

NB

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Institution of
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DRAG LINE SIMULATOR

Australian SOE Winner
JOHN PIDGEON

John Pidgeon from BMT WBM in QLD won this year's Australian Speak Out for Engineering with a presentation detailing the development of a computer model to simulate the dragline excavator during operation.

Draglines are big pieces of equipment, with Big Muskie, which operated between 1969 and 1991, weighing in at 12,000 tons. These high investment pieces of equipment require high productivity to offset the capital investment and operating expenses, so it is critical that the operator gets as much out of the machine as possible without overly stressing critical components, which could lead to increased downtime and premature failure.



Bucket from Big Muskie on display at AEP's ReCreation Land Park, Ohio

The holistic solution for improving dragline efficiency required two components. The first was the PULSE TerraMetrix system, providing real time stress and productivity monitoring to give the operators feedback on productive and safe use of the equipment. This system involves

installing equipment in the machine which determines the stresses through the excavator in real time and alerts the operator if they are operating the equipment at excessive loads which could cause undue damage to the system.



A Mosaic Company dragline at a Phosphate mine in Florida



View from a real dragline and the simulator

ON THE INSIDE

2016 Australian AGM

An insider's view of F1

Global Engineering Debate 2016

Asia Pacific Design Competition final

Engrtavanza 2016

Puffing Billy

Real world emissions & fuel economy

Regional News

Photographer of the year

Technical writing competition

2016 BRANCH ANNUAL GENERAL MEETING Hobart Tasmania

The 2016 Branch Annual General Meeting was held on the 12th of March this year in Hobart. As well as the AGM, a number of events were also held during the weekend which are detailed across these pages.

DRAG LINE SIMULATOR Continued from Cover page

Stresses are calculated and compared to known acceptable thresholds and feedback to the operator is provided through an easy to read in-cab display. This was then taken a step further and a complete real-time simulation of the machine was set up for use away from the mine-site for training purposes.

The simulation tool John presented modelled the complete excavator to provide an accurate representation of the excavator's responses as well as showing the stresses and strains throughout the equipment as the operator operates the computer representation through a normal days work.

John then looked at the modern advances in computer graphics processing units (GPUs) which allow for the rapid calculation of sophisticated physics required for real time processing of the simulator as well as compelling visuals. One of the most computationally intensive processes is modelling the ground, which needs to be segmented down to a quite small scale in order to provide realistic material properties.

The terrain is divided into small spheres (also called the discrete element method or DEM), which are continually made and destroyed as the bucket moves around to reduce the number of spheres being modelled at any one time. Texture is added to the view to make the simulation appear more realistic.

The computer simulation is hooked up to a control system taken straight out of the excavator and placed in front of a set of screens to give a wide field of view, mimicking reality. Operators can then be trained on the equipment

before being let loose on the real thing and doing some real damage. For an interesting look at how dragline excavators get around site google "walking draglines".

The developments related to this simulator allow for a unique ability to

accurately model stresses and physics responses in the machine to give useful feedback to operator trainees.

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ENGTRAVAGANZA 2016

The 4th annual Young Members Engtravaganza at the Tasmanian Transport Museum.

This once-yearly event is organised by the Young Members and seeks to combine a social and technical event. This year we visited the Tasmanian Transport Museum, and were treated to a rail-car demonstration on an old diesel locomotive; DP15 – a country and suburban passenger car built in 1939 by Waddingtons, NSW.

It was great to see this locomotive, and a number of other items at the museum, still in working order well over 7 decades after their manufacture; built at a time before planned obsolescence had been invented (not literally, the first practical application of planned obsolescence is generally credited to the Phoebus cartel, formed in 1924, which mandated light bulbs would have a maximum life of 1000 hours). I was struck by the contrast between the working environment provided for the operator/driver of these machines which seemed very bare-bones with lots of heat, noise and vibration, and the plush wood-and-fabric interiors in some of the first class cabins. I was also interested in the mercury valve rectifier, which was used to generate the DC electricity for driving the trams in Hobart (which have been discontinued). Until the mid 1970s a similar approach was used to generate DC electricity for transmitting power over long distances in HVDC (High Voltage Direct Current) cables. This was particularly topical at the time as the undersea HVDC Basslink cable, which connects Tasmania to the rest of the National Electricity Market, was out of operation during our visit (and was still out of service at the time of writing).

KHALID ABDULLA, YOUNG MEMBER'S CHAIR



RICHARD WEST – AN INSIDER’S VIEW OF F1

Richard West spent a lifetime in the pursuit of excellence and high performance in motor sport and business. Below is an excerpt of an interview he gave exclusively for News Bulletin.

How did you get into F1 originally?

I became interested in motorsport when working at a Ford dealer as an apprentice where latterly I built my own rally car, a Ford RS1600/Mexico Escort hybrid. An accident, which my doctor described as “I think you ran out of talent, half way round a really quick corner” meant that to earn a living I turned to rallying out of the seat! I joined rally sport magazine as a salesman, met various people in UK, European racing, enabling me to become a PR / event organiser for Ford and Datsun. It was from this that I saw an opportunity in F1 and applied to join the Williams team as a sponsorship assistant. I really went for it, and having got the job I was head hunted to join McLaren after just six months in the sport – the rest of my history can be found at www.richardwestassociates.com

What do you consider as the pinnacle of your career so far?

It’s all been a great journey for me. Putting together the Rothmans funds and the Senna driver combination was a highlight, so was winning Le Mans with Jaguar as a TWR director in 1990. My lowest point was losing Ayrton at Imola the day after Roland was killed – a dreadful time for everyone.

Who is the most memorable person you have worked with and did they have any specific piece of advice that resonated?

Definitely Ayrton Senna. His work and life ethic were incredible and from working with him twice at McLaren and Williams I’ve always tried to apply total attention to detail to my work, be it speaking, putting deals together or enjoying my pastimes. If you’re not giving 100%, you should not be doing it! Ron Dennis the boss of McLaren once told me to stop trying to convince him of how good I was and instead focus on my work (which I did), life’s been pretty good since then. Having a good mentor is incredibly important when you are developing your career and once you



Richard with Damon Hill and Ayrton Senna at Imola 1994

have achieved your goals, being able to rely on someone for advice when things get tough, and believe me they will do at some stage. I now mentor a number of people personally.

Many young engineers aspire to work in F1. How does the reality compare to the expectation?

It’s fantastic! It’s hard work getting there and sometimes hard staying there too! At times you have to be prepared to reinvent yourself, deal with pressure, success and failure, and frankly never give up. Being

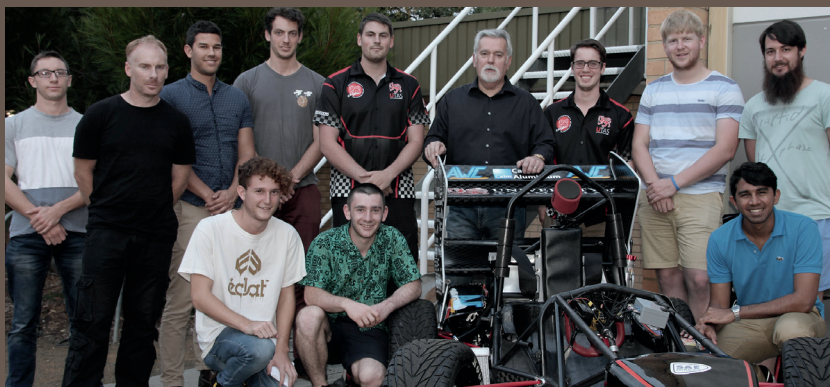
part of a team of like-minded, driven and successful men and women is like no other experience. You work, play, travel, sometimes have to suffer loss and failures together and ultimately you celebrate success together – there is nothing else like it. Does it compare to expectations? No, it exceeds them all.

You can read Richard’s books “Performance at the limit” Business lessons from Formula 1 motor racing, or watch the BBC series of the same name.

INSIGHTS INTO F1 RACING AND THE CHALLENGES OF MANAGING CHANGE IN A DYNAMIC ENVIRONMENT

Richard West gave a presentation to the students of the University of Tasmania and IMechE members prior to this year’s AGM. Richard particularly honed in on the large group of Formula SAE students that were attending the talk and provided some sage advice about the future business environment they would be entering. Particular attention was paid to the driving of quick change in the modern workplace and how to drive and adapt to change. If you don’t change you will get left behind, especially in Formula 1, where changes need to be effected each week to keep ahead of the pack.

The UTAS students brought their latest Formula SAE car down for us all to pore over after the talk. Some particularly serious words were had about sponsorship raising, so next year’s car is sure to be pretty flash.



Richard West and students from the University of Tasmania Formula Student race team with their car.

FROM THE CHAIR

The annual Australian Branch Committee meeting was held in Tasmania on the 12th of March. On the Friday prior to the meeting, we were fortunate to attend a presentation by Richard West at the University of Tasmania. His presentation was well received by those who attended. We acknowledge the assistance of Dr Jason Lavaroff of the University of Tasmania for the kind use of the University facilities for this event.

It was good to be able to meet everyone at the Committee Meeting. We were able to discuss many issues and make plans for the future of the Australian Branch. We look forward to introducing some new initiatives for the coming year. It was also sad to hear that Daya Dharmasiri would complete his service for the Australian Branch in May when he steps down as Immediate Past Chair. The Australian Branch thanks Daya for his many years of service. He is however still active as a Committee Member and Treasurer of the Queensland Panel.

After the meeting, the Australian Branch hosted the Regional Final of the SOFE for 2016. It was pleasing to see all states including New Zealand represented in the final. Once again, the standard of competition was very high. Congratulations to John Pidgeon of Queensland for winning the regional final.

The AGM (held after the SOFE final) was attended by Members with appropriate reports being presented and accepted by the members present.

We have also seen good effort from all the States in performing Professional Review Interviews for the ever increasing numbers of potential candidates applying for membership of the Institution. Well done to all assessors for this. If any of you who are already professionally registered and are willing to assist by being an assessor, please contact your local Panel who will be only too grateful for the assistance.

My thanks to all who have assisted me in the past year as Chair and with your

continued assistance. I look forward to another successful year for the Branch.

LESLIE YEOW,
AUSTRALIA CHAIR

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OCEANIA NEWS

Aren't engineers excellent? I know I'm preaching to the choir to a great extent, but I'm sitting writing this in Auckland, during the afternoon tea break in our Asia Pacific Event.

The Asia Pacific Event has been organised here in Oceania to provide the opportunity for the inter-regional final of the Speak out For Engineering competition and the Design Competition across the Asia and Oceanic regions.

There is plenty of coverage on this elsewhere in the NB, so I won't prattle on too long about it. However, what I do want to comment on though, is that if there is currently a gender imbalance in our profession, then it wasn't exhibited for the next generation here in Auckland. Four of the six SOFE competitors were women. Both the Master of Ceremonies for the morning and the afternoon sessions too were very capable women. We sometimes lambast the profession for being overtly male – but if it still is, maybe that is changing for the better.

Secondly, it is important to reflect just how universal engineering is, and how the creativity of engineers benefit society. Today's competitions have seen competitors from China, Hong Kong, Malaysia, Sri Lanka, Pakistan, as well as Australia and New Zealand – and what a standard! None of the presentations in SOFE would have been out of place in any workplace I know. All competitors presented complex (and in some cases mindboggling) engineering in terms a layperson can understand. The Design Competition participants arrived not only with innovative designs, but prototypes (working in some cases) and at least one eye on the commercialisation of their designs – and all completed on shoestring

budgets that students have to work with.

Thirdly - there is often much written about 'the gap' between university graduates and the skills needed in the workforce. I didn't see that today. I further am compelled to reflect that if such a gap exists at all (and there might be a debate in there somewhere), then the root cause cannot lie with the students themselves. They don't set syllabi. They don't offer workplace opportunities. Academia and industry do. In short, the people reading this (in the main) – do. So the challenge is for us – what are we doing to provide the forums to allow the next generation to develop? And with more than a little introspection, what are we older minds doing to learn the new skills and technologies that didn't exist when we "knew everything" in our undergraduate days?

There should always be a focus on CPD – but that focus has to be outcome based. I often ask those I mentor what new knowledge have you learned since we last met. A good question. Significantly though, they are starting to ask me the same question. What is clear to me, is that my own need for CPD is increasing as the years pass and technologies I know become outdated. Yes F still = ma, and always will, but technology moves on, and if we as individual engineers, don't try to move with it, we'll be left behind.

Events like this cause one to reflect, and I must say I'll leave today far more positive and excited than I arrived. Not only has the IMechE held an international event here in Auckland, it has again reminded me of why I love being an engineer. It's because we do things, we design things, we make things, we enhance things – in short we make society better. I doubt many in banking ever feel that satisfaction.

Off to scribble a sketch down that has just popped into my mind – as you never know - it might be a good one!

IAN MASH
OCEANIA CHAIR

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PANEL ROUNDUP

South Australia

Some SA member visited the Gawler Petanque Club on Sunday 1st May to compete in the 13th Annual Petanque Challenge where IMechE members challenge the Petanque Club members for an afternoon game. Over the past 13 years the Engineers have won five matches and the Club, who won this year, have won eight. It is very much a social rather than a technical event but there are always some technical discussions and conversation during the afternoon and the event is enjoyed by those who take part. The Panel Committee is sadly lacking Members, both young and old. Will any SA member prepared to actively participate in the organisation of social and technical events, visits and lectures please call Ken.

KEN SUMPTER, SA CHAIR
0419 861 476.

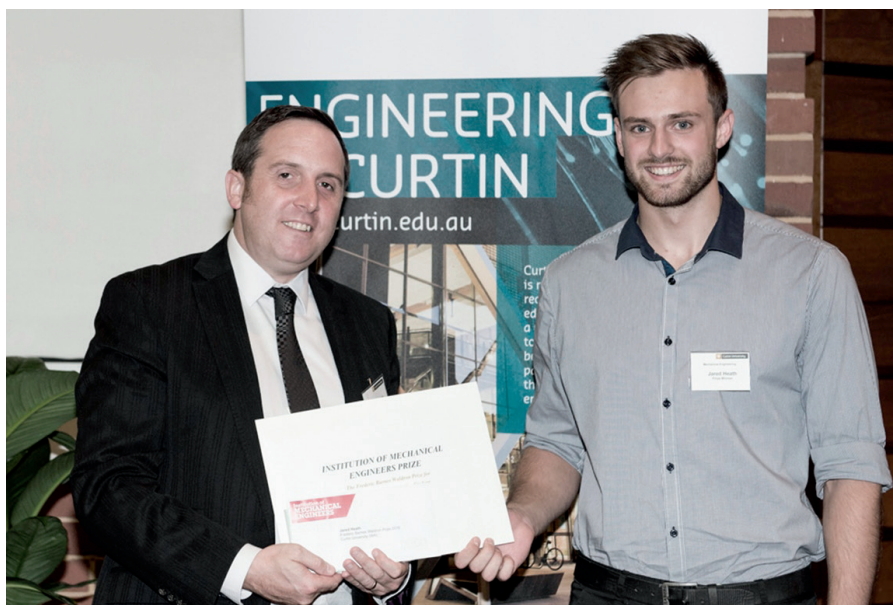
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Western Australia

This year has flown past so far and we've seen a lot of change in the Panel Committee as we progress.

First though, I'd like to share some of the events that we've been involved in here in WA over the past few months.

We kicked off 2016 with a presentation from an Elite Recruitment Specialist who is a Director of a local recruitment agency and who shared with us how we could be 'maximising our career potential'. In this, our guest speaker, Mr James Fairbairn, shared the kernels of his experience and knowledge in making sure that you are the stand out interviewee and job applicant. Having found himself regularly canvassed for advice and seeing that often, he was dispensing the same advice, Mr. Fairbairn gradually developed these kernels of knowledge into a presentation that he started to share at careers fairs, professional gatherings and the like. Last year, our event was almost standing room only and this year was similarly well patronised.



Andrew Gagg presenting the FBW award to Jared Heath from Curtin University

This year we were lucky to have the opportunity to get signed copies of Mr. Fairbairn's book: 'Career Karma – maximising your career potential'.

On a personal note, finding myself seeking new opportunities in a very tight Australian Market, I found the advice invaluable. I'd advise anyone to take the time to avail themselves of this extremely useful resource.

As an interesting aside, one of Mr. Fairbairn's ancestors is none other than one of IMechE's alumni and past Chairmen (1854-55), in Sir William Fairbairn.

In further news from the WA Panel, as well as attending our AGM in Hobart, our own Andrew Gagg was very pleased to be able to present Frederic Barnes Waldron prizes to Jared Heath of Curtin University on 1st April and John Mackenzie of Edith Cowan on 14th April.

An IMechE Australia LinkedIn page has been created by our new IT rep., Iwan Pepperell. We now need content to populate the page. We hope to borrow from the YM Facebook page as well as adding dedicated content.

Preparations are also underway for the visit of Jade Abbot (IMechE Global Account Manager) in late May. A "Get Registered" evening will be held on Monday 23rd May to

encourage members to upgrade their membership.

Also as I have alluded, we are currently in a period of change and renewal. My new career opportunity has meant a change in location as I've had to move interstate which has happily coincided with my having had the privilege of supporting our Panel as Chair for just over 2 years. As a result, the change gives us an opportunity to refresh our Committee and Panel and welcome a new Chair and Treasurer/Secretary. Although we do have a succession plan, we have sent out requests for volunteers for WA Panel committee and have had an excellent number of responses which we intend to resolve following the bi-monthly panel meeting on Monday 2nd May.

I'm extremely excited to be handing over to some new people which allows the opportunity for rejuvenation and new ideas. Whilst I intend to support the Panel as much as possible in my new role, I wish the successful imminent Chair, Treasurer and Secretary all the best going forward and your next WA update will be from our new Chair.

Many thanks and best wishes,

IAN KIRK.
WA PANEL CHAIR

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THE MELBOURNE HYDRAULIC POWER COMPANY

On 17th March, Miles Pierce of Engineering Heritage Australia presented a very interesting talk on the period between 1889 and 1967 when the city of Melbourne had a hydraulic power utility. I was quite unaware that there had been an extensive network (26km) of high pressure water mains under Melbourne's streets and lanes, which customers tapped into in order to power their various machines, such as: lifts, cranes, whip hoists, wool presses and even small Pelton wheel driven alternators. Wool presses, Miles informed us, copied the principles of Joseph Bramah's hydraulic press (which has IMechE Heritage listing). A preserved Bramah press can be seen in the Kelham Island Museum, Sheffield, UK.

The Melbourne Hydraulic Power Company delivered high pressure water (5 MPa) to the network from its central, steam driven pumping station at North Wharf. A second station was built next to Coops Shot Tower (Melbourne Central). When they were later relocated to Spencer Street Power Station, a couple of electric motor driven, Thompson Byron Jackson (Castlemaine) pumps were installed to replace steam driven ones. MHPC customers paid for the water they used,



Roshan Dodanwela and Miles Pierce at the 'Melbourne Hydraulic Power Utility' talk

and thus avoided the need to have their own boiler house and steam driven pumps (and the skilled staff required to operate them).

Hydraulic utility companies were established in only a few cities around the world. There were many local hydraulic systems within factories and docks but these were owner-operated and were not public utilities. The first hydraulic power company was established in 1876 in the city of Hull, UK. By 1883 London also had an extensive system. Melbourne had the fourth such utility to be established. Work on Melbourne's system began in 1887, under the direction of John Coates and George Swinburne (IMechE Member). Swinburne University of Technology was named after George.

Hydraulic power companies flourished for a relatively short period of time, eventually losing ground to electricity utilities. However they were very successful whilst they lasted.

After only its first year of operation, the MHPC had more than 70 lifts connected, and it continued to expand thereafter. In later years its customer base began to dwindle and eventually it became uneconomic to maintain and operate. It was finally shut down in 1967.

A few remnants of the MHPC can still be seen today. There is a restored cast iron header tank above a lane, adjacent to the new building on the site of the former Spencer Street Power Station. There is restored a whip hoist on the wall of the old Rialto building. There are miles of thick (30mm) walled, cast iron pipe buried under Melbourne's streets and lanes, branch pipes still exist in some older buildings. More visible, if you look carefully, are the many valve pit covers which can still be seen in streets and lanes. Melbourne City Council usually replaces them if they are disturbed by roadworks. If you are lucky enough to have a behind-the-scenes visit to the Forum Theatre, there is still an old orchestra pit, which once could be raised hydraulically, so that the whole orchestra appeared to magically rise up through the stage.

BRIAN CARTER, VIC PANEL



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SITE VISIT TO PUFFING BILLY RAILWAY WORKSHOPS

Puffing Billy Railway (PBR) is a popular tourist steam railway that runs from Belgrave to Gembrook in the scenic Dandenong ranges on the outskirts of Melbourne. On Saturday 30th April, the Victorian Panel combined a site visit to the Puffing Billy Railway workshops in Belgrave with a family outing on the train.

The PBR workshops are mainly responsible for the regular maintenance of the steam locomotives. However, in 1996 PBR purchased a Garrett NG/G16-129 (built by Beyer Peacock in England in 1951) locomotive from the Alfred County Railway in South Africa and shipped it to Belgrave. Once it reached Belgrave it was stripped in order to assess its condition and to put together a budget for a restoration program. The stripped

parts were stored at various locations along the railway.

PBR runs a Narrow gauge (2' 6" or 762mm) railway whereas Alfred County Railway ran a 600mm gauge railway so some major engineering redesign was required. The Drawing Office at PBR put in thousands of volunteer hours to model the entire Garrett in 3D CAD in order to identify the engineering work required and to produce workshop drawings. Apart from re-gauging, a Westinghouse compressed air brake system was also added and a complete new boiler was designed. While the designs were done by the PBR engineering office, manufacture of heavy engineering components (including the boiler) was outsourced. The participants of the site visit were able to see the new boiler and the bogies (after re-gauging) and work on the cab. The estimated budget for the project is around \$2.1million and will be completed mainly by the PBR workshop staff who are dedicated enthusiasts and volunteers.



After the workshop visit the participants boarded the 11.10am train and got off at Clematis and walked to a pub and enjoyed a leisurely lunch, after which they caught a return train back to Belgrave.

ROSHAN DODANWELA

COULD YOU WIN THE PHOTOGRAPHER OF THE YEAR COMPETITION 2016?

**WE'RE CALLING ON
PHOTOGRAPHERS WORLDWIDE TO
PUT 'INSPIRATIONAL ENGINEERING'
IN THE FRAME.**

Whether you're a professional or amateur, we'd like to see your striking images that raise awareness of mechanical engineering. judges will be looking for photographs that are ambitious, creative, thoughtful and representative of our key themes of transport, environment, manufacturing, education, energy, and healthcare.



A distinguished judging panel of leading industry professionals will select two winners and two runner-up images to be awarded at our Vision Awards ceremony in London in September 2016.

How to enter

- You can submit up to three photos based on the criteria described above
- All entries must be accompanied by a caption no longer than 20 words
- No filters or photo editing tools are permitted on photos submitted
- Email your entry photo(s) to industry@imeche.org.

The deadline for submission of photos is 29 July 2016.

Prize details

- Photo printed on canvas and presented with a trophy at the Institution's prestigious Vision Awards ceremony, London
- Tickets to a regional dinner or Institution event (over 18s)
- Winning photos will be featured in the Institution News newsletter, read by over 63,000 members across the UK and World Bulletin newsletter, read by over 17,000 members across the world.

ASIA PACIFIC SPEAK OUT FOR ENGINEERING FINAL

Auckland, New Zealand

The Asia Pacific Speak Out for Engineering final was held alongside the Design Competition final at Callaghan Innovation centre in Auckland, New Zealand on the 30th of April this year.

Topics ranged from hydrogen fuel cell vehicles to revolutionary oil and gas offshore drilling platforms. The competition was extremely tight, with the judges, from the IMechE and Institute of Professional Engineers in New Zealand having to weigh up the presentation style, visual and technical content.

Margaret Gaye came in a very close second place with a presentation on her innovative biofidelic neck for the use in rescue and trauma manikins. The neck, which replaced the standard manikin's neck is used for the training of paramedic staff and provides feedback on scope of movement which, if excessive, can lead to further neck injury. The final winner was Eryn Kwon from The University of Auckland to take first place for the entire region. Eryn had previously won the 2015 New Zealand national competition, followed by the Oceania 2015 final in Melbourne. She then went on to wow the audience in Auckland with her somewhat macabre insight into modelling of blood spatter patterns from gunshot wounds.



CSI IN ENGINEERING

Development of artificial models to study cranial backspatter.

The study of gunshot-related blood-spatter is a common and often critical task for investigators. Simulating the formation of this spatter in a reliable manner to answer case-related questions is difficult. Furthermore, the mechanism of spatter projection is not well understood. This project addressed both these concerns. Two physical models were designed and constructed, and two corresponding numerical models were developed to study cranial gunshot wounding and spatter.

A physical model of human head was developed, with correct anatomical details and biological structure of a head represented as skin, bone and brain layers. Extensive range of simulant material candidates for the skin and the bone layer were screened using another physical model of a simpler geometry. Based on the result, the optimal simulant combination to model human cranial ballistic response was recommended.

Numerical models of the physical models were developed to allow more detailed analysis of the backspatter mechanisms. Ballistic impacts were simulated using a smooth particle hydrodynamic (SPH) method. The quality of the simulation was improved

by reducing the model particle size and modulating material property inputs. The concurrent development of both the physical and numerical model allowed cross-validation of the results. A dynamic material characterisation using impact testing was carried out to collaborate the findings from the physical and numerical models.

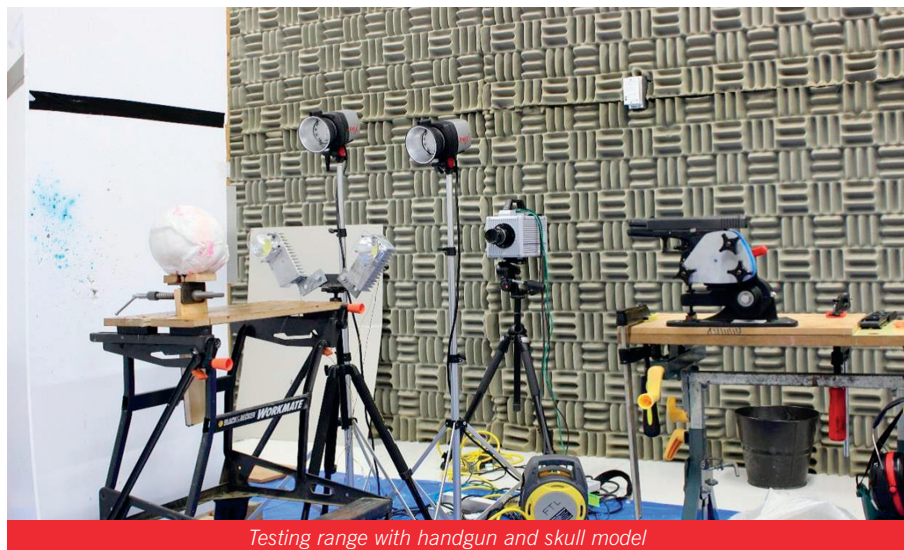
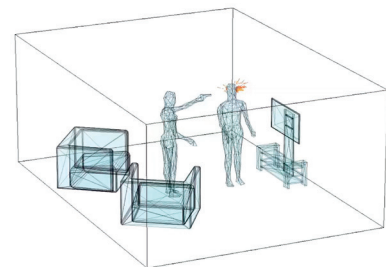
A new systematic quantification criterion to allow better comparison of the results was established. The results and findings from the research were used to explain the detailed workings of the mechanisms of backspatter, and identified the important factors.

Overall, the results of computational modelling and physical experiments

provided valuable resources to relate actual events in crime scenes with the back-spatter observed, thus adding more credibility to this form of forensic evidence.

ERYN KWON, ASIA PACIFIC SOFE WINNER

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Testing range with handgun and skull model

ASIA PACIFIC DESIGN COMPETITION FINAL

Auckland, New Zealand

Held alongside the Asia Pacific SOE finals, the brief of the design competition this year was to design a product which will aid hearing impaired people. To judge the products were three engineering representatives from the Australian IMechE branch and the Institute of Professional Engineers in New Zealand (IPENZ) as well as Mike Grainger from the Auckland Deaf Society.

The Sri Lankan contingent presented their prototype of the 'i-belt' first of all. This innovative solution provides a discreet device which alerts users to nearby audible cues such as a car horn or alarm, or a specific speech pattern such as the user's name, which can be pre-programmed into the belt. The user is notified of the type of noise and direction via multiple vibrating actuators on the belt.

China had come up with "Stentor", a device visually similar to a fitness band, which uses skull contact to transmit sound to the user. This can be done either temporarily by holding the wrist against the head, or for longer term conversations, by placing the band over the head. Use of memory metal allows the device to conform to the individual's particular size.

Hong Kong demonstrated their "Heroid" which is used to advise hearing impaired rail users of approaching trains, doors opening and closing, and other essential (normally audible) warnings in the station. Control and added functionality of the vibrating and lighting devices is completed by a smartphone app (what else?).

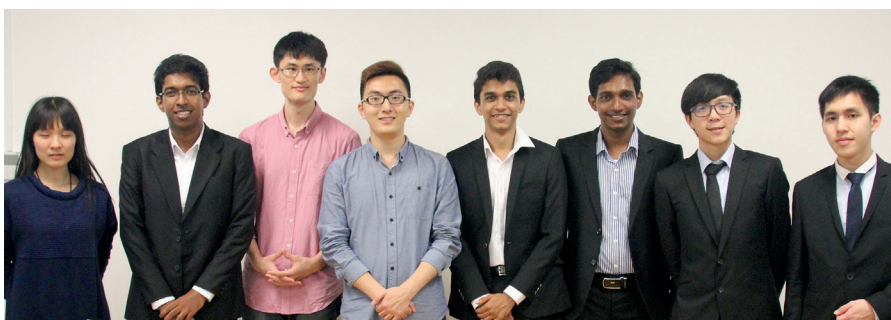
After the presentations, the judges and members got to have a play with the devices and learn a little more from the inventors and developers. Mike from the



Mike Grainger trying out the i-belt



The Hong Kong Team



All of the Design competition entrants

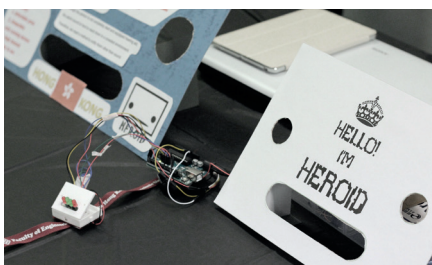
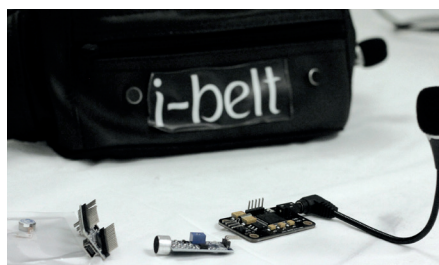
Auckland Deaf Society dived straight in and put the gadgets through their paces. He was extremely impressed with the usefulness of the designs and the focus on the final user.

In the end, there could be only one winner and Sri Lanka took out first place with their 'i-belt'. The fact that they had a fully functioning prototype and the clear functionality that it immediately provided to Mike gave them the edge in the end.

It was great to see the level of detail and thought that had gone into these. The ability to get the prototypes made up in the time and with the budget available was astounding. We are looking forwards to the next competition, hopefully with an Australian entry.

THE EDITOR

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New South Wales

It has been a busy start to 2016 for the New South Wales panel. Wanting to build on our successes in 2015 we are looking to 'redesign the way people think about engineering' in 2016. We are looking forward to connecting with members who joined the institution in 2015 and building the NSW panel. With a series of university events planned, a lecturer engagement night, high school events, socials and soft skill training on the programme, 2016 is set to be another exciting year. For all members interested in events keep a look out on Near You and for those wanting to get more involved with the IMechE in NSW do not hesitate to contact the panel.

MONIKA SUD
NSW CHAIR

Victoria

Since the beginning of the year, the Victorian panel has been running a rail themed series of lectures and site visits. It began in early February with a lecture on the new trains for Wellington (New Zealand), and was followed by a double lecture in late February on remote thermal monitoring of rail and rolling stock. A site visit to Puffing Billy steam railway took place in late April which included a tour of the workshop, a ride on the train and a pub lunch. The rail series will wind up with a tour of the new Preston tram maintenance depot in early June. Thank you to the

speakers and everybody involved in this rail series, including Metro Trains.

In between all this, the panel also managed to squeeze in a heritage lecture on the Melbourne Hydraulic Power company in March, and a mentor/mentee and social networking evening in late March. On that note, I would like to highlight that nearly all our panel members have kindly agreed to be mentors and I would encourage young members to take full advantage of this wealth of experience covering many fields. There is another mentor/mentee gathering planned for later in the year.

It is hard to believe, but the annual Christmas in July is not far away (yes, the year is flying past). This year's plans for the dinner are different and very exciting so please keep an eye out for the pending flyer. There are also several interesting events pencilled in for the latter part of the year, more information will follow in due course.

I should finally mention that the Victorian panel is always looking for ideas, speakers or possible venues for site visits. If any members can assist with suggestions or ideas for events please do not hesitate to contact me.

MATTHEW COOK
VICTORIA PANEL CHAIR

Institution of
MECHANICAL
ENGINEERS



FUEL ECONOMY AND EMISSIONS— REALITY VS. THE LAB

Air pollution around the world continues to make the news on a daily basis, with the pollution caused by road vehicles remaining a major contributor to the problem, especially in large, highly populated cities.

In recent years, greenhouse gas emissions from vehicles has become increasingly critical as well, with CO₂ emissions being intrinsically linked to fuel economy.

All of these factors are strictly governed by legislative bodies to ensure that vehicle manufacturers are producing vehicles with the best fuel economy and lowest emissions. However, in recent times there has been growing concern about the real life emissions and fuel economy of vehicles compared to their tested and stated values.

Reports indicate that vehicular emissions can be more than 3 or 4 times higher under high speed driving conditions than they are on the limited scope of the two main test cycles. In addition to that, fuel economy figures are measured on the emissions cycle as well, and there have been a number of customer led class actions against car makers when advertised fuel economy figures do not match real world results. Vehicle emission regulations have been becoming increasingly stringent since their introduction in the 1970s. However, if the real world emissions produced by vehicles is not reflecting the lab tested results, then clearly the legislation is missing the mark and not addressing the real problem. To combat this issue, the European Union emissions legislative body has recently announced a number of modifications to the emissions laws to target off-cycle emissions and ensure that vehicles meet target emissions levels under all operating conditions.

So, why is there a mismatch between emissions and fuel economy figures stated by vehicle manufacturers and the values that are seen during normal vehicle operation? To understand this, we need to look at the vehicle test procedures. There are two main legislative bodies governing vehicle emissions throughout the world; the European Union and the US Environmental Protection Agency. These two bodies have had quite different approaches to their method of testing in the past, but these are now approaching a coincident middle ground.

The EU initially developed a very arbitrary test cycle based on a notional approximation of a typical driving cycle. This cycle operates in a very limited range of the engine operating curve, with very gradual accelerations and decelerations. The cycle clearly does not represent the normal driving pattern which most people would experience. Until recently, all figures quoted for vehicles sold in Europe and those other countries which have adopted their rules (including Australia) would have been based on this unrealistic drive cycle.

The US Environmental Protection Agency (EPA) have always relied on two main test cycles (FTP-75 & US06) which approximate real driving much more closely than the European cycle. The cycle was based on a real drive through the hills around Los Angeles on various different road conditions including congested traffic and open highway driving. It also requires a cold start, meaning that the performance of the vehicle is assessed throughout its normal operating temperature range.

The European Union are now adopting a new main cycle called the Worldwide Harmonised Light Vehicles Test Procedure which is much closer to the US cycle and gives a far better approximation of real driving conditions. It also covers a much wider range of the engine operating window than the previous cycle.

However, there are still limits to what can be tested in laboratory conditions and drivers are still seeing significantly different fuel economy figures on their daily drive to what is quoted on the paperwork.

Also, the recent issues at VW have highlighted the ease with which it is possible to circumvent the test cycle requirements.

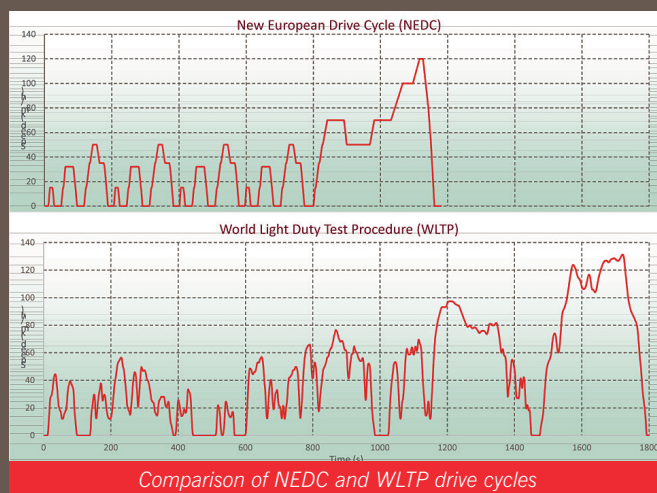
To try and address this concern and to ensure that vehicles are tested in conditions which most closely represent reality, the EU are now utilising a new test process called Real Driving Emissions (RDE).

The new test consists of putting portable emissions measurement equipment (PEMS) into the back of a vehicle and driving around normal roads to measure the emissions and fuel economy. Given that the vehicle will be driving on public roads in an uncontrolled environment, these tests should provide the most accurate representation of vehicle operation in normal use.

Tight controls will be placed on the conditions used for RDE driving to ensure that there is comparability across different manufacturers' tests, but this clearly defines a strong step forwards to ensure that the emissions and fuel economy figures we all see stuck to the windscreen of a car reflect the true values we expect to get.



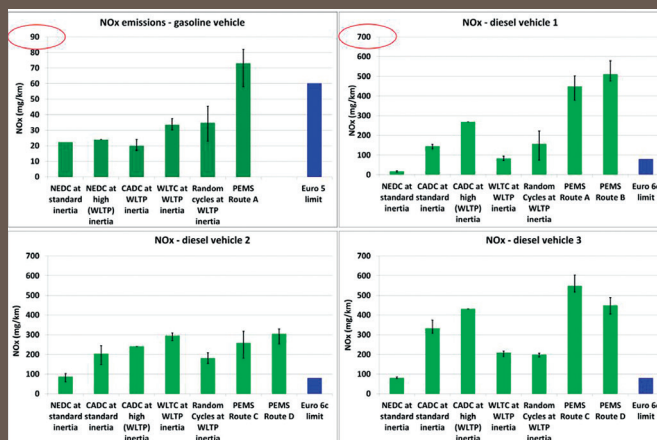
Smog over the Los Angeles bowl



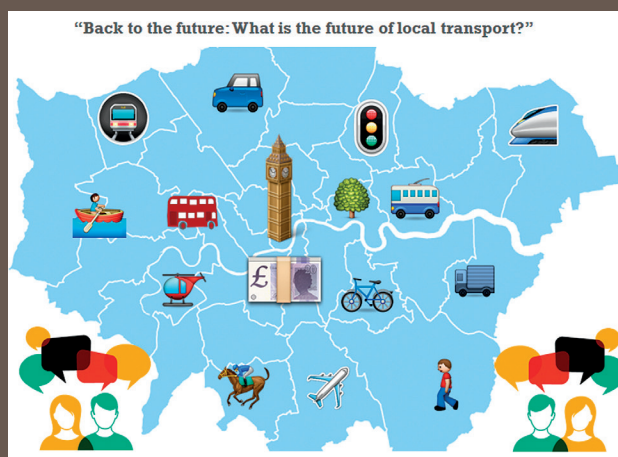
Comparison of NEDC and WLTP drive cycles



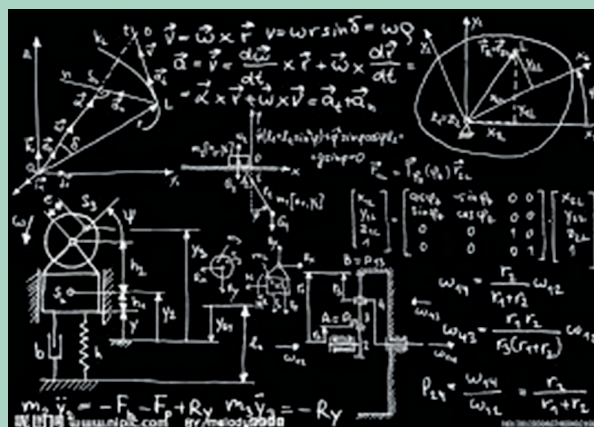
Vehicle fitted with PEMS equipment



Again we plan on holding a debate in Australia. The location and time for the debate is still to be set, but if you are involved in transport, or have an opinion about what the future of transport will or should look like, then please get in touch.



The competition is open to all IMechE members and requires a brief summary paper on a technical subject related to mechanical engineering. Entrants can be students, researchers or from any other field, but the topic of the paper must be their own work and not subject to copyright or confidentiality.



Entries close on 26th of August 2016

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