within that draft, there is a provision that says if you don't achieve 100% of your target output for a particular project, the off-take organization – Eskom or the ISMO – has the right to terminate the PPA.

It is important to get this right because IPPs in South Africa have been through a number of false starts. Investors, whether South African or international, can only be asked to continue to spend time and money for a limited period and numerous markets are competing for investor interest and funding. It is crucial that the final PPA and related documentation is the right side of the line in terms of risk allocation and bankability.

As we all know, the vast majority of these projects will be looking for bank finance. The PPA acknowledges the requirement for direct agreements with lenders, but lacks detail. Lenders will expect direct agreements covering matters such as: termination rights of the buyer to be subject to extended cure periods; lenders' step-in rights in worst case scenarios; lenders to be named as co-insured parties on the seller's insurance policies; and insurance proceeds to be applied by the seller subject to the requirements of the lenders. The final suite of documents is expected to include a standard direct agreement form dealing with these key lender requirements.

While the REFIT documents refer to guaranteed access to the Grid, they do not explain how this will be achieved. Nor does the PPA provide relief for the seller for any delays in connecting the facility to the Grid. Guaranteed and priority grid access is a key requirement of any successful REFIT Programme anywhere in the world.

Developers and lenders will be looking for the final documentation to very clearly define which party is responsible for which aspects of the connection to the Grid, eg, any required Grid strengthening and upgrading of transmission lines, etc. Also, what compensation will be available to the seller for any delay in connecting the facility to the grid? A concept of 'deemed completion' would normally apply, permitting the seller to receive income payments (on a liquidated basis) for the period from the scheduled COD until actual connection to the Grid.

The potential for South Africa's economy is huge. Energy is a key driver of economic development and it has a direct impact on new job creation. Estimates suggest that the renewables sector could create over 145 000 jobs in the country and indirect impacts could be even greater.

It also attracts foreign investment. South Africa's REFIT Programme has attracted interest from leading overseas developers of renewable energy technologies. Even though the programme has not yet been finalised, companies are spending money.

This in turn leads to skills development and transfer. If the programme is big enough then, rather than simply importing technology from overseas, if we are building and manufacturing components locally, we will be the first country in Africa to be doing so and we will have the potential to export technologies.

Optimistically, it will all come together by the end of 2010, but it could slip into 2011.

Renewable Technology	Feed-in tariff (REFIT): R/kWh
Wind	R1,25
Small Hydro	R0,94
Landfill gas (methane)	R0,90
CSP, parabolic trough with 6-hrs storage per day	R2,10

Table 1: NERSA's phase 1 renewable energy feed-in tariffs (REFITs) for the first four technologies.

Renewable Technology	Feed-in tariff (REFIT): R/kWh
CSP without storage	R3,14
Large scale PV (greater than 1,0 MW)	R3,94
Biomass, solid	R1,18
Biogas	R0,96
CSP tower with storage	R2,31

Table 2: NERSA's phase 2 feed-in tariffs cover an additional six technologies.

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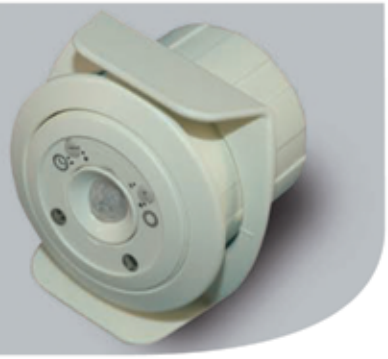
3 efficiency solutions for your building:

1 Light only when you need it
– Occupancy Sensing

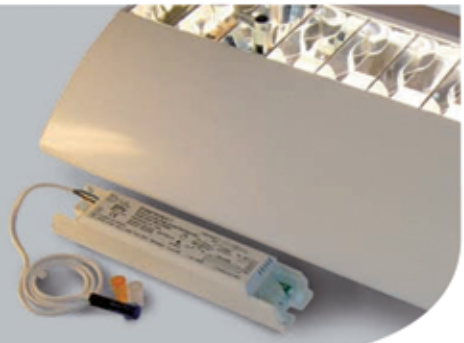


Have you ever noticed how often the lights are left on when a room is not in use? Major improvements in sensitivity and reliability have transformed the primitive "Motion Sensing" approach into a high-comfort Occupancy Sensing.

Occupancy Sensors automatically turn lights on when a room is occupied and off when a room is vacant. Saving energy could not be easier.

Typical applications include offices, conference rooms, bathrooms and storage areas.

2 Use only as much light as required
– Dimming, especially Daylight Dimming



In most buildings the lights are on at full intensity all day even when plenty of daylight is available. This is a waste of energy and causes unpleasant overlighting.

Daylight Dimming is the answer to this problem. When sufficient daylight is available the artificial light will gradually dim down. A constant guaranteed illumination level is maintained in each room at all times.

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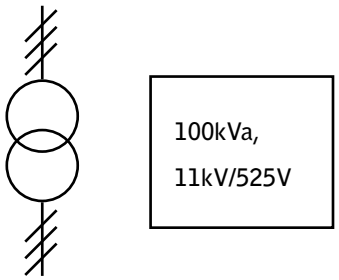
EVECTO ENERGY

Throatwarbler Smith speaks out

Please find attached an article I wrote seriously tongue in the cheek, and the only benefit it may have to the larger electrical engineering community is the production of endorphins. The spell checker was set to American English (a contradiction in terms) and I apologize in advance for s changed to z at places. I am not sure if it really fits in with the vibe of WATTnow, but I submit it anyway. Regards, Helgard Honiball



Dear Mr. Editor

To protect the concerned parties, please publish this letter under my nom de plume of Concerned Engineer (pronounced Throatwarbler Smith).

I write to you to present some inadvertent research conducted recently. The subject of this research is the understanding of elementary electricity by fresh graduates from some of our prestigious universities. Now I do mean theoretical understanding – although visions of them practically experiencing electron flow by palpitating live busbars to uplift the average intelligence in our community has at times crossed my mind.

Background: I graduated with a lot more hair on my head and less weight around my waist many years ago, and have recently grown quite lazy. I decided to start studying for an MBA because I would like more people than the 21 currently reporting to me to laugh at me behind my back, burn effigies of me and tell their wives and husbands what a psychopath they work for. You know, the typical things I would say about my boss, and more reason for using a nom de plume.

The MBA, I hope, would propel my career to boardrooms with thick carpets, peppermints on the highly polished mahogany table and abstract paintings of dubious inhibitions on the walls. But the problem with being irreplaceable is lack of promotion. So I set about recruiting an engineer. This would also alleviate some of my current workload, and cultivate more laziness on my part - a win-win situation. (see, I already know some MBA terms).

Our recruitment department set about collecting CVs and we invited all heavy current or 'electrical and electronic' graduates who dared submit their CVs over for an interview.

Research method: The candidate would be positioned in a chair, in the upright position. He would then be asked questions to determine his cognitive activity level, like "what is your name?", "where did you go to school?", "where did you study?" If these answers correlated with the contents of his CV, it was assumed that he was indeed awake and in the upright position. We then proceeded to the next level, which was the technical part. Two questions were used. Both of these I would be able to answer out of second year theory. But it turns out that many things have changed, along with hair growth patterns and weight distribution, and seemingly electricity no longer works with Ohm's law. But I am getting ahead of myself.

Question 1: How would you go about calculating the rated secondary current of the three phase transformer shown.

Results:

Question 1: Outcome C: Total incomprehension, irregular scratching of the back of their heads, suppressing involuntary bowel spasms, verbal excuses that "I don't recall now" (he probably never will), eyes glazing over - number of candidates 3

Outcome B: Dividing the kVA by the V to get A, forgetting the $\sqrt{3}$, after a pensive pause. Where would us poor electrical engineers be without $\sqrt{3}$? Lost in the sea of DC. Mercury Arc rectifiers would have no place, induction machines would be out of work and worst of all Mxit would be stillborn. Now before I venture into the virtues of roots, $\sqrt{3}$, $\sqrt{2}$, African potato and so on, let us continue. These candidates recognized the units and took a guess at how to get the answer. This should earn them some entrepreneurship points. – Number of candidates 3

Outcome A: Calculating the correct answer. Number of candidates – 2. It transpired that these 2 use this formula irregularly in the line of work they currently do.

After extracting answers to this question, and recovering in 87.5% of the cases from temporary intermittent schizophrenia on this interviewer's part, the next question was put to these by now disillusioned individuals.

Question 2a: I drew in free hand the appropriate symbol, and posed the following question. Depicted is an NPN BJT. Do you recognize the symbol?

Question 2b: Please describe how you would turn it on. Alternatively make current flow from collector to emitter.

Results

Question 2: Acknowledgement of recognition: Number of responses – 8. (100%)

Question 3: Maybe "turn it on" was a term which was not technically correct, and these hormone infested youngsters misunderstood. This in turn disabled their ability to focus on the alternate form of the question, but this is pure speculation on my part. The 0.6V or 0.7V base to emitter bias was mentioned by 3 candidates. And the rest – well they still think that engineering is a very exciting field.

Conclusion: I am doomed to stay in my current position, continue the search for competent life out there and probably have my career limited by inflammatory statements above.

There was Eight Year Mac (not his real name), who after eight years of dutifully attending Jool (Rag), finally passed his degree without understanding ohm's law. Then there was three year Mac (not his real name) who was defeated by Maths 1. Three times.

Green buildings – is it just a lot of hot air in South Africa?

Many hard-headed engineers may be tempted to believe that the green building movement is a load of hogwash from bunny-hugging environmentalists determined to plant indigenous trees in wetlands near over-populated cities just to make them feel better.

There may be a few die-hard traditionalists who think this way, and for them (and for everyone else too) I'd like to inject a couple of facts provided by Joe Van Belleghem, chief executive of international company Lend Lease that has built a six-star rated multi-use development worth millions in Canada.

He points out that buildings use one third of the world's resources and are responsible for 40 percent of the world's global greenhouse gas emissions. Moreover, buildings are responsible for 40 percent of the solid waste generation globally and use 12 percent of the world's water.

Worst of all, the air quality in buildings typically contains up to five times more pollutants than outdoor air.

Certainly, Van Belleghem's statistics might apply to Canada and the other developed countries around the world but that's simplistic and naïve. For instance, Beijing, as a developing country has the worst air quality anywhere in the world and the authorities have implemented all kinds of legislation to halt pollution.

Asia and India are among the world's greatest polluters and there are moves throughout the region to tackle the problem of pollution head on to try and reduce the enormous levels of pollution and waste that are being generated in those countries.

Let's cut through all the euphemisms and confront the problem headlong: Green building, a reduction in greenhouse gases and global climate change all amount to one thing. The human race cannot continue fouling its own doorstep. Or it can be that the consequences of this will be enormous for sustaining human life. In South Africa, Eskom alone is pumping millions of tons of greenhouse gases into the atmosphere. So are Sasol, the mining companies, Arcellor Mittal and every other industrial concern in the country.

People living in buildings are generating huge piles of rubbish and simply dumping these black bags on the street where, hopefully, a rubbish truck pitches up to carry it away. Carry it away to where? Again, the South African scenario is to an enormous landfill site where the rubbish can rot. And as it rots it generates heat and gases that can foul the atmosphere.

This might sound simplistic but it's what's happening right now. Forget about these lovely measurement tools that show the 'carbon footprint' and that, in real terms, means little or nothing to anyone at all. Just think about the stuff that you throw away every day.

That's the stuff that had to be made somewhere, packaged somewhere, distributed somehow, offered to you in one of the big shops and then, when you've eaten your chicken schnitzel (because it's more healthy than red meat) you discard the remnants in a basket.

That's the waste that engineers are talking about. That's what the carbon footprint means and that's what is fouling the planet too. The cycle of manufacturing, the cycle of distribution and the cycle of consumption.

And it is in these cycles that the role of the engineer can play such a decisive role. For it is each one of these qualified and professional people that can change the way that the world does things. For instance, Llewellyn van Wyk of the CSIR points out that by changing

the design of the foundations for a low cost house, he is able to save a ton of cement.

Shane Esmore, a director of Umow Lai, a building services and sustainability consultancy based in Australia, points out that sustainability involves every engineering discipline, including mechanical, electrical, lighting, communications, security, audio visual, fire and hydraulics.

Each of these disciplines contributes directly to reducing wastage and, more importantly, reducing the impact of pollution on the environment that we all share. And it is the pollution levels that the green building movement is trying to address.

Of course the picture is considerably bigger than this: For instance, a major South African bank decided to construct its new corporate headquarters on the western side of Johannesburg close to Beyers Naude Drive. It bought the land and erected a wonderful edifice.

Then, in true corporate fashion it installed energy-saving bulbs throughout the building; it reduced the amount of electricity being used because it had lots of natural light flooding into each office. And it was very proud of its achievements.

However, as various delegates and speakers at the recent Green Building Conference in Cape Town pointed out, the reality of this building is much more profound when it comes to its impact on the environment. Just getting people to and from the site without using public transport infrastructure adds to the level of pollution; people rely on their own transportation to get there, creating additional congestion twice a day; the natural light in the building provides specific heating problems in winter and cooling problems in summer and so forth. Ken Reynolds, responsible for Nedbank's new corporate headquarters in Sandton – and the first building to achieve a green star rating in South Africa – points out that there is a lot of 'greenwashing' that is done by developers throughout the country.

"The reality is that the project has to be designed and built in such a way that the whole project has less of an effect on the environment than those buildings built using conventional methods," he says.

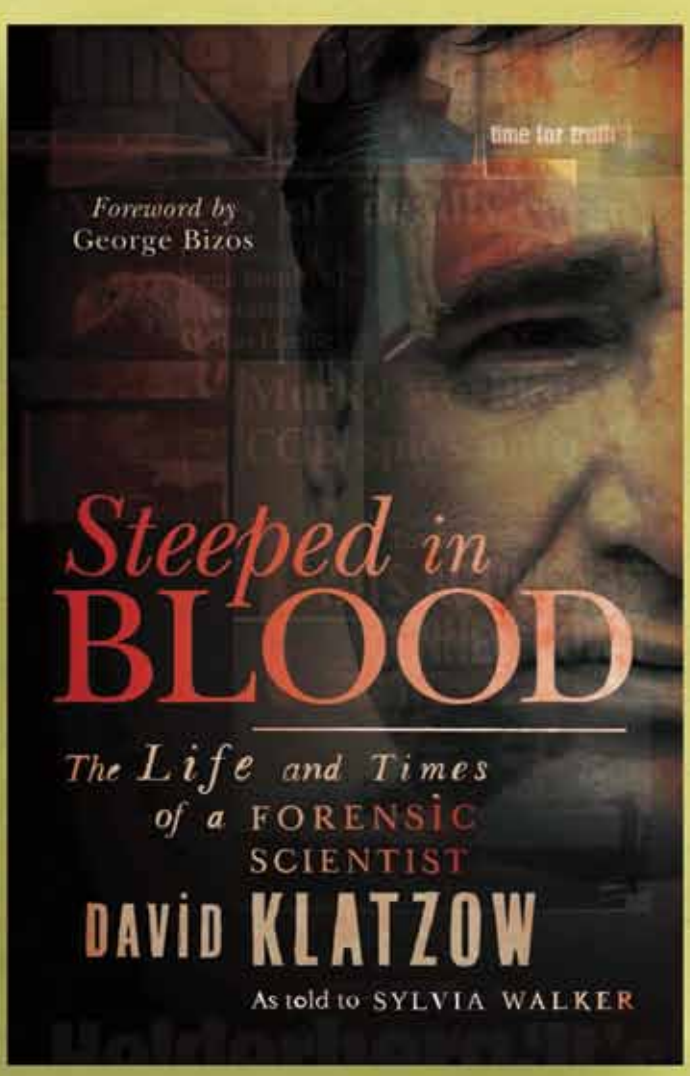
"And it starts with the choice of the site and extends right the way through to the building's sustainable lifespan of 20, 30 or even 50 years," he says.

Van Belleghem, who's had considerable experience working with green projects, says that this is the first step to creating a sustainable environment. His project, Dockside Green in British Columbia proved that green building methods provide real, long-term savings that will improve the quality of life for everyone involved in the process.

It is a large development of 121 000 square metres, built on the old site of Victoria's inner harbour – an industrial site that had been in use for more than a hundred years. The site itself had been abused by years of pollution and the ground was covered with the residue of petrochemicals, toxic heavy metals and had even been used as a landfill garbage dump.

What are some of the things that have been done at the Dockside Green project?

The buildings have received the Leadership in Energy and Environmental Design (LEED) platinum certification, the highest certification that can be awarded by the internationally recognised green building certification system. But as Van Belleghem points out, the environmental impact of the development extends much



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This book exposes a demanding and sinister world where the rewards are equalled only by the frustrations, and where the truth is always elusive. But the truth is out there, and David Klatzow will find it.

About the Author - David Klatzow

Dr David Klatzow is an internationally recognised forensic scientist. He is an expert in the field of pyroforensics and an authority on blood alcohol. Before branching out into the world of forensic science, he was a lecturer in biochemistry at the University of Durban-Westville and medical biochemistry at the University of the Witwatersrand.

About the Author - Sylvia Walker

Sylvia Walker is a marketing manager in the financial services industry with a passion for writing and a keen interest in the world of crime. Her first book, Dealing in Death, was published in 2009 and focuses on tik and the plight of parents who live with addiction.

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further than putting up buildings that use less energy. For instance, there is a centralised gasification plant to provide a heating system for the entire development; a hundred percent of sewage is treated on site and the recycled water is used to water the plants and to flush toilets in the different buildings in the mixed-use development.

The potable water savings are 66,5 percent below the baseline for LEED certification and it is estimated that 350-million litres of water are saved each year. This is equivalent to the whole of Victoria's water usage on the driest day of the year.

Every unit in the development has meters to measure the use of hot and cold water, heat and electricity so that every person pays for what they actually use.

The impact of the Dockside Green project on greenhouse gas emissions is also extremely interesting. Electrical energy savings reduce the carbon dioxide emissions on the site by 95 tons a year; the natural gas savings through energy efficiency save another 2 759-tons a year while the use of biomass heat saves another 537 tons and the savings achieved through the use of the biomass system as opposed to using natural gas amounts to another 1 824 tons.

The total savings at the site, in terms of carbon dioxide alone amounts to 5 215 tons. All this has been achieved by clever engineering.

"The benefits are so much greater than that though," says Van Belleghem. "For instance, otters have migrated into the wetlands and streams that run throughout the site. They arrived looking for an easy meal because Canadian geese chose to settle there, and within the first year, 12 goslings were born.

"The use of indigenous trees and plants meant that the birdlife returned. This encouraged predators to come to the site and now we have the otters and foxes happily living there. There are over 10 000 species of Canadian fish in the waterways – and we didn't put them there," he says.

Van Belleghem says that, for the residents at Dockside Green, the return of the indigenous birdlife and animals have added to the charm of the development and has seen people taking a much greater interest in their natural surroundings with the spin-off that they are taking care of the environment as well.

While South Africa doesn't yet have a project of this scale, various architects, engineers and developers are starting to use some pollution-reducing mechanisms such as sun screens to protect the glass façade and reduce the energy needed to cool or heat the buildings.

At 24 Richeford Circle, a new building developed by Maponya Developments and Beare Holdings, heat recovery wheels have been installed to provide fresh air and increase ventilation, waterless urinals are used in the toilets and an indigenous garden has been planted to reduce water usage.

Group Five's Kenda Stern says at the Nedbank headquarters in Sandton that the energy efficiency measures extended to on-site treatment of black water, the use of water-efficient fittings, energy efficient lighting and heating, ventilation and air-conditioning systems and advance lighting controls to dim the lights during the day to compensate for the natural light in the building and increase light intensity as dusk descends.

But these are all rather insignificant measures when compared with the Dockside Green development. As Ken Reynolds of Nedbank points out, it is a start and Nedbank is the first major company to endorse green building methods in the country and it has been rewarded with a four-star rating.

The Green Building Council of South Africa bases its rating systems on those implemented by the Green Building Council of Australia but the measurement criteria have been amended for local conditions.

There are nine categories that are included in the Green Star Rating Tool that cover management, indoor environmental quality, energy, transportation, water, materials, land use and ecology, emissions and innovation.

According to Nicola Douglas, chief executive of the council, a green building has to be energy efficient, resource efficient and environmentally responsible and to achieve this incorporates fundamental aspects of design, construction and operational practice.

"It means, really, that the resources must be used efficiently and that all wastage must be kept to a minimum," she says.

"In practical terms it incorporates design, materials and technology to reduce the energy and resource consumption. That means reduced

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heat loads, the use of natural light, greater circulation of fresh air, the use of non-toxic materials and so forth," she says.

But what impact has green building – and the rating tools that can be used for these buildings – had on the engineering and architectural professions? If the Green Building Coucil is to be believed then the impact is significant as more and more professional people are adopting green building practices.

Reynolds is, perhaps, a bit more wary and he says that the process really starts with the clients. "At Nedbank we have always been environmentally aware and this awareness extends back over the past 25 years and more. But that is not typically the case among many of the clients who are erecting new buildings around the country," he says.

Building specialist Llew van Wyk agrees. He says that the notion that a developer can adopt one or two energy saving mechanisms and then apply those on site is simply not good enough.

Instead, he says, the process must start right at the very beginning of the building cycle and must encompass such elements as better design of foundations, more efficient use of materials, the overall impact that the building will have, not only on its immediate surroundings, but on the transportation of people to and from the building itself.

"It's much more of a holistic concept than putting in fragments to represent energy efficiency," he says. "Like the Dockside Green project, South African engineers need to start looking at things differently and then find ways to solve the direct impact that these building methods will have on the development," he says.

Of course Van Wyk is not wrong, particularly when you look at the relatively recent Sandton central business district. There is at least the promise of a public transportation infrastructure as the Gautrain will be able to carry people from central Johannesburg to Sandton, and from Pretoria to the business district.

But this is not the case when you look at suburbs such as Randburg where the public transporation infrastructure is virtually non-existent. "To build green buildings in such areas at this stage might save owners some operational expense but will certainly not have a meaningful impact on the overall pollution levels affecting that part of the city," he says.

A new mixed-used development in Pretoria, Menlyn Maine faces much the same difficulty. It is being built on the eastern side of the city, far from any public transportation infrastructure, but the goal is that people will be able to live, work and be at leisure in that area and not have to stray far away to earn a living.

So in that regard, Menlyn Maine may have some direct benefits. The developers of Menlyn on Maine are so confident, that the company is sponsoring the development of the Green Building Council's rating tool for the mixed use development grading.

According to the developers it will make use of relatively standard features such as high efficiency lighting, hot water service systems and chillers, energy efficient motors and elevators and so forth. More interestingly, the company says it will use in-situ-concrete, pre-cast concrete systems, acoustic panel ceilings and resilient floor tiles and carpets.

Menlyn Maine says it will install water-efficient irrigation systems, use storm water harvesting systems and even have water recycling plants on a building-by-building basis.

It will be interesting to see what the development – and the many others underway – actually yield in terms of savings and environmental impact, because at this stage, the green buildings that do exist in South Africa are all too new to be measured by any meaningful criteria.

And, of course, if architects and engineers buy into the entire green building concept then, in the years ahead, South African cities might be much more healthy to live in than they are at the moment.

And, I suppose, that Johannesburg, classified as it is as an urban jungle, might have much to gain from better, more efficiency and more environmentally-friendly building methods too.

It's important to not lose site of the goal as well: to reduce pollution and wastage – and engineers are past masters at achieving that as soon as they turn their minds to that problem.

The Eskom new-build programme – a reason to unite

By Peter Middleton

Parabolic trough concentrated solar power (CSP) – a possible specialist technology area for South Africa if IRP2010 chooses to invest in renewable generation options instead of large scale coal or nuclear options.

Between now and 2030, if the economy carries on growing at the current rate, South Africa will be required to double the capacity of power generation in this country. That means that the country will have to build, at least, another Eskom.

As Dr Steve Lennon points out, Eskom is currently engaged in building the Medupi and Kusile 4 800 MW power stations, and Ingula, a pump storage plant. These are massive projects by anyone's measure. The two coal plants are supercritical and use clean coal technology. They will be fitted with modern gas cleaning technology and will be the world's biggest dry-cooled power stations – and dry cooling is widely used by Eskom in South Africa.

Lennon says the 4 800 MW Medupi, coal-fired power station will have a higher efficiency than any other operating today because of its use of supercritical technology. It will be commissioned between 2012 and 2015 and, of the R120-billion cost, about 60 percent will be spent locally. "This will ensure that local manufacturing capacity is developed – a process happening as we speak. Already, a fabrication and welding training facility has been established; the first PEMA membrane welding machine commissioned in Tshwane; and we are seeing enormous leverage coming out of the project through the placement of contracts. The boom in the Lephalale area is absolutely incredible, through this one project alone," he says.

Medupi on its own is bigger than Gautrain and all of the World Cup stadiums put together. In addition to Medupi, Kusile and Ingula, there are also other projects: a 100 MW solar thermal plant; a 100 MW wind plant and a massive road-to-rail project that will be built. On top of these, independent power producers (IPPs) are coming on board to build more renewable projects.

"The energy sector in South Africa is a very exciting space. Forget the other challenges in the South African economy – we can build the economy just on the back of the energy sector," he says.

Of course the most critical thing facing the country at the moment is the skills shortage and Eskom is working on developing skills while building the power stations and improving power generation in the country.

"At Eskom, we see the shortage of skills, especially in the areas of welding and boiler-making. Medupi alone will require at least 8 000 tradesmen and at least double that to do the jobs involved in contracted work. We have to populate that skills base and this is one of the enormous challenges. Industry is doing quite well at increasing its training – but it needs to do a lot more. Every one of us will need to spend a lot of time thinking about training if we are to ensure that we develop artisan level skills," he says.

As part of the Medupi programme, Eskom started the Lephalale FET College, with funding from Siemens and Hitachi to the tune of R50-million. Today 7 000 - 8 000 employees are working on site, 2 600 skilled with trades, about 2 000 contracted learners, 162 A-class welders and 40 B-class welders. At any one time, Eskom has around 6 000 learners in the skills pipeline across all disciplines – but this is really just a start.

"What we really need in South Africa is to get the skills pipeline pumping. If people have skills, then not only are they much easier to employ in the first place, but they are also more able to create employment for themselves," he says.

"I am a champion of technical careers, right through the technical skills value chain and I believe we have to regenerate the sense of excitement in technical careers in South Africa. That means that we, as practitioners in these fields, need to turn our industries and disciplines into something sexy and exciting for young students, he says.

In a separate development, the World Wildlife Fund (WWF) has recently released its report entitled: 50% by 2030: Renewable Energy in a Just Transition to Sustainable Electricity Supply', and it argues that the Integrated Resource Plan (IRP2010) for electricity supply for the next 20 years should target significantly higher percentages of renewable energy: "Responsibility aside, the volatility of the fossil fuel price and the border tax measures to penalise carbon emissions will mean that if, as a nation, we are in the vanguard of low-carbon re-industrialisation, it will boost our competitiveness in the world economy, while also greatly expanding the value we derive from renewable energy resources," says WWF CEO, Morné du Plessis, in the report's foreword.

Quoting President Jacob Zuma, who announced Government's intention to develop a National Green Economy in May this year, the report notes that South Africa has "no choice but to develop a green economy." Also highlighted is the briefing document: Towards a Resource Efficient Low Carbon and pro-Employment Growth Plan, which notes a research finding that a 15% shift towards renewable energy generation by 2020 will create 36 400 new jobs without taking any jobs away from the coal-base.

In 2008, the WWF-commissioned Cape Town University's Energy Research Centre (ERC) is to explore the costs of generating 15% of South Africa's electricity using renewable resources by 2020. Key findings include:

- By 2020, electricity costs for a 15% renewables scenario would be only slightly more (15%) than a scenario based on continued dependence on coal and nuclear plants (a baseline scenario).
- If combined with an energy efficiency programme, the 15% renewables scenario would result in slightly lower over-all electricity generation costs from about 2015 onwards.
- If carbon finance were added into both the renewable and the energy-efficiency programmes, average electricity costs would drop by up to 18% below the baseline scenario by 2020.

Also coming out of the ERC study, is an Excel-based planning tool called SNAPP – the Sustainable National Accessible Power Planning tool – that allows users to compare a proposed scenario or resource plan against a reference case, eg, a 'business as usual' scenario. SNAPP, which can be downloaded from the WWF website (http://www.wwf.org.za/what_we_do/climate_change/) is designed to make analysis of electricity plans more accessible and to enable users to interrogate Government's proposed integrated resource plans. "It contains over a dozen interlinked spreadsheets. Basically, you plug in a new set of investment options and it uses embedded data to calculate emissions profiles, unit costs of electricity, etc," Worthington tells MechTech.

Having already demonstrated that a shift to 15% renewables by 2020 was feasible, Worthington turned his mind towards appropriate targets for 2030: "What would happen if we didn't build any new coal or new nuclear plants after Medupi?" he asks. "This tool allows you to add units until peak generating capacity, reserve capacity and reserve margins match the predicted growth plans."

Published in the '50% by 2020' report are comparative SNAPP investment models which are both consistent with Eskom's growth predictions. The reference scenario assumes dependence on supercritical coal (19,1 new GW by 2030) and PWR nuclear (14,9 new GW by 2030).

The renewable scenario, which simply assumed no more coal after Medupi and no more nuclear, suggests a shift towards Wind (9,5 GW at 25% capacity factor and a further 12,7 at 30% capacity factor) and solar thermal central receiver plants (33,2 GW of new capacity by 2030). "CSP is the key substituting technology for this exercise, but whether you go for trough or central collector is a little academic. Some people say that concentrated photovoltaics (CPV) will make a lot more sense in future. Costs are coming down with production scales and greater efficiencies, so it is also becoming a competitive option," says Worthington. "Both solar water heaters and PV are also particularly suited to distributed off-grid solutions that ultimately limit grid-based demand," he adds. "But the purpose of this exercise is to inform the IRP2010 grid-based process, which is imminent."

Worthington argues that IRP2010 ought to be provisional. "The IRP is an electricity generation plan so it should really follow the broader Integrated Energy Plan (IEP)," he says. "People don't want to talk about the switch towards electric vehicles, for example, because of anxiety about meeting current electricity demand. Do you want electric vehicles to increase demand on an already strained system? But actually, yes you do, because EVs are charged at times of low demand, eg, at night, so you are not adding to peak demand, and every car battery or fuel cell is then available as a form of distributed storage," he explains.

We ask why nuclear has been excluded when emissions are at the core drivers of change. "This is a renewables intensive scenario and we do anticipate nuclear being included in IRP2010. But we don't believe that the modelling costs currently being used by the nuclear industry accurately reflect reality.

The costs overruns in Finland, for example, are already over 20%, and time overruns are hitting 2-3 years. Quoted costs of $3 500 per kW installed are being used for modelling, and these are claimed to be lifecycle generation costs, but current parameter sheets ignore the full nuclear fuel chain and the decommissioning costs. These are,

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therefore, not true lifecycle costs and should not be used to make decisions about over $1-trillion of public spending," he responds.

Renewable net costs, on the other hand, become more attractive over the lifecycle. "If we go in with high ambition, new renewable plants may still present challenges in terms of up-front capital costs, but there is immediate value in having them in the power generation mix. Industry needs Eskom to sort out its emissions because the profile gets passed down to all industries that use Eskom-generated electricity and it negatively affects the carbon footprint of all exported products," Worthington says.

The cost of capital is another key cost-mitigating factor favouring renewables over nuclear options. "If you just look at capital cost comparisons, then you are ignoring the cost of borrowing the money. Any nuclear investment has got to be state-backed. No private stakeholders will fund nuclear plant and the cost of capital is high. But if you are funding renewables, and you do it through one of the climate or development funds that offer low cost of capital for the global-good, you can get nominal interest rates. So the total costs over time will be much lower," he explains.

"But the biggest loss we face by taking the nuclear route is the opportunity cost. We don't have the capital to invest in both nuclear and renewables. So let's build a renewable energy industry, an industry that can export into all places in Africa, without the emissions or security concerns associated with coal and nuclear options, respectively.

"The World needs to get as close as possible to 100% renewable energy this century. In the interim we will need to use demand side management and Open Cycle Gas Turbine (OCGT) options as insurance for unusually high demand and to protect the system. I have also included some coal in this exercise, via Integrated Gasification Combined Cycle (IGCC) technology, which is better suited to CO2 sequestration if we can find secure sites.

"We must stop thinking of renewables as a nice add-on – they have to become the heart of the system. We should start building industries locally now, and if we put a particular strategic effort into one technology, solar tower options, for example, we have a good chance of becoming a world leader," Worthington suggests.

Richard Worthington, climate change programme manager for WWF South Africa.

High performance computing in SA given the edge

Wits University has been awarded R2,2-million over three years from the CSIR Centre for High Performance Computing (CHPC) for its innovative cyber technology project.

The 2010 CHPC Flagship Project was one of two Flagships awarded out of 19 proposals. The Project will be co-led by Prof. Steve Damelin from the Wits School of Computational and Applied Mathematics and Prof. Michael Sears from the Wits School of Computer Science. Damelin says: "The Award will involve multiple projects with undergraduate, graduate and postgraduate students and scientists all over the world in Imaging, Computer Vision, High Performance Computing, Computational Harmonic Analysis and Remote Sensing over the next three years."

Another member of the team, Prof. Ekow Otoo, Acting Head of the School of Computer Science explains: "This project embodies programmes to develop talents and expertise in High Performance Computing. It helps set the stage for active participation in developing next generation computing applications that would require peta-scale and exa-scale super computers. These systems enable applications to be executed in hours as opposed to months on today's computers." Other members of the team include Dr Amandine Robin, Michael Mitchley and Nontokozo Mpofu (CS) from Wits University. "There are numerous sub-projects contained within the overall Award," explains Damelin. "We are interested in developing mathematical tools using, for example, computational harmonic analysis, differential geometry and approximation theory to apply to important practical problems. A typical example is ultrasound imaging where we study image reconstruction of various parts of the human body in two or three dimensions. Its applications are widespread, for example, in scanning the foetus in vivo during pregnancy or producing the tools to assist doctors in marking areas that are often difficult to assess through other methods, like the boundaries of nerves in tissue."

The team will also investigate hyperspectral imaging which refers to the simultaneous collection and processing of information from the ultraviolet to the thermal region of the electromagnetic spectrum. "One of our projects will be to apply hyperspectral imaging, using satellite technology to create patterns of data that will enable geologists to study rock materials and minerals that could assist in prospecting for valuable minerals and other resources," says Damelin. "This is really where the mathematics comes in – the team will look at producing algorithms to compress and represent high dimensional spaces on two dimensional computer screens, and to produce data that is easy to access and understand. This is an example of a 'cyber loop initiative' which brings real-life industrial problems to the table to be interrogated and solved mathematically by students and researchers in applied mathematics," he adds.

Sears concurs: "Its key objectives are to enable South Africa to become globally competitive and to accelerate Africa's socio-economic upliftment through effective cyber infrastructure.

Book seeks to redefine Higgs mechanism

True Nature of the Higgs Mechanism by Chandrakanth Natekar

This book seeks to advance a new theory related to the Higgs mechanism, the process by which gauge bosons can theoretically achieve a nonzero mass through spontaneous symmetry breaking.

According to Natekar, the Higgs mechanism relates to fundamental aspects of a universal binding force. He contends that the Higgs mechanism is a force that always moves towards the centre of a particle and holds the particle as a single unit and that without this mechanism, the very existence of any given particle, matter or object is impossible.

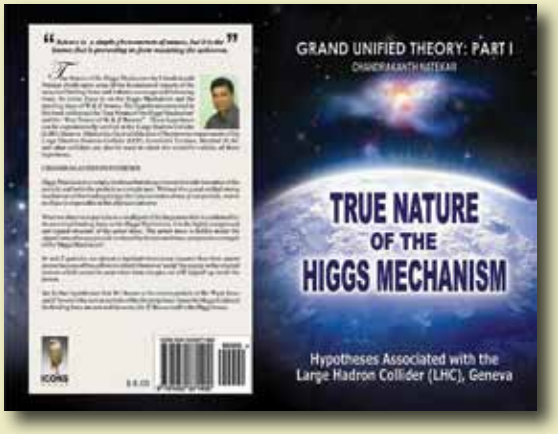
Natekar also argues that observable particles are only a small part of the huge mass that is condensed by the universal binding force or Higgs mechanism. The actual mass is hidden inside the compressed zone of every particle or object by the extraordinary binding strength of the Higgs mechanism.

Natekar asserts that in the transitory pair of W & Z Bosons, W Boson is the carrier particle of the weak force and Z Boson is the carrier particle of the Higgs mechanism or binding force. Hence, Z Boson itself is the Higgs Boson.

"As a child, I realised that all the stellar and non-stellar bodies of the universe and their constituents, including the human mind, are made up of matter, but matter always functions in tune with nature," Natekar says.

"This inspired me to investigate the hidden root of everything and led to my 'Grand Unified Theory.'"

Natekar says his hypotheses can be verified by the experimentation at the Large Hadron Collider in Geneva, Switzerland. He further states that the large electron positron collider, Fermilab's Tevatron, Stanford University's SLAC and other colliders can also be used to check the scientific validity of his ideas.

















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HD phone technology won't stop dropped calls

High-definition phone calls are being rolled out by Orange using a new standard for these calls but users will have to have HD phones to hear the difference. Apparently the technology more than doubles the frequency range for the calls.

It works on the basis of isolating voice sounds from the background noise. However, the more fundamental problem of mobile phone reception has not been addressed so if a user is in a poor reception area, the call will drop off the network regardless of whether or not it is made using the HD technology.

Sony Ericsson, Nokia and Samsung have started installing the new technology on the latest batch of phones being offered to consumers.

In a separate development the Indian government has said that it will not shut down services to BlackBerry users in that country for at least another 60 days.

There are fears in many countries in Asia, Middle East and in part of Africa that BlackBerry phone technology can be used for subversive purposes and countries such as China have already blocked e-mail and news services to these devices.

So while the mobile phone companies are making more and more sophisticated handsets, the authorities are passing legislation that effectively reduces them to their original and primary purpose of making phone calls quickly and easily.

Sony offers total home entertainment system

Sony has released an extensive suite of 3D entertainment solutions that range from content creation of 3D movies and stereoscopic games, distribution and display and it claims to be the sole consumer electronics manufacturer that offers total 3D enjoyment from beginning to end. .

For some time Sony has been extolling the virtues of its 3D television sets but now the company has developed new network models, the Bravia NX810 and NX710, that have full 3D capability, combined with connectivity and elegant design.

By connecting the TV to the 3D Sync Transmitter and putting on Sony Active Shutter 3D glasses it's possible to enjoy lifelike, immersive high definition 3D entertainment. Quality is assured even in 2D, as the TVs have a high definition video processor, Dynamic Edge LED backlighting and Motionflow technology of up to 200Hz, resulting in incredibly sharp images, smooth motion and ultra high contrast of over 1,000,000:1.

Add to this the BDV-IZ1000W surround sound system that uses five ultra slim speakers, a virtual 7.1 wireless rear speaker system and 1 000W of S-Master full digital technology. Coupled with Sony's 3D Surround technology, the 3D entertainment experience takes on a new depth and realism that is bound to completely envelope viewers in each and every scene.

All 3D Bravia TVs are supported by a rapidly increasing variety of 3D content, including the latest Hollywood movies on Blu-ray 3D disc and even 3D games such as WipEoutHD and MotorStorm for the PlayStation®3. Creative movie makers can further use Sony's latest range of and Cyber-shot cameras to easily produce 3D panoramic shots, both portrait and landscape, with Sony's exclusive 3D Sweep Panorama function. This easy-to-use function allows users to simply sweep the camera in a horizontal or vertical direction to capture impressive, ultra-wide panorama shots in 3D that can be viewed on any compatible LCD TV that supports 3D viewing via HDMI.

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What do a trunk and a fin have in common?

Industrial automation specialist, Festo sets out to apply natural principles to industrial practice and to use the biomechatronic results of this process in its automation systems. This dedication is evident through the company's Bionic Learning Network, which is an alliance of educational establishments and specialist companies tasked with exploring bionic solutions for evolutionary automation applications.

The Bionic Learning Network aims to develop decentralised, self-controlling and self-organising systems and its main focus is using bionics in the formulation of new principles of operation for the delivery of energy efficient, mechanical engineering innovations.

The Bionic Handling Assistant is the network's newest offering, providing a completely flexible and safe means of moving objects from one position to another. Inspired by an elephant's trunk, the 'assistant' employs innovative biomechatronics technology to minimise hazards of direct contact between machines and human operators.

In the event of contact between the Bionic Handling Assistant and a human, the assistant will yield immediately without modifying its desired overall dynamic behaviour, and will resume its operation once the threat has been averted. Unlike other heavy industrial robots, this assistant is characterised by an excellent mass-payload ratio. In addition, it provides smooth operating motion with more degrees of freedom and makes efficient use of its resources in production and operation.

The assistant comprises three basic elements for spatial movement, along with a hand axis with ball joint and a gripper with adaptive fingers. The basic elements each comprise three circularly arranged actuators tapering at an angle of three degrees.

Each actuator is supplied with compressed air at the interfaces of the basic elements. Resetting is effected by the loop-like design of the actuators, which act like a spring when the compressed air is discharged. Bowden cable potentiometers on the outside of the actuators register their extension and control the system's spatial movement. In the hand axis, three further actuators are arranged around a ball joint.

Their activation displaces the gripper by an angle of up to 30°. SMAT sensors from Festo register the travel and make for precise alignment, while VPWP proportional directional control valves are used for the overall control of the Bionic Handling Assistant.

This latest innovation could open up a host of new applications that involve direct, non-hazardous contact between humans and robots. These include using equipment in hospitals and rehabilitation centres or in agricultural and animal husbandry applications.

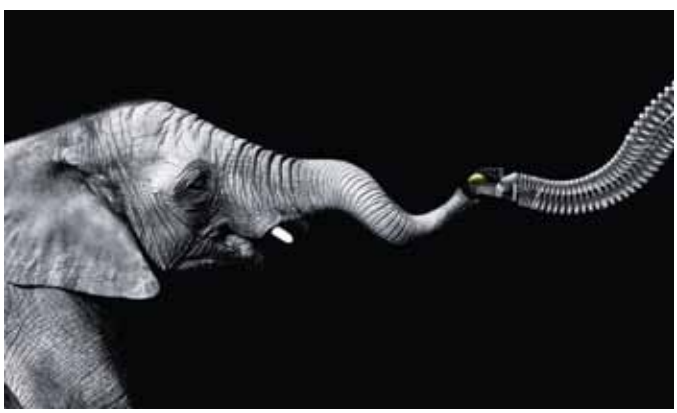
Another interesting materials handling solution from Festo, is the BionicTripod 2.0, derived from the tail fin of a fish. It can be described as a horizontally arranged tripod that is rotated at 90 degrees from the conventional tripod configuration.

It consists of a drive unit, a tripod structure free to move in all spatial directions, a flexible hand axis and an adaptive FinGripper soft handling unit. The hand axis is structured in a way that is similar to the one used on the Bionic Handling Assistant, but has the added advantage of three extra degrees of freedom and a 30 degree range of deflection. The highly versatile FinGripper constitutes the interface between the object and the actuators and consists of a pneumatic actuator in the form of a bellow and three gripping fingers.

Precise control and displacement of the tripod structure are ensured by the EGC electric linear axis and EMMS electric drive from Festo. The system is controlled by the CMXR robotic control software, which combines mechanics, electrical drive and control technology into a complete kinematic systems solution and co-ordinates highly dynamic spatial movements.

A particular advantage of the BionicTripod 2.0's horizontal configuration is that objects can be picked up from the working surface and deposited to the side at a different level, a beneficial feature for different agricultural applications and for the sorting of materials for recycling. Since the structure is pliable and flexible, it is ideal for tasks in human-machine interaction and can be used in sorting applications or as a 'third' hand.

The tripod was developed to achieve a maximum scope of operation with a minimum weight of the moving parts, which enhances energy efficiency. It is an example of the forms energy efficiency may take in the future of automation technology, made possible by electric linear actuators, electric motors, robotic control, pneumatic valves, sensor technology and control technology from Festo.



Elephant trunk: Drawing inspiration from nature, Festo mimicked the flexibility and versatility of the elephant trunk for its latest design in the Bionic Learning Network, the Bionic Handling Assistant.

Bionic handling: The Bionic Handling Assistant from Festo offers complete flexibility and the ability to safely move objects from one position to another.

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Going away – well keep it to yourself

A dire warning about discretion on social networking sites such as FaceBook has been issued on an Internet site called Please Rob Me. It says that publishing details about your forthcoming holiday on social networking sites just alerts vigilant robbers in your area to the fact that your property is a sitting duck, waiting to be stripped.

And, it says, it doesn't matter if you warn would-be robbers that you have a huge Rottweiler, a sophisticated alarm system or infrared beams around your property either. This just gives potential criminals more vital information they need before they attack your premises.

The Web site has closed down having drawn considerable attention to the dangers of posting details in status updates about planned vacations, out-of-town trips or weekend getaways.

Of course the likelihood of robbers being able to monitor entire suburbs constantly and track down exactly which people will be away is remote but there certainly are some dangers attached to providing too much information via a Twitter account, your LinkedIn profile or via Facebook.

For instance, in New Hampshire, three local men, Mario Rojas, Leonardo Barroso and Victor Rodriguez burgled 18 homes in the Nashua suburb simply by checking status updates on Facebook and then pillaging the homes of those people who had announced that they would be away for a specific period.

New Hampshire police recovered stolen goods valued at about $200 000. The investigators tracked down the trio by listening for a specific kind of fireworks that had been stolen from one home. When they heard it they converged on the suspects and recovered some of the stolen goods.

Powertech comes up for air

Power Technologies has entered the switchgear market with two products in the 11kV air insulated medium voltage range dubbed the PT Switchgear ZZK-12 series that are capable of supporting the safe distribution and management of power throughout South Africa and Africa.

These products are key to building a reliable power infrastructure, enabling the development and growth of regional economies claims Peter Riley, Powertech's executive director of business development. He claims Powertech has subjected the switchgear to extensive tests using the International Electrotechnical Commission's IEC standards.

The equipment, which was tested at the world renowned KEMA Institute of Netherlands, has been approved and certified by the Institute.

Riley says the new products will form a vital part of the company's product mix, are competitively priced and backed by Powertech's 12 month warranty as well as its extensive technical support programme.

The PT Switchgear range consists of air-cooled modular units, enclosed in zinc-aluminium coated steel, and can be moved on sliding racks. Riley says these units are typically installed in a 12 kV 3-phase AC system rated at 50 kHz and can be used safely at altitudes of up to 2 000 metres and will withstand seismic activity of up to eight on the Richter Scale.

Powertech's new switchgear technology will be sold to municipalities, Eskom, mining and industry.

The picture shows what happens when a disconnect switch fails open properly. This was a 115 kV quick break disconnect that had exceeded its switching capability while attempting to de-energize a 40 km section of transmission line Tillamook, Oregon. At times the disconnect switch operated properly, but not this day. As can be seen, one phase successfully disconnected, but the other two phases did not. Luckily the operator was able to reclose the disconnect before it relayed out.

Earth Wire Monitor – EWM550

Profit and production are the key to your success.

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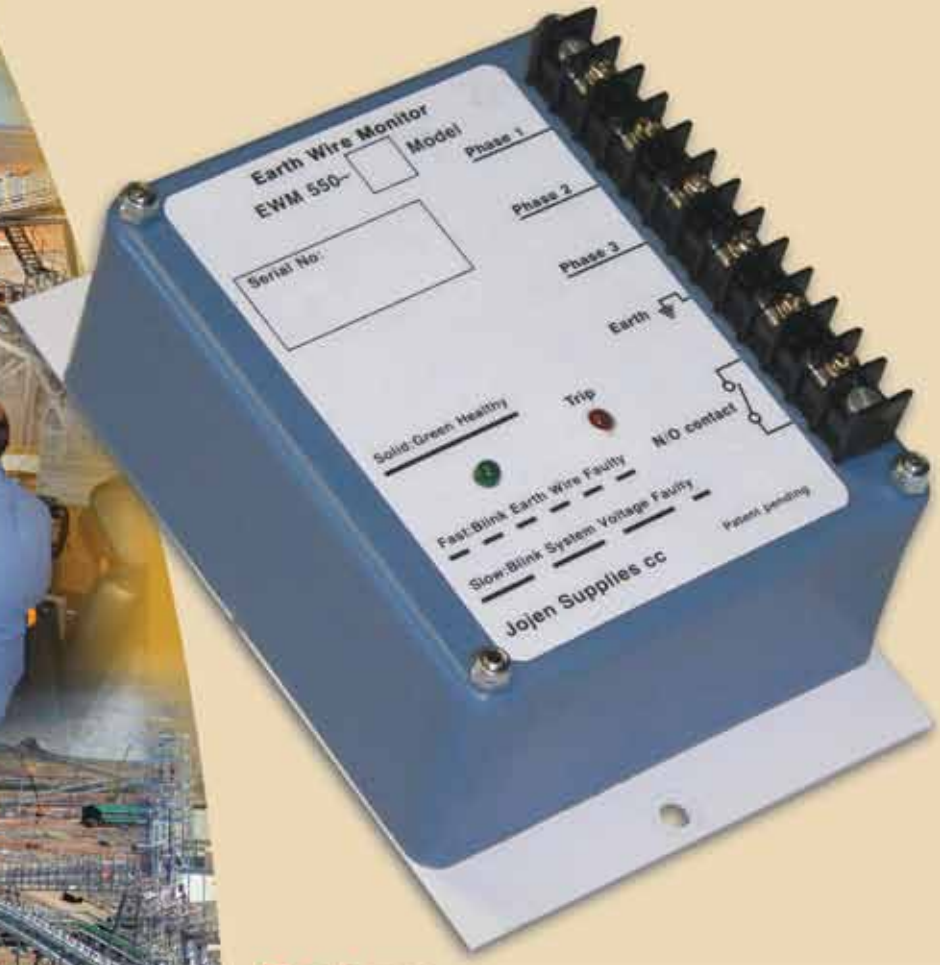
The EWM550 is a unique device offering you increased peace of mind in the most hostile of operating environments.

It works with the electrical supply system to monitor and alert you to a deterioration of the earthing system allowing you to react before your production is affected – but protecting your plant and personnel in the case of a dangerous condition developing.



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JOJEN SUPPLIES

'Print' a new limb when you need it

Bespoke Innovations, a company based in San Francisco, is using 3-D printing to create prosthetic limb casings wrapped in embroidered leather, shimmering foil or any other type of material a customer might choose.

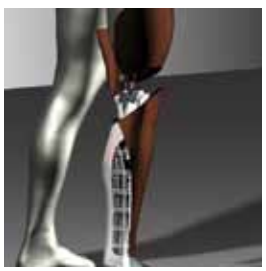
The company, owned by Scott Summit and his partner, Kenneth Trauner, an orthopaedic surgeon, has just opened a studio in the city and are selling customised limbs and limb coverings that cost a fraction of other prosthetics made using traditional methods.

Apparently the 3-D printing method means that these prosthetics can even be washed in a dishwasher. The technology creates an object by stacking one layer of material, such as metal or plastic, on top of another layer, gradually creating the final product.

Bespoke Innovations uses a purpose-built camera and scanner to capture an image of an existing prosthetic limb, which is transmitted to a computer so that more detailed sculpting of the covering can be done. The 3-D printer creates a 'film' that fits tightly around the prosthetic limb. It can be made from any flexible material.

The two have built test models of full legs that have sophisticated features to mimic body symmetry, have locking knees and flexing ankles. It costs between $5 000 and $6 000 to 'print' a leg, compared with the $60 000 it costs to make a prosthetic leg using traditional methods.

Most often the 3-D printing is used for making rapid prototypes but improvements in materials and printing techniques have now opened a range of new, longer-lasting applications. A host of modelling programs are available for 3-D printing and range from free applications that can be downloaded to the more sophisticated offerings from companies such as Alibre and Autodesk. The 3-D printing machines cost between $10 000 and $100 000 and are made by industry leaders such as Stratasys and 3D Systems. MakerBot Industries offers a kit for hobbyists that costs less than a thousand dollars. The applications for these machines is developing rapidly and, for instance, an Amsterdam company, Freedom of Creation, designs and 'prints' exotic furniture and other fixtures for hotels and restaurants, makes iPhone cases for Apple and eye-cream bottles for L'Oreal.



Similarly, LGM, a company in Miniturn, Colorado uses 3-D printing methods to make models of buildings and resorts for architectural firms and according to Charles Overy, LGM's founder, it used to take the company two months to build these models by hand and typically cost about $100 000. He says he can now build the models for about $2 000 and can 'print' them overnight.

Plan to make computer literacy part of basic education

Information and communication technology should be introduced into the basic education system as part of a concerted effort by government to narrow the digital divide, claims Telkom's Dr Richard Majoor.

He says that regulators within the ICT environment might be valuable in improving competition but contributed little or nothing to innovation as innovation was driven by market forces where economies and skills interact.

Majoor says that government must ensure that there is sufficient education at a basic level to provide basic computer literacy along with technical subjects such as computer programming and electronics.

He urged businesses in South Africa to adopt online teaching methods and introduce job-related skills training for school-leavers so that they could be better prepared for a job when they enter the employment market.

South Africa's local ICT market is expected to grow to R263-billion by 2014 according to Telkom's Dr Brian Armstrong who claims that the demand for information continues to grow exponentially.

The local telecommunications market is changing rapidly as network operators increase their data offerings in an effort to maintain an edge in the highly competitive telecommunications market in South Africa.

For instance, Cell C has launched the first 4GS high-speed network with data speeds of up to 21,6 Mbps in Port Elizabeth and the company claims that about 30 percent of the country will have access to this network when the first phase of rollout is complete by the end of this year.

Cell C's network is being rolled out on a city-by-city basis although why it chose to launch the service in Port Elizabeth remains a bit of a mystery considering that Johannesburg, Cape Town and Durban are considerably larger centres with many thousands more clients.

Think it and a computer can speak it?

Bioengineering scientists at the University of Utah have succeeded in translating brain signals into speech using sensors that are attached to the surface of the brain. The results are 90 percent accurate.

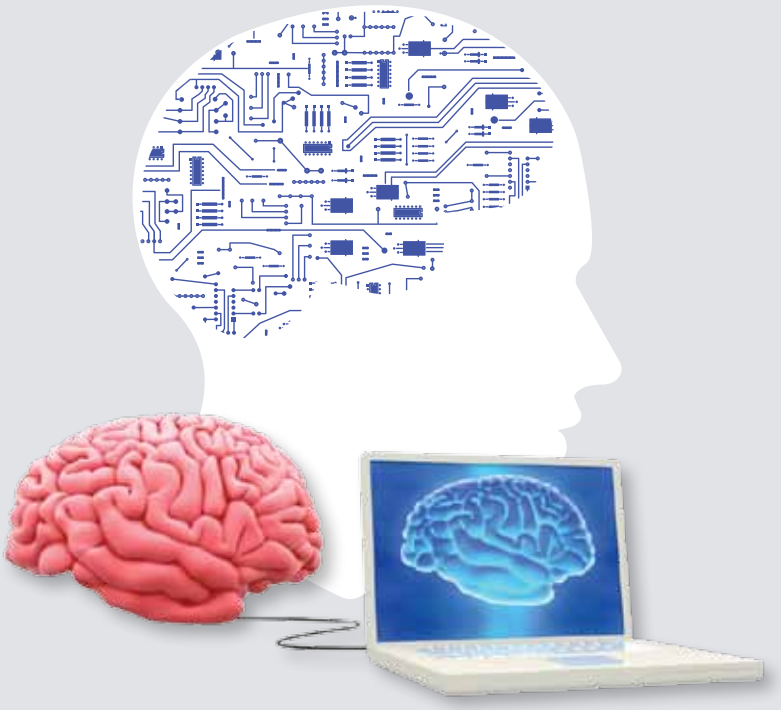
The new technology may mean that paralysed patients who are unable to speak may soon be able to do so and could even lead to individuals being able to read each others' thoughts.

Professor Bradly Greger, lead researcher for the project, says that the researchers attached two button-sized grids of 16 tiny electrodes to the speech centres of the brain of an epileptic patient. The patient had had part of his skull removed for another operation aimed at treating his epilepsy.

Using the electrodes, scientists recorded the brain signals in a computer as the patient repeatedly read each of the first ten words that might be useful to a paralysed person: yes, no, hot, cold, hungry, thirsy, hello, goodbye, more and less.

The researchers got him to repeat the words into the computer and were able to match the brain signals for each word between 76 and 90 percent of the time. Professor Greger says that thinking the word produces the same brain signal as speaking it.

He says that even an extremely limited vocabulary of just 30 or 40 words would mean an immeasurable improvement in the quality of life of people who are paralysed or who suffer from 'locked-in syndrome'.



Love the product, hate the packaging

Amazon, one of the largest online retailers in the world, has been urging manufacturers to cut back on the extremely secure packaging methods they use because so many customers around the world are enraged by the shrink-wrap methods that make it so difficult to open a product.

Amazon's Doug Herrington says that packaging is the source of the most customer complaints received by the company. In fact only 600 of the millions of products available from Amazon have frustration-free packaging.

The company is now encouraging all its suppliers to start using packaging that is easy to remove and Herrington says that the strategy has already worked for Philips after it changed its packaging for the Essence toothbrush after being shown statistics on the reduction in customer complaints by Amazon.

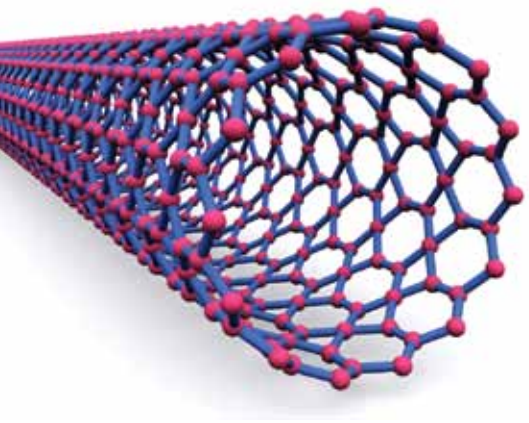
Philips asked its supplier, AllpakTrojan to create a frustration-free package design that would stop consumers having to use a pair of scissors or a knife to remove the covering.

Within a few weeks, AllpakTrojan had developed the new container and tested it extensively by dropping it, putting in on a vibration table and even kicking it around on the floor. The travel case protected the brush head, while the cardboard components protected the charger and toothbrush base.

Philips is now investigating changing all its packaging on the entire product range to make it much easier to open.

Shrink wrapping and vacuum-sealing products is popular with many manufacturers as they believe it reduces levels of theft but the reality is that many products are returned to Amazon – and other retailers too – because angry shoppers have got so frustrated at trying to remove the packaging that they have damaged the product itself.

Several other recent converts to frustration-free packaging include Polaroid, Procter & Gamble, Duracell, Bounty and Tide.



Organic nano-material strongest ever?

A revolutionary new spherical nanostructure, derived from very simple organic elements, yet strong as steel, has been developed at the laboratories of Ehud Gazit of Tel Aviv University and Itay Rousso of the Weizmann Institute of Science.

Lightweight and exceptionally strong, easy and inexpensive to produce, friendly to the environment and biologically compatible, these promising bio-inspired nanospheres have innumerable potential uses – from durable composite materials to medical implants, claims the researchers, Professor Gazit, Dr Lihi Adler-Abramovich and Inbal Yanai from TAU's Department of Molecular Biology and Biotechnology.

The team worked in collaboration with Dr. Itay Rousso and Nitzan Kol from the Weizmann Institute and David Barlam and Roni Shneck of Ben-Gurion University and used a simple dipeptide, consisting of only two amino acids, to form spherical nanostructures. Self-assembling under ambient conditions - without any heating or manipulation – this remarkable new material is the first bio-inspired nano-material known to date that is mechanically equal and even superior to many metallic substances.

While demonstrating chemical properties similar to those of the ultra-rigid Kevlar polymer, already used for bullet-proof vests, the new substance is built from much simpler building blocks, enabling some important advantages: manipulation and deposition at the nano-scale, the fabrication of nano-materials of tubular, spherical and other geometries, and spontaneous formation by self-assembly. Here, indeed is a perfect building block for numerous applications:

Hard and strong as steel, this new nanostructure is an ideal element for the reinforcement of composite materials used in the space, aviation and transportation industries; biologically compatible yet extremely rigid and durable, it is an excellent candidate for replacing metallic implants; tough, light and impenetrable, it is an exceptional option for manufacturing bullet-proof vests—to name just a few high-potential uses.

The new nanotechnology development now emerging from Tel Aviv University is based on extensive research which began in Gazit's laboratory in 2003. In an earlier achievement, the team was able to fabricate tubular nanostructures that assemble themselves into vast 'forests' featuring exceptional mechanical and physical properties.

This earlier work, based on the doctoral thesis of Dr. Lihi Adler-Abramovich, and published in 2009 in the prestigious Nature Nanotechnology scientific journal, may eventually generate self-cleaning windows and solar panels, as well as supreme energy storage devices with exceptionally high energy density.

Biodiversity education through Conservation on Wheels

Springbok Atlas, the tour and bus operator has teamed up with Ezemvelo KZN Wildlife to launch Conservation on Wheels, a project to create better awareness of biodiversity and its importance for South African rural communities.

Ezemvelo KZN Wildlife manages 99 protected areas and two World Heritage sites in Kwazulu-Natal. The organisation is involved in several biodiversity projects, including People and Parks, Kids and Parks and the Ezemvelo Soccer Cup, all aimed at enhancing the level of awareness and education of South Africans.

One of the key challenges facing the project has been both a lack of funding at a high level and a lack of transportation on a logistical level making it difficult to reach the rural communities and spread the conservation message. Springbok Atlas has solved this problem by providing the organisation with a luxury coach to get the Conservation on Wheels project going.

Conservation on Wheels will see a bright eye-catching branded luxury bus head out in to the rural communities as a mobile classroom and education centre, bringing the conservation education to the people. The bus is equipped with DVD player and screens, and can also be used as a mobile cinema and can be used to take groups of adults and children to different ecosystems so that they can experience the reality of conservation.

Conservation on Wheels is a mutually beneficial partnership. Springbok Atlas provides the much needed transport to assist Ezemvelo KZN Wildlife to reach the rural communities and spread the conservation education, and in exchange Springbok Atlas has a variety of benefits including increased publicity through co-branding the vehicle, exposure to the rural communities and next generation and most importantly, the opportunity to be involved in such a worthwhile environmental and community project.

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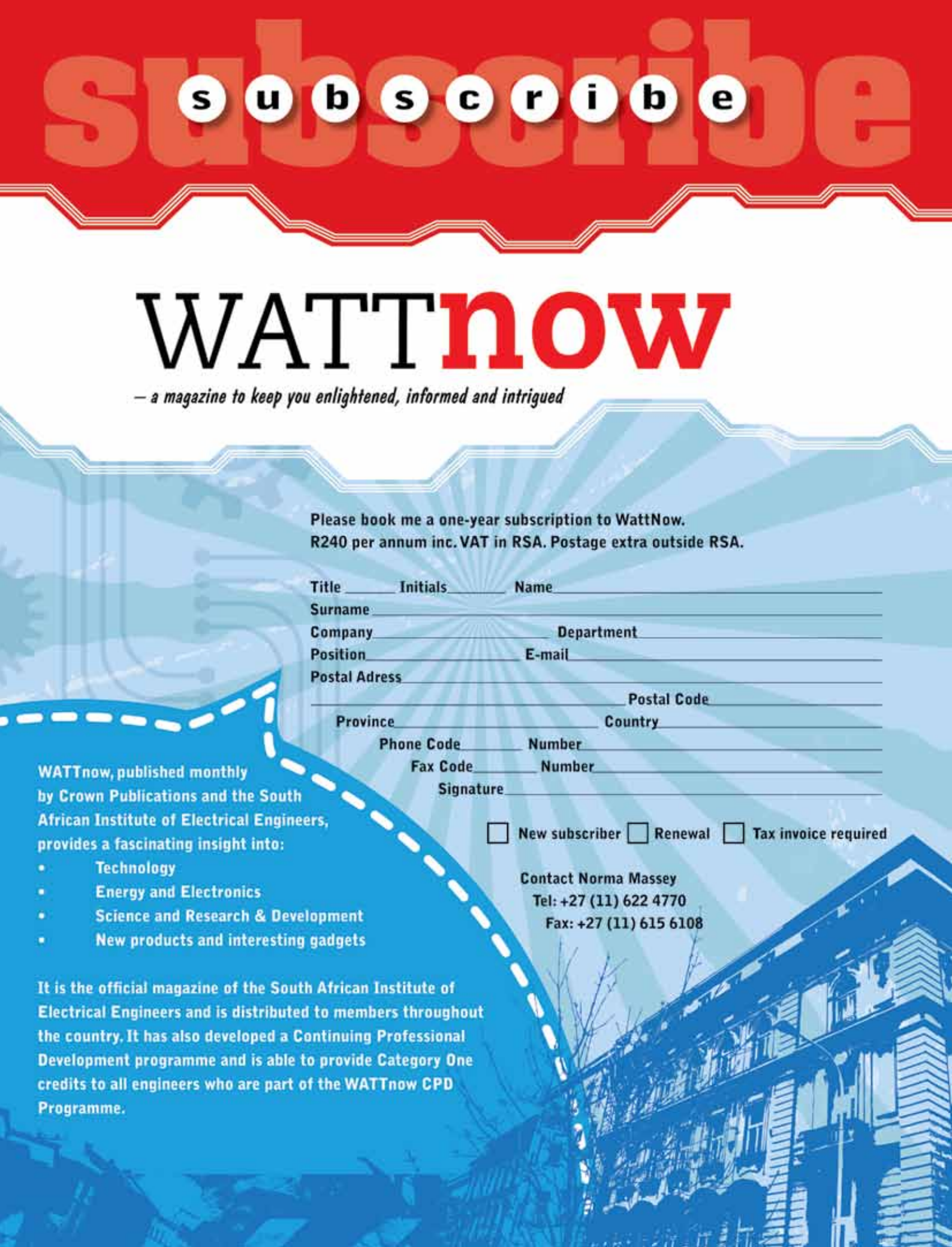
WATTnow, published monthly by Crown Publications and the South African Institute of Electrical Engineers, provides a fascinating insight into:

- **Technology**
- **Energy and Electronics**
- **Science and Research & Development**
- **New products and interesting gadgets**

It is the official magazine of the South African Institute of Electrical Engineers and is distributed to members throughout the country. It has also developed a Continuing Professional Development programme and is able to provide Category One credits to all engineers who are part of the WATTnow CPD Programme.



Ten technologies rewarded for safety benefits

Euro NCAP Advanced is a Euro NCAP initiative in response to the rapid development of new technologies available when buying cars for which there is no independent assessment.

By rewarding advanced technologies, Euro NCAP is now providing an incentive to car manufacturers to accelerate the standard fitment of important safety equipment across their model ranges as well as offering more comprehensive guidance to consumers about the safety of new cars, helping them to make the right purchase decision.

The organisation has rewarded the first set of manufacturers for their efforts in their development of new safety features. The 2010 rewarded advanced technologies are:

- Audi Side Assist
- BMW Assist Advanced eCall
- Honda Collision Mitigation Braking System (CMBS)
- Mercedes-Benz PRE-SAFE® and PRE-SAFE® Brake
- Opel Eye
- Peugeot Connect SOS and
- Citroën Localized Emergency Call
- Volkswagen Lane Assist
- Volvo City Safety

Euro NCAP Advanced is open to any technical system that has a proven safety benefit, whether it is primary, secondary or tertiary, as long as it is available as an option on one of the Euro NCAP tested cars and not already addressed by the current star rating.

The overall rating consists of an independent verification of a car by Euro NCAP based on crash tests and published protocols, The Euro NCAP Advanced assessment is based entirely on manufacturers' data generated in their own defined test conditions and rigorously analysed by a team of experts appointed by Euro NCAP. In addition, Euro NCAP Advanced requires manufacturers to identify exactly what the safety impact of their technology may be in European countries, taking into consideration the different infrastructure, jurisdictions and at times driver behaviour.

Sasol-sponsored, Sasolburg learners win at Minquiz

Students from Sasolburg scored a podium finish in the National Minquiz® Science Competition sponsored by Sasol and held at the Mintek campus in Randburg.

The Sasolburg team, comprised of Madelein van Staaden (Afrikaans Hoerskool), Thoriso Mokoena (Kahobotja Secondary), Sharma Singh (Drie-Riviere Hoerskool) and Evidence Moraba (Nkgopoleng Secondary), competed against 50 other grade 12 finalists and came an overall third in the event. This was the first time that Sasol teams participated in this competition.

To secure their winning position, each regional team of learners participated in an individual written test, followed by a team building activity, aimed at getting each team to work together in order to assess each other's strengths and weaknesses.

This was followed by a live on-stage quiz where teams competed head-on, in a rigorous and nail- biting Science and Mathematics competition. Each Sasolburg team member was awarded a scientific book prize as well as R1 250 for each of their schools.

Organised by national science council, Mintek, the competition is made up of a number of regional legs that culminate in the national competition. The aim of the Minquiz competition is to foster excellence in mathematics and physical science at school level and encourage learner's interest in careers in science, engineering and technology.

With education forming a vital part of Sasol's strategy, initiatives such as Minquiz are key for building a culture of curiosity and innovation in the fields of science and maths at school level. As an anchor sponsor, Sasol partnered with Mintek in this practical and challenging competition. By sponsoring the Sasolburg, Mpumalanga and Free State legs of the competition, Sasol aims to build capacity in education in the areas it operates in and support learners and educators with extra tuition and interactive learning opportunities.

Zimbini Zwane, Sasol's Community and Government Relations Affairs Manager, said: "It is important that corporate organisations partner with the Department of Education to expose as many learners to a variety of projects where science, maths and technology are made into fun and exciting subjects.".

Left to right: Julie Dixson (SAIMM), Patience Mthembu (Sasolburg Chaperone), Madelein Van Straaten (Afrikaanse Hoërskool Sasolburg), Patrick Nemushungwa (ASSAf), Sharoma Singh (Hoërskool Drie Riviere), Evidence Moraba (Nkgopoleng Secondary School), Thoriso Mokoena (Kahobotjha-Sakubusha) , Alistair Douglas (Apollo Scientific).

CPD Overview

WATTnow, in conjunction with the South African Institute of Electrical Engineers (SAIEE), has launched this programme for engineers who need to meet their professional development commitment by securing Continuing Professional Development (CPD) credits. In terms of the renewal of registration requirements, all professional electrical engineers must earn five CPD credits a year. Failure to certify CPD credits could jeopardise renewal of their registration.

WATTnow publishes articles in each issue that qualify readers for Category One CPD credits, which require engineers to respond to in-depth questions posed on articles that are specially designed and validated to provide CPD. Engineers using the system will accumulate between 0.1 and 0.3 CPD credits if all the questions are answered correctly. Ten such articles are published annually so at least one CPD credit can be obtained by this method. The articles in **WATTnow** are independently validated by the SAIEE, which determines the exact value of each credit applicable to each issue of the magazine.

In future, **WATTnow** will produce a series of video broadcasts of up to six lectures annually on topics that have been validated for CPD by the SAIEE. These lectures will be filmed and edited by a **WATTnow** production team and converted to either CD or DVD disks before being distributed free-of-charge to members of the **WATTnow** CPD Programme.

A series of appropriate questions will be included on the CD or DVD and members of the programme can submit their answers directly to **WATTnow** by e-mail, on-line or by fax. The filmed presentation will qualify the user to claim credits in the Category One section, which makes attendance of a conference at least once a year mandatory.

The SAIEE will issue each member with an official certificate recording the exact number of credits gained by each individual in any given year.

The **WATTnow** CPD Programme is based on a subscription service that will cost non-members of the SAIEE R2 400 a year while members of the institute will pay an annual subscription fee of R1 000.

This programme offers all members of the **WATTnow** CPD Programme a one-stop-shop to participate in and comply with the professional development criteria laid down by ECSA and ensure that all professional engineers can maintain their status without having to search around for sufficient credits to meet the ECSA requirements.

For further information visit www.wattnow.co.za

Are Britons getting dumb and dumber?

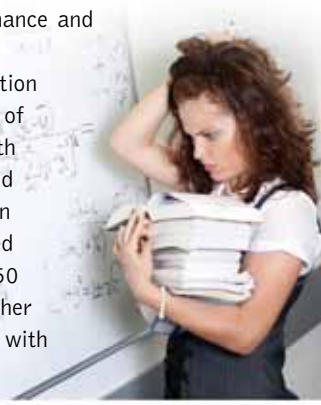
Graduation rates at British universities have dropped sharply and Britain is now ranked 15th (down from third place) in the latest Organisation for Economic Co-operation and Development (OECD) survey of universities in Europe.

Britain is now ranked behind the universities of Slovakia, Poland and the Czech Republic and has dropped in its ranking over the past ten years. Vice-chancellors and unions have warned the British government that the UK faces a serious risk of being left behind in Europe's economic recovery because of plummeting graduation rates.

The percentage of students completing their university education was below the OECD's average according to the latest Education at a Glance report published in September. Worryingly for Britain, the public investment in higher education had also dropped sharply and Britain now lags behind its competitors in Europe.

There has been intense debate in Britain in recent months over the need to improve the level of higher education ahead of the publication of the Browne Review on finance and funding of university students.

In 2000 the UK had the third-highest graduation rate among OECD countries with 37 percent of young people getting a degree compared with an average of just 28 percent. Denmark and Norway were on a par with Britain but in Finland 41 percent of young people graduated while in New Zealand it was even higher at 50 percent. The level of public investment in higher education in Britain is 0,7 percent compared with the average of one percent.



Toyota's Tokai Challenger wins solar race

The high speed Tokai Challenger, Japan's entrant in this year's South African Solar Challenge, completed 4 061 km through South Africa to cross the finish line in first place. The ten-day race started and ended at the Innovation HUB in Pretoria.

The Tokai Challenger was built by students at the Tokai University in Japan. Its victory, in what is billed the most gruelling solar race on the international calendar, follows a similar victory at the recent Australian Global Green Challenge. "With a race distance of over 4 000 km and elevation differences of 1 700 m, the South African Solar Challenge can easily be described as the toughest solar race in the world," says Professor Hideki Kimura, project leader and member of Tokai University's School of Engineering.

The race was organised to emphasise the benefits of environmentally-friendly technologies and to give students, in a wide range of disciplines, the opportunity to gain valuable experience.

"As this race was such a gruelling event, I believe it was the best possible opportunity for the students to learn about technology, engineering and the environment. I am sure that these students will introduce major new environmentally-friendly technological innovations to the automotive industry in the near future," says Kimura-san.

Supporting the driver and crew of the Tokai Challenger were Toyota Prius vehicles supplied by Toyota South Africa.

"It was a great honour to be part of a project such as this," says Dr. Johan van Zyl, president and CEO of Toyota South Africa. "The project not only highlighted the importance of environmentally-friendly technology, but it also allowed us to showcase the Prius, which is one of the boldest steps yet towards mass produced hybrid and other clean energy vehicles."

The Tokai Challenger's main driver was Kenjiro Shinozuka, the first Japanese racing driver to win a World Rally Championship event and a Dakar desert race. The University of Johannesburg's entry into the Solar Challenge came about in an attempt to show young people that building alternative fuel vehicles can be fun. "As a department we'd like to show youngsters that it's a fun thing to do. Building this car is a real world problem and you have to learn to fix it on the fly," says project manager Marco Fürruter. Fürruter though, is pleased with his team's progress, given the budget and time constraints they had to work with. "Time and budget are a big issue for us. We're all electrical engineers and when we consulted widely to build this car, we were told it was impossible. We had no help from the mechanical engineers," he added. The car was built in just over five months and was reasonably competitive in the race. The Japanese vehicle has a cruising speed of 120km/h, but it is a purely solar car whereas the University of Johannesburg's car could cruise at about 100 km/h.

"We're capable of building a vehicle like the Japanese, but they've got a budget of €2m, whereas our budget was R300 000. We wanted to promote our department and to encourage people to come and study at the University of Johannesburg," he said.

The Solar Challenge is organised in SA every two years by the Advanced Energy Foundation and the Innovation Hub.

The Tokai Challenger on its way to winning the Solar Challenge.

The winning team from Tokai University in Japan celebrate in style at the Innovation Hub in Pretoria.

Slimming plan creates neutron star

A single event that took place between 3,5-million and 5-million years ago created a cluster of stars known as Westerlund 1 about 16 000 light years away in the constellation of Ara, the Altar.

It was discovered in 1961 by a Swedish astronomer and has become one of the favourite observation sites in stellar physics as it is one of the biggest clusters of super-stars in the Milky Way.

It comprises hundreds of massive stars, some of which have a brilliance that is equivalent to about a million Suns and others that are so huge they are 2 000 times the diameter of our Sun.

The Westerland 1 in one of the Milky Way's few magnetars – a particular kind of neutron star formed from the explosion of a supernova – that can exert a magnetic field that is about a million, billion times stronger than that of the Earth.

Acording to Simon Clark, who led the team of observers, when the Westerland star transformed into a magnetar is was probably about 40 times bigger than the Sun.

He says current assumptions theorise that stars of between 10 and 25 solar masses go on to form neutron stars but those above 25 solar masses create black holes, or gravitational monsters that are so powerful no light is emitted from them. If this is the case then the star should have become a black hole but Clark suggests that it was probably part of a binary system that slimmed down to become a single neutron star. In essence, as the stars evolved they began to interact and the companion star began to steal mass from its progenitor star. The progenitor then exploded, becoming a supernova.

The binary connection was broken by the blast and both stars ejected from the cluster leaving the glowing remnants that make up the magnetar being observed using the European Southern Observatory's Very Large Telescope in Chile.

Now here's a breakthrough: Dry water

At last, something you've always wanted: Dry Water.

Scientists have created a powdery, sugar-like substance that contains a water droplet surrounded by a sandy silica coating so that 95 percent of the 'dry water' is actually wet.

They believe that this dry water could be used to fight global warming as it could soak up and trap carbon dioxide because the dry water is three times better than ordinary water at absorbing carbon dioxide. They believe it could also be used to store methane and provide an alternative to natural gas.

The research, conducted by Dr Ben Carter of the University of Liverpool was presented at the 240th national meeting of the American Chemical Society in Boston.

He demonstrated another application for dry water when used as a catalyst to speed up reactions between hydrogen and maleic acid. This produces succinic acid, an important raw material widely used to make drugs, food ingredients and a wide variety of consumer products.

Hydrogen and maleic acid need to be stirred to form succinic acid but this is not necessary when using the dry water particles that contain maleic acid and, Carter says, this makes the process more energy efficient.

The technology used to make dry water can be used to create a range of dry powder emulsions or mixtures of two or more unblendable liquids such as oil and water.

Powdered material called "dry water" could provide a new way to store carbon dioxide in an effort to fight global warming. (Credit: Ben Carter)

Will the universe expand and accelerate forever?

The National Aeronautics and Space Administration expects the universe to keep expanding after scientists released their findings about dark energy, which some people say is pushing the universe apart at an ever-increasing speed.

So far astronomers have been unable to say what dark energy is but have explained it, thus far, as an invisible and mysterious force that makes up about 72 percent of the universe.

About 24 percent of that is thought to comprise dark matter.

Researchers have been using the Hubble Space Telescope to study dark energy and dark matter and they now believe that just four percent of the universe is made from the stuff that makes people, planets, stars or anything that has atoms. Scientists used both the Hubble and the European Space Observatory's Very Large Telescope to observe how light from distant stars became distorted around the cluster of galaxies known as Abell 1689.

The galaxies are in the constellation of Virgo and form one of the biggest galactic clusters known to science. Its huge mass makes it act like a cosmic magnifying glass, causing light to bend around it.

Professor Eric Jullo, a scientist at Nasa's Jet Propulsion Laboratory, who led the international study, says that it is possible to see gravitation and dark energy bend the images of the background galaxies into arcs.

He says that based on the study results, scientists can confidently say that the universe will continue to accelerate and expand forever.

Forget Pong-Go, just swallow a glass of milk

Scientists sometimes study strange things in this world and none more so, perhaps, than the way to remove the pong of garlic from your breath once you have eaten a platter of prawns drenched in garlic butter. The smell of garlic on your breath can linger for days – upsetting everybody you come into contact with and causing people in a crowded lift to visibly wince.

Well if you don't like this sort of garlic prominence then, according to scientists at the Ohio State University, you can solve the problem by drinking a glass of milk. Just 200 ml of milk will reduce the garlic concentration by about 50 percent.

Researchers tested raw and cooked garlic and found that one of its compounds, allyl methyl sulphide, cannot be broken down during digestion and because of this is released from the body in the breath and sweat. Brushing your teeth (even with something as pungent as Jeyes Fluid) will not get rid of the pong.

Apparently full-fat milk is best at reducing garlic breath and scientists believe that it works by suppressing the sulphurous properties of the garlic. Professor Sheryl Barringer says that while garlic has been used in medicinal treatments for thousands of years, it is still regarded with distrust by many people because of its effect on the breath.

Garlic is an excellent source of magnesium, vitamin B6, vitamin C and selenium. It helps to lower blood pressure (except for those people exposed to your breath in a crowded lift) and cholesterol and also reduces the risk of cancer.

Barringer says for best results in reducing the smell of garlic on the breath you should drink milk with your meal rather than afterwards. Other foods may also help to reduce the smell of garlic and these include prunes, basil, aubergines and some mushrooms.

Barringer's studies confirmed, though, that milk was best at masking the volatile garlic compounds that make your breath stink.

Mentorship

The SAIEE is offering mentorship and advice to young engineers.

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 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 engineers, who may not have the time to spend with the young engineers discussing and planning their career paths.

This service 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, but not too often, say a few times a year, when both should have enough time to listen properly to what the other has to say.

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 5000 members the SAIEE has many experienced engineers who are willing to act as mentors. They are 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.

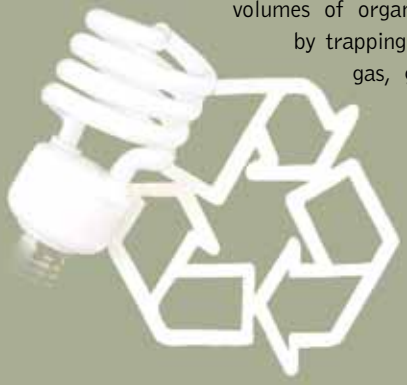
So if you feel that you would benefit by talking to a mentor, please contact Ansie Smith on the number below. She has a database to match the profiles of mentors and mentees.

Prospective SAIEE Mentors

If you feel you that you have the time and interest to help mentees, please contact Ansie Smith on smitha@saiee.org.za or 011 487 9050,

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

Burn waste and create electricity



Bosch Projects and Munitech are using waste-to-energy initiatives to reduce volumes of organic waste by trapping methane gas, generated as waste decomposes, and using it to generate electricity at Bisasar Road and Marianhill landfill sites in KwaZulu-Natal. While the projects are relatively small, the eThekwini Municipality is extracting about five megawatts of power from the landfill sites using a GEC Jenbacher reciprocating engine driving an alternator. According to Graham Ahrens, business manager of energy business systems at Bosch Projects, the more effective way to reduce landfill volumes is to incinerate the combustible or organic waste and convert the heat from the incinerator to electricity.

He says that the amount of energy produced from incineration is about 20 times greater than that recovered from landfill gas. Ahrens claims that proper processing plants need to be established at landfill sites in other areas around South Africa to reduce the enormous volumes of waste and to generate additional electrical power.

According to Ahrens, the waste-to-energy initiatives may have the potential to create jobs, but the reality is that waste is not pre-separated at source, making most of the recyclable materials difficult to recover.

Scrap your A-Class, get an E-Cell instead

Mercedes plans to produce 500 electric-powered versions of its A-Class vehicles for test purposes and these will be leased to selected customers in Germany, France and the Netherlands.

The vehicles will apparently be suitable for daily use and will provide a range of up to 200 km and will have an output of 70 kW. The two high-performance lithium-ion batteries are located underneath the floor of the vehicle.

Production of the A-Class E-Cell will be integrated into the series production line in Rastatt as only minor adjustments are necessary such as new consoles that allow the lithium-ion batteries to be fixed to the floor.

Mercedes says that no changes to the bodywork of the cars were necessary and the electric drive train can be fitted on the standard production line. Apparently Mercedes has paid particular attention to training its staff so that they are competent to work on the high-voltage vehicles.

Mercedes will invest E600-million in extending the existing facilities at the Rastatt factory that includes building a new body-shell working area. A further E10-million will be used to make modifications to the paint shop. The Smart Fortwo electric drive models and the B-Class F-Cell have been made at the Rastatt plant since 2009.

SAEEC

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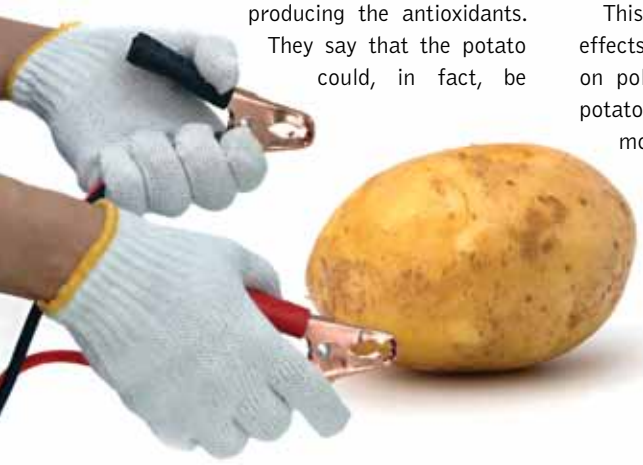
To register or for more information visit our website: www.saeec2010.org.za

Japanese create a torture chamber for spuds

Scientists have found that by giving the humble potato a charge of ultrasound or electricity generates more antioxidants in the vegetable and that these may help hungry humans combat heart disease and cancer.

Researchers at the Obihiro University in Japan say the technique creates enough stress in the poor old potato to trick it into producing the antioxidants. They say that the potato could, in fact, be transformed into a superfood.



Ask just about anyone living in Britain about this and they're bound to tell you that the potato is already a superfood anyway.

Dr Kazunori Hironaka, lead researcher for the study says that drought, bruising and others stresses stimulate the accumulation of beneficial phenolic compounds in fresh produce.

This prompted him to evaluate the effects of ultrasound and electric shocks on polyphenols and other antioxidants in potatoes. The vegetable is the world's fifth most widely consumed plant food and is a good source of antioxidants, vitamin C and polyphenols.

These chemicals are used to mop up destructive molecules and influence cell growth. Plants use antioxidants to help them survive particularly if they are exposed to drought, insect attacks or infections.

To conduct the study, the team built a potato torture chamber where they could subject the vegetables to high frequency ultrasonic sound waves and mild electric shocks. The treatment almost doubled the levels of antioxidants in the potatoes.

The potatoes were submerged in water (trust the Japanese) and subjected to 600 watt blasts of high-frequency sound for five or ten minutes. The electrified spuds were immersed in a salt solution and given 15-volt shocks for 10, 20 and 30 minutes.

Just five minutes of ultrasound treatment increased antioxidant levels 1,5 times, polyphenol content 1,2 times and levels of other antioxidants 1,6 times. A ten minute electric shock treatment boosted antioxidant activity 1,6 times, total polyphenols 1,2 times and the levels of chlorogenic acid 1,7 times.

The water bomb keeps ticking - Fedusa

Trade union federation, Fedusa warned that South Africa is sitting on a water time bomb because of inadequate management and monitoring, particularly at a municipal level.

It has filed a notice of possible protest action with the National Economic and Labour Council. Fedusa points out that in terms of the National Water Act, no person can unlawfully, intentionally or negligently commit an act or omission that polluted or was likely to pollute a water resource. However, it says that many municipalities consistently transgress these provisions without any fear of retribution. Fedusa says that 104 mines are currently operating without a valid water licence and the majority of these are in Limpopo.

It cites poor sanitation and water service delivery, high levels of pollution and eutrophication in dams and rivers, poor quality of drinking water and non-functional wastewater treatment works as examples of the transgressions committed by municipalities.

It has urged government to place the responsibility for safe drinking water and the management of all wastewater treatment works under the control of a national project manager.

In a separate development, the World Bank claims that investment in water management projects and new hydroelectric power plants are essential for sustainable growth in Africa.

Vahid Alavian, an adviser to the World Bank Africa warned that water resources had to be shared and in order to do so, the infrastructure needed to be created in a responsible manner.

Moreover, hydropower and water use for agricultural needs must be combined, as this will allow entire regions to benefit.

Alvian says that energy output from projects such as those in the Zambezi basin could be improved by about ten percent if a number of projects were grouped together and would result in increased energy output of up to 23 percent.

SA's first Euro4 fuel distribution eco-fleet

The Carbon Disclosure Project (CDC) reported that the transportation industry, worldwide, accounts for 13 percent of global emissions and yet only nine percent of the transport companies are investing in low carbon initiatives claims Murray Bolton, chief executive of Cargo Carriers.

"South Africa is certainly lagging behind in terms of carbon reduction strategies," he says.

The 2009 UN Copenhagen Climate Conference stressed the importance of reducing emissions particularly as those countries responsible for over 80 percent of the global carbon emissions agreed that serious cuts need to be made. South Africa contributes about 1,48 percent to global emission levels, making it the 13th largest contributor of greenhouse gases.

A sister company of Cargo Carriers, Ezethu Logistics is helping to improve the transport sectors by bringing the first Euro IV fuel distribution fleet into South Africa.

Euro IV is the latest standard set by the European Union for reasonably acceptable carbon emissions and Bolton says the Euro IV fuel distribution fleet upgrade, combined with Ezethu's high levels of health, safety, environment and quality (SHEQ), has already become a key differentiator when looking for new business.

Ezethu was founded by JSE-listed logistics company Cargo Carriers, which sees SHEQ as a top priority and encourages all its subsidiaries and associated companies to do the same.

"We have to place a high importance on SHEQ as we transport gas, fuel and chemicals," says Bolton. "These industries set high standards for sustainability, so embracing a more environmentally friendly approach is a non-negotiable for us. Introducing the country's first Euro IV fuel distribution fleet proved to be a major advantage in the tender for what is essentially a renewal of our Total contract."

Ezethu's recently awarded contract with Total involves the transportation of fuel from Waltloo to Pretoria and Pretoria North. There are four toxic pollutants found in fuel: Nitorgen oxide, total hydrocarbon, carbon monoxide and particulate matter. Particulate matter refers to the fine incombustible particles that are spewed out of the exhaust into the atmosphere. "Reducing carbon emissions is something that the transport industry needs to take very seriously," says Bolton.

Energy efficiency must be controlled

Steadily increasing energy consumption and the environmental impact from rising carbon emissions demand that developers take seriously the importance of designing and building energy efficient offices, commercial buildings and homes.

"It is not just enough to make use of equipment that saves energy or to implement low-energy lighting," says Nico van der Merwe, product manager building systems at Schneider Electric South Africa.

He says proper controls need to be in place to ensure that these measures make a real reduction in energy consumed. If sustainable gains are to be made, every device or feature that consumes energy must become part of the solution.

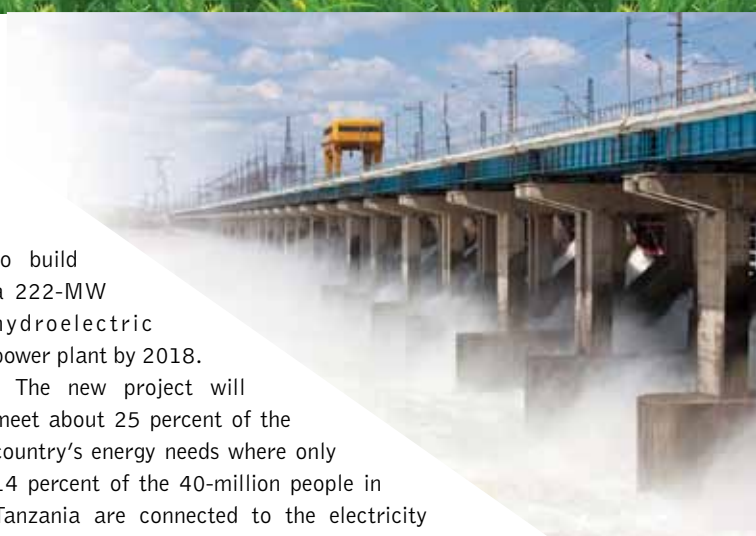
Van der Merwe adds that an important element of energy efficient homes, offices and commercial buildings is changing the attitudes of individuals so that their behaviour is aligned to energy saving.

"We have technology to control energy use in buildings and the lighting systems used can account for 30 percent of the electricity consumption at a typical commercial enterprise. This is compounded by huge data-centres that have increased electricity consumption and so forth," he says.

A Schneider Electric international white paper reveals that in most countries, each domestic dwelling, whether a stand-alone home or an apartment, will generate more than six tons of carbon dioxide a year, which is enough gas to fill six hot-air balloons.

He says energy efficient products can save between 10 and 40 percent of the electricity consumed in residential and small commercial buildings. These products include dimmers, time-switches, movement/presence detectors and light-sensitive switches all controlled by management systems.

Angola, Tanzania invest in water power



Angola is planning to invest billions of dollars in rebuilding its dam infrastructure so that it can generate sufficient electricity for the local population and to export electricity to neighbouring states, claims Joao Borges, Secretary of State of Energy.

He says that Angola's rivers have the potential to generate about 18 GW of energy but the country is only able to produce about five percent of that figure because the dams and infrastructure were damaged during the civil war that lasted for more than 25 years. Angola is one of Africa's largest oil producers and has the necessary funds to invest in rebuilding the dams and improving the electricity grid.

Most of the water that flows through Angola's rivers flows directly into the sea, providing little additional benefit to the local population, says Borges. Meanwhile Tanzanian authorities have announced that they have signed a $700-million contract with Borodino Group to build a 222-MW hydroelectric power plant by 2018.

The new project will meet about 25 percent of the country's energy needs where only 14 percent of the 40-million people in Tanzania are connected to the electricity grid. Most of Tanzania's electricity comes from hydroelectric power plants although it does have a 300-MW generation plant based on natural gas. The government says it needs to spend about $1,5-billion to improve power production in the country.

Watt's Says

Hi Paddy,

I have just read your article SA attitudes must change in Mar 2010 issue of WATTnow - brilliant!

You have identified the most important issue facing not only SA, but the rest of Africa and many other countries - lack of maintenance.

Not that I am a maintenance or production engineer, in fact I am a project eng having been involved in new capital projects all my life.

You could typify me as typical of the silent majority, never having sent a letter to a newspaper or commented on an article in any magazine. So you can rightly feel honoured, your article is the first I have ever commented upon, and I do read an awful lot and wide variety of topics, and have many times felt the urge to send in a reply.

The reason for the late reply is due to the fact that I only received the Mar & Apr issues yesterday, having received the May issue 2 weeks ago. I have been working in Qatar for many years now and it typically takes post 3-6mnths to arrive here. The local letters from Qatar we receive promptly, but from overseas it takes long, somehow I think the problem lies here. Somewhere at one of the many state bureaucracies, staffed by locals who typically have work hours from 8-12 or 8-1, but do very little work in that time, the post heaps up for months and then gets cleared out once in a while it seems (probably when they get a poor Nepalese or Indian in to clean up the office).

Qatar has money pouring in from oil & gas revenues and much of it gets wasted on big projects where most of the work gets done twice, once to do a shoddy job and the second time around to fix it with another shoddy job.

No new road has a 100m stretch that is without damage of one form or another. Big high rise buildings with impressive glass facades and design have no parking bays and the pavement outside is usually in a terrible state. Have a look close up and you will see the bad workmanship. When something doesn't work, it gets replaced by a new unit – forget maintenance. Often a new road is built and 2 yrs later it gets ripped up for a bigger wider road or to install sewerage pipes or power cables that were not installed due to bad planning, or more correctly, no planning or foresight whatsoever.

To summarise, here in Qatar the attitude is – do not worry, the state has plenty of money to pay again for a 2nd time. Forget about planning ahead or maintenance, in a few yrs it will be replaced in any case. So why do a good job that will last for 20yrs since it will be replaced/broken down/dug up in the next 5 yrs, or a more modern piece of equipment will be available allowing the 'old' one to be chucked out and replaced by the latest model. In any case, that means more jobs for more people.

So whereas SA do not have the money, here they have too much money, but attitudes are even worse because of that!

I enjoy your magazine more than the old Elektron, being much more readable AND LESS HIGHLY TECHNICAL with content on day to day issues and new products such as cell phones, the environment or internet etc. I always find articles that the kids and wife must read as well and they also find them interesting and readable!

Finally, what I particularly like about your articles others in WATTnow is the 'no nonsense tone' (vat nie kak van kabouters) and that you speak up and address the real problem issues and underlying causes in SA, (eg Transnet Logistics issue in Mar'10 issue). It is high time someone has the guts to address issues usually not talked about due to being politically sensitive/"in staatsbelang/landsveiligheid" or that it may offend some races/big institutions/companies/political parties/people etc etc.

If it is a problem, talk about it!! By not bringing it out into the open and addressing it will not bring solutions or make it go away, it will get bigger and more problematic.

Enjoy spring in SA
Hennie Lourens

Dear Paddy

When the desalination plant at Sedgefield was built was consideration given to using wind power to run it? This seems to me to be a natural match for wind power for the following reasons:

1) If more clean water was produced than immediately required, it would represent energy storage when the wind does not blow.

2) Instinct tells me that voltage and frequency are less important than would be required for Grid connection. That should allow for a wider range of wind speeds.

I believe that wind power could be useful if a match could be found between the technology and the application. Another match for the wind technology could be a grid for charging electric vehicles. I would be interested in an opinion on this.

Regards
Garth Beresford, Retired Member

Dear Sir,

On page 49 of your January 2010 edition, in an article written by Mr. Du Toit Grobler, I read the following: "On 1 January 2010 the world

entered the second decade of the 21st century ... .'' unquote.

To my simple mind, a decade represents a period of 10 years. The first decade of the 21st century, having started on the 1st of January 2001, can therefore only end on the 31st of December 2010. The second decade can thus only begin on the 1st of January 2011. It is as easy as that. The first decade of our modern Gregorian almanac ended in the year 10 AD, and the second decade started in the year 11 AD after all. I am surprised that the engineering world fails to grasp this simple mathematical principle.

Kind regards.
Hennie du Plooy

Dear Paddy,

We met at one of the Siemens Profile Award ceremonies.

I thoroughly enjoyed reading the latest edition of Watt Now, but found a minor error in one of the articles. I hope this is of value to you. With respect to the article ''Laughing gas in the Arctic is no laughing matter'' in the April 2010 issue: NOx refers to the binary compound of Nitrogen and Oxygen or a mixture of such and admittedly this includes N2O or Nitrous Oxide, the compound often referred to as laughing gas. However in an atmospheric pollution context, NOx refers to the oxides of Nitrogen: NO and NO2 (not N2O). These compounds are products of combustion and are also involved in the many ozone reactions in the atmosphere. It is these compounds and their atmospheric concentrations that research is investigating and not Nitrous Oxide.

Kind regards,
Mike Grant

Dear Paddy,

At least someone gives credit to engineers despite the fact that engineers have low visibility and do not enjoy the social acceptance and acknowledgement of the business or managerial types.

While I wish to acknowledge the enormous contribution engineers have made to our country and recently to the soccer world cup infrastructure improvements, I wish to voice certain cautions when recommending an engineering career to a young person.

I was a passionate engineer all my life, and was enthused by the very aspects of engineering that the article by Dr Angus Hay has so eloquently emphasized. Yet it is also well-known, that as a profession, engineering is not unlike soccer, for it has a relatively short lifetime.

After 35-40, unless you made it to management, your value as an engineer will dramatically decline, no matter how sincerely you try to keep up with new technological developments. It is a short, intoxicating, wonderful, challenging and fulfilling party, but it is definitely not a profession from which you can retire gracefully.

No matter what you have accomplished as an engineer, after you reach a certain still fairly young age, no one will want you. I was lucky for having been able to shift sideways into the academe, but few can do that.

Besides, if you take the other avenue of being promoted to engineering management, you will suddenly have to confront the necessity of dealing with people rather than hardware or software design problems. Psychological studies have shown, that engineers mostly prefer to work on technical problems and this means a completely different mind-set than that of people-oriented professions. Anyone who enters the exciting and at least up to a certain age financially rewarding field of engineering must know such things beforehand.

Prof.Ian Shaw, PrEng
ishaw@wirelessza.co.za

PS. No need to go to either Telkom or Neotel for cost effective broadband. I have recently changed to wireless iBurst from dial-up and am actually saving money while my 1 Gig service provides a speed of 1 Mbps! Besides, it was an enormous pleasure to free myself from Telkom!

Dear Paddy

I was wondering whether you (or your readers) can help me. I am researching for an article about Dr Johan Coetzer who pioneered the Zebra sodium battery. I would be most grateful for any information or contact names you could please give me on this.

Kevin Desmond
desmond.book@wanadoo.fr

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Lotus shows off five new supercars

Malaysian owners of the Lotus brand of supercars has embraced green technology, and all five of its new models – scheduled for release between now and 2015 – will be available in hybrid variations according to Lotus chief executive Dany Bahar. The new Lotus Esprit has a mid-mounted, pressure-fed five litre V8 engine delivering 455 kW to its rear wheels and Bahar says the exceptional performance is due, in part to the lightweight design of the new supercar.

He says that previous Esprit models conjure up images of beautiful women surrounding James Bond, and the new car is no exception. Bahar says that it represents a new icon for the world-famous Lotus brand that will only be matched by its exceptional performance as a supercar. The new Elan is the smallest of the range of five new vehicles and it offers a 2+2 format, making it ideal for everyday use. It is powered by a turbocharged 330 kW V6 engine and weighs just 1 295 kg, giving it an exceptional power to weight ratio. Brahar says this new model is perfect as a road car and can be used competitively on the track because its precision handling makes it a pleasure to drive. It will go on sale in 2013. The star of the show in the Lotus line-up is the new Elite that uses the same 455 kW V8 engine as the Esprit. However, the engine is front mid-mounted and drives the rear wheels, propelling the car to a sensational 0-100 km/h time of just 3,7 seconds. It is set for release in 2014 as a 2+2 GT and comes with a retractable hard top. Brahar claims that this Lotus is a set of contradictions as it is spacious, yet compact, high performing but giving off low emission levels, lightweight and yet surprisingly solid to drive.

He says that this is one model of which the company is exceptionally proud as there is no other sports car like it in the world today.

Another new model is the Elise but it will only be available in about five years time. This model is sexy, agile and is Lotus's entry-level vehicle that is targeted at young professionals who are eager to own a supercar. The Elise has a two-litre, four cylinder, turbocharged engine rated at 235 kW and is capable of reaching 100 km/h in just 4,5 seconds. The final model in the Lotus line-up is the Eterne, also due for release in 2015 and it uses the same V8 engine used in the Esprit and the Elite. It is the only four-door sedan being made by Lotus but Brahar says that it is not an evolution of an existing two-door model but has been purpose-built as a comfortable, racy sedan.

He claims the Eterne is the ultimate four-door sports car with impressive performance figures to match the Lotus pedigree.

SAIEE is keeping a watchful eye on the electricity sector

The second Integrated Resource Plan for Electricity (IRP-E 2) was due to be published in August this year but has been delayed and will only be published in September or October according to the National Electricity Regulator of South Africa (Nersa).

The Department of Energy hand-picked a task team of large consumers, academics and experts to help it devise the plan and then swore each one of these members to secrecy.

Their first task is apparently to deliver 29 parameters that could be used to draw up the plan. Why 29 nobody knows (except perhaps the task team and they are not saying).

A paper reviewing progress on the second Multi-Year Price Determination (MYPD-2), by immediate Past President of the South African Institute of Electrical Engineers, du Toit Grobler, was presented at the annual South African Revenue Protection Association's symposium in Johannesburg in July.

He points out that there are a number of anomalies in South Africa's energy sector such as the government's commitment in 2000 to the provision of free basic electricity and water to every household in the country. Grobler claims that while this is a noble goal, the reality is that it detracts from effort to promote energy efficiency among users, especially when it is seen against the background of penalising larger household consumers by implementing higher block tariffs.

To further complicate matters, large industrial consumers of electricity enjoy discounted tariffs while domestic consumers who exceed certain limits are penalised through inflated tariffs.

When the application by Eskom was submitted to Nersa earlier this year, the SAIEE attended the public hearings and made a number of formal submissions to the regulator objecting to the increases and making alternative suggestions.

Among others, the SAIEE contended that high energy users in industry were effectively being subsidised by other users and this was unfair. It called for the electricity prices to be market related and there should not be 'special tariffs' such as those applicable to BHP Billiton for its aluminium smelters as this distorts the electricity market.

Grobler points out that the SAIEE was severely criticised for its comments. However, Eskom has held protracted negotiations with major users, including BHP Billiton and Anglo American in a bid to standardise tariffs for all customers.

The SAIEE also contended that those industrial concerns that generate surplus energy during normal production processes should be able to sell the surplus at a predetermined price through Power Purchase Agreements.

Grobler says that there has been some progress on concluding such agreements but these have not yet been finalised, resulting in the fact that available generating plants, such as the IPSA gas-fuelled power station in Newcastle remain idle.

During the public hearings the SAIEE warned that higher electricity prices would increase energy theft with the concomitant risk to human life.

The institute was severely criticised by Eskom for these comments.

Grobler says that the SAIEE's contention has proven to be accurate and Energy Minister, Dipuo Peters told Parliament that the country's municipalities lose more than five percent of their annual turnover because of energy theft.

In reply to a Parliamentary question, Peters said that up to 50 percent of the 5 850 GW hours of Eskom's losses in the 2008/09 financial year appeared to be the result of energy theft.

This was compounded by the copper cable thefts that cost the South African economy R7-billion a year.

Apart from the cost of cable and electricity theft on the economy, the SAIEE pointed out at the public hearings that municipalities around the country add further layers of inefficiency to the processes of delivering electricity to the consumer and that the impact of this is that consumers end up subsidising such inefficiency.

There has been some debate over dividing South Africa into two time zones (East and West) as this will help to spread the peak energy demand and relieve some of the pressure on Eskom's reserve margin but there has been no progress on this matter even though it could result in electricity savings of between 0,5 percent and 2,6 percent in the maximum demand.

The SAIEE also recommend that Nersa monitor the consumer price of electricity to ensure that consumers (whether bulk, industrial or domestic) are not subjected to unreasonable profits being made by Eskom or any other organisations involved in the electricity supply chain.

Grobler points out that the SAIEE is continuing to monitor developments within Nersa, the Department of Energy and within any other stakeholder in the electricity arena. It is also actively taking part in the work of the National Planning Commission and is contributing to the formulation of the MYPD-3, which is due to be published in 2012.

Derek Woodburn's quest for his personal 'grail'

In the October 2009 issue of WattNow, the Editor, Paddy Hartdegen published a short article I had written about my frustration in trying to locate a copy of my article on colour-changing silica gel, which is extensively used in the electrical industry. The silica gel article had been intended for publication in WattNow, but had been passed-on to an associate editor, Glynnis Koch who considered it more suitable for the Chemical Technology, another publication in the Crown stable.

My article was published in that magazine in 2006. To my immense disappointment there were no copies of Chemical Technology available from Crown and apparently the only accessible copy of the publication was actually in the British Library.

One of my favourite places to visit in the world is without doubt the British Library. After the USA Library of Congress, the British Library is the second largest repository of books, patents, sound and music recordings, databases, maps, philatelic collections, journals and magazines. It is the National Library of the UK, and holds over 150 million items in all known languages.

The library collection includes about 14 million books, with some historical items going back to 300 BC. It has a wealth of treasures on display, such as illustrated medieval manuscripts, the original hand-written Alice in Wonderland, the Magna Carta, original manuscripts by Mozart, Beethoven and The Beatles. Its National Philatelic Collection is the best permanent display of philatelic material in the world. On my recent visit, their public exhibition was on maps, which included the biggest atlas in the world, given by Dutch merchants as a gift to King George III in order to gain trading rights in Britain.

While thousands of people were enjoying the FIFA 2010 Football World Cup during June and July this year I had the opportunity of re-visiting the UK, and started trying to access my silica gel article. Although the British Library is adjacent to the huge St. Pancras/Kings Cross railway stations, there is quite a long walk from the deep recesses of the underground tube system to the British Library.

Only on my third visit was I able to obtain a Reader Pass because in order to be granted such a pass, not only have you to prove who you are, but also provide recent proof of your place of residence. My passport proved who I am, but all of my postal material goes to my Post Office postbox. Only my Council account for electricity and rates gives my place of residence – and I certainly did not have a copy of a recent Ekurhuleni account with me in London. Eventually the Library staff accepted my International Driver's Licence as proof of residence in South Africa, but only because there was an Automobile Association stamp across part of my hand-written home address.

The British Library is not a public lending library like the ones we are accustomed to, but is a Research Library. It is the legal archive of all published books and manuscripts, available for study on-site, to any person with a valid reader pass. There are hundreds of seats in the reading rooms, which spread out over three floors. The Humanities section is on two floors; Rare Books and Music; Business and Intellectual Property Centre on another two floors; Social Sciences; Manuscripts and Science on another two floors alongside Maps; and Asian and African Studies.

The Library only holds single copies of books, and nothing can be borrowed. The on-line catalogue of the Library has to be searched to establish if they have the material that you are looking for and let me tell you that catalogue is extensive.

The publication date I had been given was almost a year out, but the lady took pity on me and arranged to pass on the requested details to their Boston Spa journal storage facility to see if they could find it. She granted me my precious six-day reader pass and arranged to have an E-mail sent to my daughter to confirm when the item had been located, and when it had been delivered to London. When she discovered that I had written the article, she exclaimed: "Oh, as an author, you are entitled to a three-year pass!"

When I returned to the library a few days later, it was with great excitement, I found there were further tight restrictions to follow. All items such as bags, cameras, mobile phones, food, pens or sharp instruments had to be locked away in the basement locker room (which requires a pound coin in-a-slot) before I was allowed to go up to the Science reading room. Although the brilliant displays on the ground floor and basement are open to anybody, you are only permitted to access a reading room with a valid pass and clean hands. A laptop, pencil, paper and cash are permitted. If I had wanted to study rare old material or manuscripts, I would have had to wear cotton gloves.

Since I wanted to photo-copy four pages, I first had to load 80 pence (20 p per page) onto my magnetic-striped reader pass. I savoured being able to handle the journal for which I had so long searched, before photo-copying the front page, the contents page, and the two pages of the article itself. As I left the Library with my precious photo-copies, almost dancing in the street, I felt this had been a very different London experience.

Swanepoel wins ScopeX ATM award

Johann Swanepoel, a member of the South African Institute of Electrical Engineers and an active participant in the Astronomical Society of Southern Africa takes his commitment seriously and spends as much time as he can studying the stars for fun.

He was recently rewarded with a special ScopeX ATM Award and according to ScopeX's Chris Stewart the ATM (Amateur Telescope Making) awards remain a popular component of ScopeX, the underlying purpose of which is in large part to promote the advancement of Amateur Telescope Making as a hobby.

The awards are intended to highlight achievements, draw attention to particularly interesting or exceptional items on display, and to inspire people to higher levels of achievement.

"ScopeX presents a deadline towards which it is evident that many people work feverishly each year, and this time was no different. In fact, the largest telescope on display was driven 1 200km from George to achieve first light at ScopeX, the beautiful crescent Moon obliging as the first target.

The criteria for judging considered:

- Workmanship: quality of finish, beauty, style and precision of execution
- Innovation: application of new ideas, principles, materials or techniques
- Difficulty: challenging optical configuration, grand scope of project, courageous modifications
- Lateral thinking: unusual ways of solving old problems, interesting application of found materials.

Naturally the most interesting contenders embody a mix of these attributes, and all exhibits are carefully scrutinised with a view to finding them. It may be that a single element or component is particularly interesting or - on the other extreme - a body of work comprising several disparate items may be deemed exceptional as a system. Work in progress is always welcome, and may well incorporate a certain 'something' that is especially noteworthy. An instrument that was previously the subject of an award would only be eligible for another in the event that significant improvements should be recognised.

Johann Swanepoel is typical of the engineer. He showed, with his project that he takes a long-term view, follows a rigorous engineering approach and works meticulously to his goal, researching every step and then thoughtfully improving the state of the art as he goes.

In this way, he happily tackles challenges that would daunt only a slightly lesser man.

This year, he presented the largest home-made scope ever to grace the field, a 20" f/4 in the Krige/Berry style – but with his own unique improvements. To achieve this, he first imported two mirror blanks and built a versatile reconfigurable grinding and polishing machine.

Figuring was done with sub-diameter laps. Testing involved a Foucault tester equipped with a camera and precision micrometer movements, surface analysis being rigorously conducted via image analysis software he wrote himself.

This enabled a large number of zones to be examined at each stage, whilst eliminating human bias in the analysis, vital to ensure high quality in such a large short-focus mirror.

Finally, the behemoth truss-style optical tube assembly (sporting an 18-point mirror cell designed with PLOCS, a rear-loading system for safe transport of the mirror, and a balancing system to cater for eyepiece changes) was treated to a motorised alt-az drive that can be controlled in goto mode from a PC.

His years of meticulous engineering were recognised by the award of a Baader Planetarium Hyperion zoom eyepiece courtesy of Eridanus Optics.

Johann Swanepoel's home-made telescope that won him a ScopeX ATM award.

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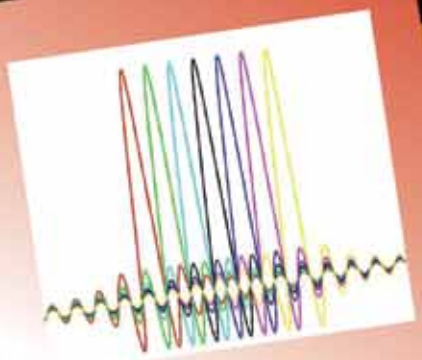

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