



AUTOMOTIVE LECTURE SERIES

To demonstrate the world-class engineering capabilities and skills that we have in Australia, the Victorian Panel proposed to run a series of events in 2014 that would focus on particular engineering topics or fields.

In light of recent events, it is somewhat ironic that the Panel planned that the first of this series would focus on the talents that Australia has in the automotive engineering field. Shortly after the planning started around holding the series in early 2014 – primarily to be coincident with the Melbourne F1 Grand Prix - Ford announced a decision to close their Australian manufacturing facilities and then, later in the year, Holden and Toyota made announcements to end both engineering and manufacturing operations within Australia.

Despite the massive and permanent impact of these announcements to the Australian automotive industry, the Panel decided to continue to with the automotive theme, but looking towards the future.



HSV Gen-F GTS – HSV, Clayton

Events at HSV's facility in Clayton are always well attended – this time over 40 members and guests enjoyed Phil Harding's informal presentation in the HSV boardroom. While most attendees were already aware of the world-class pedigree of the new HSV GTS and that it's arguably one of the most advanced production cars ever produced in Australia, most were surprised to be made aware that HSV is actually an independent company with the commercial investment and the HSV related design and engineering managed in-house.

While the new Gen-F GTS could possibly be the last in the line of this particular type of Australian built 'supercars' – the combination of independence, proven engineering talent and level-headed leadership give the flexibility for HSV to be placed to deliver with quality whatever new opportunities arise in the future.



TOMCAR – MTM, Oakleigh South

At the other end of the spectrum from the HSV – the audience at the presentation of the all-terrain TOMCAR were given a surprising indication of the unique qualities and performance of this Australian built vehicle. Originally conceived as a robust and easy to maintain alternative to the Jeep for military applications, the commercial and redesigned version of this vehicle is currently manufactured in Melbourne as part of a venture between TOMCAR and long-established first-tier automotive supplier, MTM Ltd.

After an informative presentation by Mark Albert (CEO, MTM Ltd) and Michael Brim (co-owner of TOMCAR Ltd) of the history and unique design qualities of the vehicle, the audience were invited to the production facility and the opportunity to examine the vehicles first-hand. As would be expected, when a group of engineers get together to talk about engineering 'things', the product and facility review ran over time by well over an hour!

Again, the TOMCAR product is another example of MTM, one of Australia's main automotive-sector companies, diversifying and using their skills to look for success with new business opportunities.



Insights into F1 racing and the challenges of maintaining business performance – Richard West

Richard West originally trained as an automotive mechanic, he moved into the commercial world of motor racing in the 1980's and subsequently held senior commercial roles with the McLaren, Williams and Arrows teams. He was a main board director of the TWR Jaguar sports car teams that won the Le Mans and Daytona 24 hour races in the 1990s. He has worked alongside a total of nine World Drivers' Champions including Alain Prost, Niki Lauda, Keke Rosberg, Nigel Mansell, Damon Hill, the late Ayrton Senna and Michael Schumacher.

In presenting to well over 100 members and guests at Melbourne University, Richard's informative and easy-going style was a resounding success with the audience. His ability to describe the key attributes and behaviours that the best of the Formula 1 teams adopt in order to pursue excellence by illustrating these with actual events and his personal experiences brought the whole presentation to life.

To the great delight of the attending Formula SAE team from Melbourne University, Richard spent time with the students after the presentation to answer questions and cast his experienced eye over their particular single-seat racing car.

In wrapping-up the lecture series for the Victorian Panel, the key message that Richard left the audience, was the importance of avoiding dwelling on the past but rather quickly adapt to the new environment, identify new opportunities and take charge of the inevitable change. ■

Vince Pendlebury

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IMECHE ENGINEERING HERITAGE AWARD – BRABHAM REPCO BT19

The presentation of the IMechE Heritage Award to Sir Jack Brabham AO OBE proved to be one of the high points in a series of successful events organised by the Victorian Panel throughout the year.

Held in the Formula 1 paddock immediately prior to the 2014 Melbourne Grand Prix, the presentation was attended by a group of VIPs including: the Premier of Victoria - Dr Denis Napthine MLA, Ron Walker AC CBE and Australian Grand Prix Chief Executive, Andrew Westacott.

In introducing the event in front of a large audience and media presence, Victorian Panel Chair Andrew Lezala spoke of the long history of the IMechE and the significance and rarity of the Heritage Award.



Dayaratne Dharmasiri presents plaque to Sir Jack Brabham and John Moller

Presenting the award to Sir Jack (now aged 88) and CEO of Repco John Moller, Australian Branch Chair Dayaratne Dharmasiri, described to the audience the engineering significance of the Brabham Repco BT19 and in particular the simplicity and reliability of the design that led it to be a championship winning racing car in the hands of Sir Jack.

The Heritage Award plaque now sits alongside the Brabham Repco BT19 at its permanent home at the Victorian Historic Racing Register in Box Hill, Melbourne. ■



The Brabham-Repco BT19 Formula 1 car powered Sir Jack Brabham to victory in the 1966 Formula 1 driver's and constructor's championships. This was the first time that the driver won both the driver's and constructor's championships and is unlikely to ever be repeated. Changes to the Formula 1 regulations allowed for an increase in engine size from 1.5 to 3 litres between 1965 and 1966 and led to a mad dash to develop new engines for the cars of the 1966 season. Brabham persuaded Australian company Repco to develop a 3 litre V8 for use in their BT19 car which was originally designed to house a 1.5 litre flat 16 engine. The Repco V8 was unable to compete with the rival V12s in terms of raw power, but had improved reliability and lower weight. This, in conjunction with a simple and light space frame chassis, allowed Brabham to go on and win the championship for that season with 4 wins out of 9 races.

Only 1 BT-19 was ever built and the car is currently displayed at the Victorian Racing Register in Box Hill, Melbourne

Engine: V8 Oldsmobile

Capacity: 2,996 cc

Power: 315 bhp at 7,800 rpm

Weight: 518 kg

Power to weight: 608 hp/tonne (compared to ~920 hp/tonne for 2014 F1 cars)



ENGINEERING HERITAGE AWARDS

From hovercraft to sewage works, from railway lines to bombers mechanical engineering plays a vital role. The Engineering Heritage Awards celebrate and promote this by recognising artefacts, locations, collections and landmarks of significant mechanical engineering importance. Established in 1984 by the Institution of Mechanical Engineers, they increase public awareness of engineering, past and present.

A notable few of the 92 previously presented awards are shown below emphasising the wide ranging applications awarded. For full details of the previous awards go to the IMechE About Us pages:

<http://www.imeche.org/About-Us/scholarships-and-awards/engineering-heritage-awards>

SS Great Britain (awarded 5 Feb 2000)

A wrought-iron steamship built under the supervision of Isambard Kingdom Brunel for the Great Western Steamship Company. In 1843 she was the largest ship in the world at almost 100 metres and the first screw-propelled ocean-going wrought-iron ship

Jaguar E-Type (awarded 25 November 2011)

Manufactured between 1961 and 1974 this iconic British sports car was voted the most beautiful car ever by the Daily Telegraph and continues to be seen as a pinnacle of vehicle exterior design.

Fluent CFD (awarded 1 April 2002)

First released in October 1983, fluent became a market leading standalone company in 1988. Fluent CFD software was awarded in recognition of the significant impact of the on knowledge, excellence and innovation in mechanical engineering. ■



SAUBER F1 TEAM PRINCIPAL INTERVIEW

Former YM Queensland Chair Yassmin Abdel-Magied found herself wandering the Formula 1 Paddock earlier this year at the Sepang circuit. The drivers were interesting, she thought, but the more intriguing things were often said by those who run the business.

Monisha Kaltenborn, Sauber's Team Principal and the sport's first female in the role, was kind enough to sit with Yassmin for a few minutes and have a chat about all things F1.

Monisha, being the first female in any role is something that attracts lots of attention. What are your thoughts on the divisive issues of targets and quotas?

Quotas are something artificial so I don't like to support anything artificial. At the same time you have to ask how many women are right at the top in any sector? It's equally bad, even worse maybe in others such as banking.

From that perspective, it becomes about what can actually improve that, and that leads to looking at an artificial mechanism like a quota. It might work in a lot of sectors, but sport is a place where these things probably won't.

It's a very tricky question because normally when you talk about quotas people reduce it to an obligation. What they forget is the second part. You have to take a woman with the same qualifications as a man.

It is far more important that the women who are in the sport try to support and give the opportunities. The best way is if you have people out there who can inspire others.

As a team principal with a background in law, you come to the sport from a very non-technical field. Do you find the lack of technical expertise a challenge?

You have to have a basic understanding of things. That's very important, otherwise people will tell you what they want to and you have no idea!



Sauber C-33 Ferrari 2014 Formula 1 car

I think the studies I did and the profession I was working on before was a good basis to enter into any field. The one thing you definitely learn in law is to work your way around new issues and ask the right questions.

Do you think F1 exists in a bubble, and is that okay?

I don't think it's a bubble. I think we are one of the strongest sporting platforms. Look at the number of people who watch races and how we are represented on a global basis. We are too big a dimension to be living in a bubble.

What we need to do is be strong as a platform.

Take what we are doing in the technical space. We have the introduction of the hybrid engine; a sophisticated system with a very high level of efficiency. This is exactly what the consumer industry is talking about at the moment. So we take up challenges that are relevant to a very large community. It would be good to leverage that and make that look positive. This is something that at the moment, is not really happening.

Why is it so difficult to communicate these positive messages about the sport?

We don't have a joint communication around these things. I think every team has to do that on their own, so that everyone benefits.

What does Sauber do in this space?

We are going to launch a new initiative soon where we will try to disseminate information about all these important things that the sport does, like the hybrid system. It is also about more than just what the sport is doing, but

also about what we do as a team. For example, we are completely carbon neutral, and have invested in things like the solar panel carport (people quite like that - no snow falls on their cars now).

As a smaller team, are you feeling the pressure around the new regulatory changes?

A lot of pressure! It is not only the financial and personnel restrictions that we face, but also the time frame set to these changes. As a customer team on the power train side, information comes with a certain delay. This is natural because we are not developing the components, but it means the team has to wait and there are then many compromises. Particularly on the chassis side, the supplier will wait for as long as they can to define their points of reference so for us down the line, it is a very big challenge.

How has the team dealt with it?

First of all you have to accept it, but that doesn't mean you have to just give up and wait. The team must still try to do the best and I think they have done so. They did a fantastic job over the winter, considering how quickly we proved our reliability at the first test in Jerez. Hats off to the team! ■



Monisha Kaltenborn and Yassmin Abdel-Magied at the 2014 Malaysian Grand Prix

ENGTRAVAGANZA 2014 – PERNOD RICARD WINERY

The Australian Young Member Section (YMS) meets each year at the annual Engtravaganza. This year the YMS spent a glorious Sunday learning about wine.

On February 23rd, 11 young members attended a technical tour of Pernod Ricard Winery, home to Jacob's Creek.

The aim of the Engtravaganza is to gather the Young Members around Australia for an annual technical tour. This year the event focussed on the engineering skills required to grow the vines and balance the flavours when producing wine on a mass scale.

The day started with a tour of the Pernod Ricard facility where alcoholic beverages are produced; products such as Ballentines, Chivas Regal, Absolut Vodka and, most topically for the Barossa Valley, Jacob's Creek. Wine in Adelaide is a large part of the local economy and culture, hence why this was selected as the event to follow the AGM in South Australia.

The Pernod Ricard winery was established over 150 years ago. It is different to many other wineries in Australia as it is mass production, untouched by human hands. The process is purely mechanical using pipes and storage tanks. The production stages have been designed based on taste tests and the experience of respected oenologists.

The journey begins with the grapes being shaken from the vine; a process which delivers a cleaner bunch



IMEchE Young Members at the top of the storage tanks at Pernod Ricard winery. Left to right: Caitlin Prior, Daniel Stewart, Michelle Bailey, Yassmin Abdel-Magied, Belinda Hernden, Matt Proudlock, Amy Lezala, Michael Riese, Chris Ong, Matthew Springer and Prasana Sritharan

than hand picking. The bunches are organised into one tonne containers which are catalogued with date, time and location of picking. This information allows for product tracking from vine to bottle and beyond.

The tonne containers are emptied into the Archimedes screw that commences the pressing process. Pernod Ricard are investing millions of dollars into new equipment which is expected to enhance the pressing process and reduce waste.

The pressed juice is transported across the plant into stainless steel fermenting vats where it is monitored for progression. At the correct time, dependent on grape ripeness and desired product, this is then transferred to the bottling plant.

The bottling plant is designed around the bottle-neck of labelling. This is a delay as there are numerous products being bottled at the same time. A key issue for the Pernod Ricard team is the waste generated by swapping pipes when changing lines. A continuous improvement initiative of lean manufacturing and waste monitoring

procedure has been implemented to improve this.

The winery is also trialling different inert gasses to protect the wine from oxidation. Even in this fine detail of the production process there is an immense amount of mechanical theory relating to pressure balancing.

The fine details of the wine production is where mechanical engineering plays its part. The winery is currently trialling open cask fermentation with large open topped stainless steel vats specifically designed to ensure the right amount of heat is retained during the fermentation process to generate the desired flavour. This required extensive research into the dimensions of the vat, the stainless steel wall thickness and the depth of the insulating air gap between the vat and the concrete wall. All of these factors affect the thermodynamics of the wine production.

The networking opportunities were taken advantage of by all. There were attendees from four different industries and Students from five Universities. The attendees in industry quizzed the students on current research. The students inquired on potential vacation work. One Student received an invitation to join for a six month internship. The YMS Chair took the opportunity, whilst a good representation of the nation was present, to gain to face feedback on what events YMs want to see in 2014. More networking evidence and a photographic chronology can be found at **#Engtrav2014**

The greatest evidence for the Engtravaganza benefit has been the feedback from the attendees.



Young members view the process steps of the bottling line

Comments from one that the event was “a fun and educational experience”. Another attendee reported that she was “surprised by the number of females” even though she knew them all. The ratio of men to women was a great result for her.

The national event also shows that the YMS is vibrant in states outside of their own locality, which is not evident until they meet fellow YMs from across the country. The Section is nationwide and we are active nationwide. Inspiration was shared amongst the YMs. One gave a summary on the Institution “This

organisation is ours to shape it as we will and there is support for that” whereas another stated “The future of engineering is alive and well, and it is up to us to continue it and take it forward”.

In the wise words of our most experienced Young Member, “We drank wine and learned more about engineering! How much better does it get?”. The event was a great success. ■

Amy Lezala
Young Members Chair



Pernod-Ricard staff showing how waste is minimised through innovative processing techniques

THE “COOLER” SIDE TO WINEMAKING.

When the general public as well as most engineers are questioned about their knowledge on wine making, pictures of wooden barrels, artisan wine makers sampling the fermented juice or workers harvesting the grapes are often conjured in people’s minds. To a lesser extent and for people familiar with the industry, there may be pictures of immense metal storage tanks or grape crushers in one’s mind. However, one additional and extremely vital part of the process is hardly known to the engineering fraternity or the average wine connoisseur as such. The art of temperature control. In the current times the control of the temperature of the grape during harvest right through to the finished product is a finely honed process that can make all the difference to the final drop. Cold Logic, located in Port Adelaide and hence in close proximity of the Barossa & Clare Valley as well as the McLaren Vale, is one such company that operates in this niche market.

Unbeknownst to many, and depending on the set-up and environmental conditions, the refrigeration of the product from crushing, to pressing to fermentation can sometimes be responsible for up to 60 per cent of the annual power bill for a winery. As a result it is extremely important that these processes and the refrigeration equipment are tightly controlled and work as efficiently as possible.

There are many possibilities for different refrigeration solutions to achieve the final end result.



Generally Freon & Ammonia as primary refrigerant together with Glycol as a secondary medium are most commonly used. Ammonia has overtaken Freon as the preferred solution for new installations, simply because of the price for a system charge. Staying with Ammonia as the example at hand, temperatures of -20°C can easily be achieved but only temperatures between -2 and -10°C are usually required. Depending on the set-up of the winery themselves, sometimes the Ammonia is used directly to undertake the refrigeration of the individual process steps or using some form of industrial heat exchanger, Glycol is used to undertake the cooling. While Glycol is the safer way of cooling wine, it also introduces inefficiencies requiring more energy, bigger systems for the same amount of cooling and harder working equipment leading to higher wear and tear.

Compared to cooling requirements for other food processing plants, the wine industry is especially diverse over the duration of a year. Whilst large cooling requirements exist during vintage and summer, at other times, the requirements are very low. For this reason it is extremely important for the supplier of the refrigeration systems to fully understand the exact requirements of the client and achieve a cost effective outcome which requires optimised capital expenditure for new and upgraded systems.

Dr Michael Riese is the contracts manager at Cold Logic in Port Adelaide, South Australia. Cold Logic is a leading supplier of industrial refrigeration systems to the food and beverage industries in Australia and will be celebrating 30 year since company foundation in 2014. ■

EDITORIAL

This *News Bulletin* is my first, so please forgive any deliberate mistakes or inaccuracies. Many thanks to Matt Springer for showing me the ropes and also providing some of the excellent content. I became a chartered engineer with the IMechE in 2007 and have worked for a number of companies in the field of diesel engine design and manufacturing throughout the years and currently work for Ford Motor Company in Geelong. From someone in the automotive industry it was compelling to see the automotive expertise within Australia on display in the Victorian automotive lecture series, but also sombre to be reminded of the talent which will struggle to be re-engaged within this sector over the coming years. Hopefully companies such as Tomcar will continue to shine in the wake of mainstream automotive manufacturing leaving Australia. In my new role I was fortunate to attend the AGM in Adelaide and meet with the motivated local IMechE board. I was also able to attend the Engrtravaganza event and confirm that the engineering principles behind the Pernod-Riocard winery do indeed go a long way towards producing a fine drop.

I hope you enjoy the contents of this month's *News Bulletin* and please contact me if you have any feedback or comments.

Matt Proudlock

News Bulletin Editor

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FROM THE CHAIR

Greetings! It was a tremendous experience meeting with our motor racing legend Sir Jack Brabham, our Honourable Victorian Premier Dr Denis Napthine, Repco Managing Director John Moller, and many other dignitaries at the prestigious Formula 1 Melbourne Grand Prix. The IMechE received unsurpassed recognition and publicity as a result of the presentation of our 93rd Engineering Heritage Award to the Repco-Brabham BT-19 racing car at this event. The support we received from Repco and the Formula 1 Corporation was absolutely amazing. A big thank you to the Victorian Panel and our late John Burt, for their relentless efforts and for being instrumental in the organisation of this incredibly successful event.

RAAF Roulette aerial displays and F/A-18 fly-overs in the skies above Albert Park were spectacular. Witnessing the precision flying and aerobatics always get us thinking of all the engineering, mechanics, systems and crew skills involved which need to be absolutely perfect and completely synchronised. Wouldn't it be interesting to see the risk assessments and risk management processes for those sorts of events?

Backtracking a bit now, our Oceania Region Board Meeting held in Dunedin was a good opportunity to embrace

the future strategy and plan for the Region. It was an excellent chance to meet and make acquaintances with our counterparts from Engineers New Zealand and Mechanical Engineering Group, and to enjoy their hospitality. Thank you Win for organising the very successful, event.

As a by-product of the meeting in Dunedin, we also had the opportunity to witness the presentation of the 91st Engineering Heritage Award to the Armstrong Disappearing Gun. Two Heritage Awards within 51 days! This Gun, a clever design to give greater protection to the gun crew, was manufactured in 1886 at Newcastle upon Tyne, and has been in its current gun pit since 1889. It is the only fully restored example of this type of gun still in its original emplacement, now of course the centre of the peaceful and tranquil wildlife reserve "The Royal Albatross Colony".

While in Dunedin we also enjoyed two other engineering feats in the form of the "Taieri Gorge Railway" and the world's steepest street, "Baldwin Street".

At the "Interchange 2014", the legacy event of the Corporative Research Centre (CRC) for Rail Innovation, held this year in Brisbane, I had the opportunity to acquire my own personal hard copy of our (IMechE) Journal of Rail and Rapid Transit,

September 2013 Volume. This is a dedicated special issue on the work of the CRC for Rail Innovation, Australia. It is quite heavy and profound reading, but I am in no doubt that those of you who have a keen interest in railway engineering will find these publications quite captivating.

On a rather sad note, our long serving colleague Stan Gafney has decided to move on with other things in his life. For those who don't know, Stan served the Branch for many years in a multitude of capacities, including the position of Australian Branch Chair, 2001-2003. His contribution and service to the Branch and the IMechE over the years is widely acknowledged and greatly appreciated. We wish Stan and Bobbie good health and all the very best in their future endeavours. Elizabeth Smith will now take Stan's place in South Australia. Thank you Liz.

A warm welcome to Matt Proudlock our incoming Assistant Honorary Secretary & News Bulletin Editor. Matt brings with him wealth of knowledge, invaluable publishing knowhow and resources that will benefit the Institution and News Bulletin greatly. Please support Matt by continuing the supply of publishing material.

Although it is now a common occurrence, it is still extremely pleasing and encouraging to see the continuous emergence of our younger members and their gradual taking over of the Institution. Succession planning is important and plays a vital role in the smooth transition to the next cohort. We now have true evidence of this happening, as another very successful event "Engrtravaganza 2014" was held in Adelaide, thanks to our Young Member Section. Another most important initiative in their programme is facilitating our International Business Development Manager Rachel Leech's proposed 2014 tour Down Under. This tour will undoubtedly promote and improve the awareness of the IMechE.

With a modicum of luck, perhaps there could be a Presidential visit to Australia as well, to Oceania to be exact, in the first quarter of 2015.

Kind regards.

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OCEANIA REGION NEWS

The IMechE Oceania Region year got off to an enthusiastic start in January. The Regional Board met in Dunedin, New Zealand, for a wide ranging review of what we hope to achieve in 2014, together with development of the necessary plans. The focus is on consolidating and improving the technical programmes members have come to expect, and expanding from there into new fields. Recruitment is another high priority area, as is the fostering and encouraging of our expanding Young Member Section.

The successful meeting was held on 25 January, the day after a ceremony at Taiaaroa Head on the Otago Peninsula where the 91st IMechE Engineering Heritage Award was presented. This was to the Armstrong (Disappearing) Gun, built in Armstrong's Engineering Works in Elswick, on Tyneside, in 1886, and commissioned at its present site in 1889. There was an attendance of 82 at the presentation ceremony and it became very clear that the Dunedin community treasure this artefact. It is one upon which they have lavished many refurbishment hours and they deserve to be proud of their gun and their accomplishment. They were particularly proud that the IMechE had recognized how special this distant item is.

From one Heritage Award success to another! And what a success it was. I would observe, from the Region perspective, how well the Victorian Panel worked as a team on this event, and how far the, IMechE focused, media attention carried our name and image. Very well done all round.

One other of our initiatives came to fruition since I was last able to update you. In April, the 5th Annual IMechE Volunteers Conference was held in the UK in York. Three of our Australian volunteers, including Belinda Herden, our Young Member Representative, were amongst the 180 attendees who travelled from around the UK and the seven international regions to participate.

This was the largest Volunteers Conference since it began in 2010. The conference featured a two day programme of lectures and workshops, aimed to provide volunteers with a chance to share best practice and learn about IMechE services. The format of the conference ensures that there is something for everyone, with each participant choosing to attend the workshops that most interest them. There were also plenty of chances to network with IMechE members from all over the world.

This year's programme also featured a presentation from myself in my role as Oceania Young Member Representative. The presentation highlighted the great work that has been happening in our part of the world. It also provided an opportunity to make those members based in the UK aware of the challenges that come from being 10,000 miles from the IMechE headquarters in Birdcage Walk in London.

The whole trip for our three volunteers was a great opportunity to 'be involved'. A sentiment, or rather a goal, that I recommend to every member.

Ken Tushingam & Belinda Herden
Oceania region chairman Young Member Representative

YOUNG MEMBERS SECTION NEWS

The AGM in February was a fun weekend had by all who attended. The Australian Panel met in Adelaide with Young Member (YM) representation from the Australian YM Chair, the Oceania YM Chair and the Media Rep.

At the AGM it was highlighted that we have a lot of potential and a high demand from the Young Members in Australia but we do not have the man power to deliver within the Young Member Section (YMS). So we distributed a call for arms and we had a great response! Thank you to all of you who volunteered your support. The local State Young Member Groups will be coordinating themselves to introduce you all to our goals.

The main goal we have this year is to roll out our calendar of events. We have now standardised our events across the States, selecting a few strong projects that we can focus on. Please keep in touch with the Near You website to see when these will be in your local area.

Despite the good response we are always interested for people to get involved. The only limitation in the number of events we host is the number of organisers we have. If you would like to see more events and are able to donate some of your time to the cause, we would love to hear from you. If you have any requests for events, we would also love to hear your ideas.

The Engtravaganza was a great success in February. A total of 13 Young Members toured the Pinot Ricard winery, the home of Jacob's Creek. The level of technology involved in mass producing wine was astounding. The glorious weather also helped us enjoy the beautiful scenery and delicious lunch.

Ideas for next year's Engtravaganza will be needed for the next quarter so please send us your comments. ■

Amy Lezala
Young Members Chair

<http://nearyou.imeche.org/near-you/oceania/Australia/australia-young-member-panel>

NB169 Wordsearch Winner

Congratulations to the winner of the previous wordsearch, Hugh Evans who was presented with their prize at the GP event



NB170 Wordsearch:

PERNODRICARD, BRABHAM, TOMCAR, SAUBER, REFRIGERANT, CASTLEMAINE, POLYCRYSTALLINE, BENALLA, DRILL, RMIT, REPCO, MENTOR, TELEMACHUS, PANEL, ELECTRODE, FSAE, AGM, BARNES, WALDRON, KALTENBORN, ARMSTRONG, ROULETTE

Please email your answers to the Editor, first correct entry will win a prize

GRINDING THE HARDEST TOOL IN THE WORLD

In large scale manufacture such as the aerospace industry, the need to produce thousands of clean accurate holes in components made primarily from composite materials is a very real challenge.

To achieve this in an efficient manner requires tooling that maintains a sharp cutting edge for the longest possible time. To address this, manufacturers have turned to the hardest tool in the world - Polycrystalline Diamond (PCD) drills

PCD drills are not actually manufactured from diamond, but from diamond powder. Diamond powder of a specified particle size (usually between 1 to 30 microns) is mixed with cobalt and applied under extreme pressure in a die fusing process which not only produces an extremely hard micro structure but also forms the tip of the drill bit. This however, presents manufacturers with a significant problem – how do you grind a drill produced from the hardest material in the world into an appropriate form? Moreover, despite its incredible hardness, after extensive drilling through composite materials, the drill bit will eventually become too blunt to use, thus requiring frequent grinding over time.

PCD drills have traditionally been ground by machinists who have developed great skill and dexterity

for their machine tools. Armed with experience and an intuitive feel for the pressure needed to be exerted on the tool, they can take anywhere from four to five hours to grind one drill. While this exceptional skill is to be admired, such a time consuming and laborious process is clearly impractical for duplication into large scale production, hence there is a need for a more efficient automated process. RMIT University's Manufacturing and Materials Engineering staff took up the challenge in 2011 with a 6 million dollars plus project supported by the Advanced Manufacturing CRC. This research work is partnered with the world's largest CNC grinding machine tool manufacturer, ANCA, to develop a CNC grinding machine for polycrystalline diamond drills.

Initial research was conducted into the suitability of potential manufacturing processes that could be adopted onto existing CNC grinding machines. These processes included: abrasive grinding, ultra vibration lapping and abrasive waterjet cutting, to name a few. In the end, the research team decided to adapt the Electric Discharge Machining (EDM) process as the baseline principle for this new development. EDM is already well established as a way of machining challenging materials such as hardened moulds. The process essentially creates a series of rapid



Tip of a PCD drill bit.

electrical discharges (sparks) between an electrode and the part removing small amounts of material. The RMIT team then focused on the type of development platform required to ensure that the full geometry of a drill bit profile could be achieved. Existing CNC grinding machine tools offered many desirable attributes including 5-axes and well established grinding software to control the machine tool.

The existing platform required several modifications to its configuration to enable it to function as an electric discharge grinding (EDG) machine. Some of the major changes have included the replacement of the grinding wheel with an electrode and a dedicated power generator with control system.

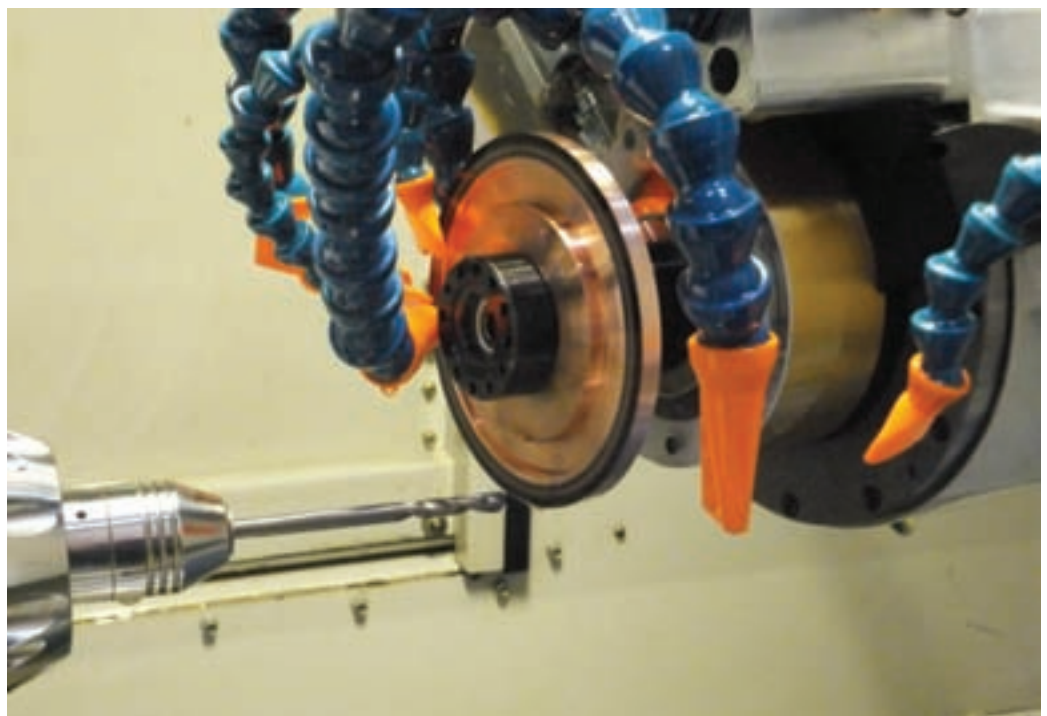
One of the fundamental difficulties encountered by the research team relates to the requirement to maintain a consistent gap between the electrode and the drill bit so that a constant burning voltage can be maintained. In a conventional grinding process, the position of the grinding wheel in relation to the part is established when the wheel touches the component. In EDG, a gap between the wheel and the PCD material should be maintained because if the materials are in contact, a short circuit situation occurs and results in no material being removed. The EDG process presents challenges of both finding position (so the machine knows where it is) and maintaining a consistent and efficient gap as material is removed from the drill.



Aerospace production requires PCD drills to produce thousands of holes

The electrode itself is essentially a copper disk that rotates much the same as a grinding wheel. A dedicated power generator has been incorporated into the EDG platform to provide the electric charge. The electrical discharge pulse intensity and timing is determined by a control system developed by the team. Understanding the nature of how the spark erodes the polycrystalline material is key to the successful design of the machine as it determines such fundamentals as feed rate, area of removal, rotating speed of electrode wheel, etc.

An important part of the research is to investigate the effect of heat affected zone residual stress in the drill bit. Some EDG drills have been found to fracture more easily than others although the same grinding parameters are applied. To eliminate this problem, the team has developed a stress measurement process separately. Interestingly, the EDG PCD drills compared favourably to drills ground using traditional methods. The study found high residual stresses in traditionally ground drill bits, this may account for why drills sharpened by this process have historically had a tendency to chip. Early signs indicate that the EDG process overcomes this problem. It is also well worth noting that the time taken to sharpen a PCD



Setup with 5-axis grinding machine

drill has been reduced from hours to an impressive 20 minutes.

To date ANCA has sold several EDG machines and more inquiries from interested customers have been received. This is a positive step as any problems and/or feedback encountered in the field are sure to help the research team further develop and refine this technology. With potential customers such as Boeing and Airbus on the horizon, the rewards for successfully developing this technology cannot be underestimated. It is certainly a great example of an Australian University research project leading the way

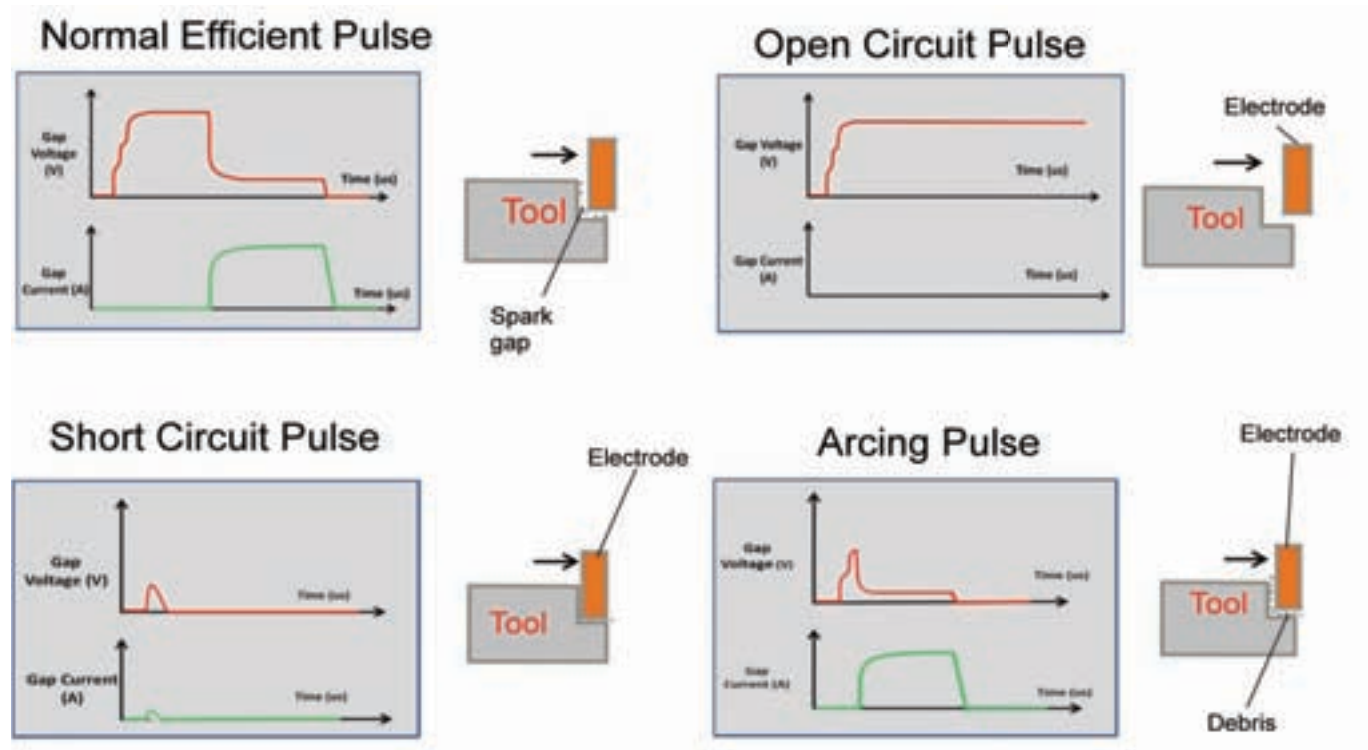
in developing a global engineering technology. ■

Professor John Mo

John Mo is Professor of Manufacturing Engineering and was Discipline Head of Manufacturing and Materials Engineering at RMIT University. He is responsible for overseeing this project as part of RMIT University's commitment to industry research.

Matthew Cook

Matthew Cook is an IMechE committee member, Senior Mechanical Engineer at BAE Systems and a Master student of Professor Mo.



FSAE TEAM SWINBURNE ENGINEERING OUR FUTURE BENALLA COLLEGE VISIT

On Wednesday 5th March 2014 nine student members of team Swinburne travelled to Benalla College for the inaugural Engineering Our Future school visit. The Engineering Our Future program was developed during 2013 with help from staff at Swinburne and additional comparative guidance from external educational organisations as well.

The key goals for Engineering Our Future are to inform year 9 & 10 students about Engineering and to make it exciting and attractive as a career path. This is the key point for secondary school students since it is the preeminent time when students must begin to select subjects for VCE and are subsequently beginning to choose their career path.

The reception that we received at Benalla Secondary College was fantastic with the year 9 students and staff alike, all very keen to hear about our experiences as university students and in particular about our involvement with the FSAE project. Many of the students had previously not had exposure to the opportunities that university education can offer and no one in attendance had ever seen a project anything like an SAE car before!

We broke the visit into a number of sections to maintain the students' interest and to ensure that they could ask more detailed questions of our team members about our experiences



Team Swinburne demonstrate the car's capabilities

in a smaller group environment. A formal presentation kicked off proceedings outlining who Team Swinburne are and what engineering is, while also covering other important points such as pathways into university education, assistance available to access university and also encouraging more female students to consider engineering as a career path.

Following on from the main presentation were a series of workshops allowing our team members to show the year 9 students different areas of the SAE project, from the making of car parts, to CAD and FEA analysis. This was also well received by the students who enjoyed being able to see and touch real race car parts along with seeing some of the

advanced technology that we are lucky enough to use every day at Team Swinburne.

However, the highlight for everyone involved was getting to see our SAE car in action on asphalted areas at the school. The year 9 students were now able to see what the hard work of a group of young engineers could really do! We did a series of acceleration runs to show the cars straight line performance along with some skidpan style track work showing off its cornering ability. There was not one student without a grin from ear to ear by the end.

It was also very rewarding a number of weeks later to receive letters in the mail from the students we had visited, telling us not only how much they had enjoyed our visit and seeing our car in operation but how we had changed their perceptions of university, made a number of them feel that it now is an option for them as a future career path and that they were genuinely now considering going to university to further their educations. Previously for some of these students this had not been the case.

Overall the visit was both enjoyable for us as a team, along with the students and teachers of Benalla Secondary College, but also very rewarding and worthwhile knowing we have quite possibly helped to shape some young people's lives for the better. ■

Matt Tanis
FSAE Team Swinburne



Benalla college students have a closer inspection of the car

STATE NEWS

QLD REGION NEWS

The first quarter in Queensland has been a busy one with the organising of the Panel Committee Meeting and AGM at a new location at the Brisbane Square Library to elect Office Bearers for 2014. While it was pleasing to see new faces take up positions, it was also sad to see a few leave after many years of good service. The Panel thanks them for their contributions over the years.

The Frederic Barnes Waldron (FBW) Award was presented to Mr Morgan Lewis of the University of Queensland as Best Student for 2013 at the Panel Committee Meeting in February. Morgan also signed up as a Committee Member of the Queensland Panel that evening.

Nathanael (Nate) Martin of the University of Southern Queensland has been nominated for the FBW Award as Best Student for 2013/14.

Both the Panel Treasurer (Daya) and I attended the Branch Committee Meeting and AGM in Adelaide in February. As Members of the Branch Committee, we were also fortunate in being able to attend and support the presentation of a Heritage Award to the Brabham BT19 car in Melbourne during the F1 Grand Prix.

At the National Speak Out For Engineering (SOFE) Finals held in Adelaide during the weekend of the Branch Committee meeting in February, Ms Caitlin Prior, who was the Queensland representative, won the John Burt Memorial award for the best presentation with her topic on, "A Comparison of the Desktop Additive Manufacturing Systems, UP and CUBE". She will now proceed to represent Australia at the Regional SOFE Finals. Congratulations to her!

The 2014 Queensland State SOFE competition will be hosted by the University of Queensland on the 15th April. We look forward to a spirited competition to produce the next representative for Queensland at the 2015 National SOFE Finals.

Leslie Yeow
QLD Panel Chair

NSW NEWS

It has been relatively quiet this past quarter here in NSW. Nick Simpson attended the IMechE Annual General Meeting in place of me. This year the AGM was held in Adelaide. As winner of the NSW SOFE competition, Nick presented in the national final and came 3rd place. Well done Nick a bronze medal!

The NSW Mechanical Chapter have had some popular technical presentations of late, in conjunction with EA and ASME, at the Engineers Australia auditorium in Chatswood.

In February, Zac Bouchabake and Mike Coburn from HILTI Australia gave an interesting presentation on "post installed anchors". Post-installed fastenings with both mechanical anchors and chemical anchors have been widely used by the construction industries in all sorts of projects; Applications range from structural fixings supporting structural elements, to non-structural fixings supporting non-structural elements. This presentation presented HILTI's innovative SAFEset solutions to reduce the risk of installation by eliminating the crucial stage of holes cleaning.

In February the IMechE NSW Panel ran the 2013 Speak Out for Engineering presentations in the city at the King Street Brew House. We had excellent attendance and we are hoping to continue to run a bi-monthly technical presentation schedule in the city. I presented Nick Simpson and Adam Benwall with their certificates which had finally arrived on Australian shores from IMechE HQ.

Sadly the NSW committee are having to say goodbye to Nick Simpson our Communications Officer. Nick has decided to return to the UK. Thanks to Nick for all his support in the NSW committee.

We would like to welcome to the NSW Panel Phillip Donnelly from PB's a position is yet to be decided upon but we are excited to have him on board.

Monika Sud
NSW Panel Chair



Richard West and Melbourne university FSAE team and car

VICTORIA NEWS

The Victorian Panel had a very busy start to the year 2014. Our Programme for 2014 started on the fourth of February with a technical presentation on "Additive manufacturing with Titanium and Aluminium castings for the aerospace industry" which was held at the CSIRO in Clayton, Victoria. The first part of the presentation on additive manufacturing with Titanium was done by Chad Henry, the additive manufacturing operations manager at the CSIRO and Chad explained the CSIRO's strategy aimed at value adding to Australia's Titanium ore reserves by supplying to the additive manufacturing industry. He also explained the technology used by the ARCAM 3D printer and some of the testing and validation work that is going on in relation to 3D printed parts from Titanium. The second part was done by Dr Roger Lumley of AW Bell Foundry. Roger explained a new process pioneered by AW Bell which increases the efficiency of Aluminium castings and improves thermal and strength properties of the casting.

An automotive themed lecture series was organised by Victorian Panel Committee member Vince Pendlebury. While traditional automotive manufacturing is being phased out in Australia the lecture series highlighted the high level of technical skills and innovation that exists locally and the opportunities that are available to suppliers of automotive parts to diversify and finally focussed on how professional Institutions like the IMechE can help engineers transfer their skills from Automotive to other sectors.

The series was very successful and was a good opportunity to give IMechE publicity and showcase the benefits of joining a professional Institution. The

Victorian Panel hopes to continue this format and organise lecture series for other industries in the future.

On the eleventh of March the Victorian Panel and Engineers Australia hosted Professor John Mo, Discipline Head of RMIT university's Manufacturing and Materials Engineering to present on "Grinding the hardest tool in the world – Polycrystalline diamond drill". The lecture was very interactive with participants posing lots of questions during and after the presentation.

On the sixteenth of March 2014 the Victorian Panel awarded an IMechE Engineering Heritage Award to Sir Jack Brabham and the CEO of Repco Mr John Moller at the Australia Grandprix for the Brabham BT19 racing car. The award ceremony was a very successful event and was attended by the Premier of Victoria Hon Dr Dennis Napthine, Victorian state minister for Innovation, Tourism and major events Hon. Louise Asher, The CEO of the Australian Grand Prix Andrew Westacott and former Lord Mayor of Melbourne and Former CEO of the Australian Grand Prix, Ron Walker. A detailed account of the event can be found on page 2. ■

Roshan Dodanwala

Hon. Secretary Victorian Panel

WORD TO THE WISE

When you search for 'Mentor' on Dr Google, a number of results appear relating to Greek mythology.

The traditional Mentor is believed to be the guide and guardian for Telemachus, son of Odysseus, whilst his Father was at war. In modern day this namesake has been taken to represent an experienced and trusted adviser, for this is what a Mentor is; an advisor.

Mentors are not there to instruct or direct/chastise. The role of a Mentor is to guide and encourage. A common mistake when stepping into the

Mentor-Mentee relationship is to expect the former to take the driving seat. Many developing Engineers say to me that they do not hear from their Mentor, that they have not been contacted to review the latest quarterly report. Good. This is the responsibility of the Mentee as it is in their interest to seek the advice of the Mentor.

Mentees – use the service to its full potential. The IMechE provides a Mentor as an independent party to review your career development. You have the opportunity to discuss difficult situations with an impartial ear, away from the office you are working in. It is the support of someone as invested in your career development as you are. It is a great opportunity to have this level of interest from someone with additional experience to whom you can take all of the dumb questions you are too afraid to ask, knowing that they will not pass any judgement.

To be this person in a young Engineer's career is not an easy role. We thank all of our Mentors for the time and effort they give to the Engineering community. They do it, not only as a thank you to their past Mentors, but for what it brings to them. Being a Mentor is a development in itself; it highlights all of the experience gained over the years as well as the areas where more knowledge is needed, which is often learned from the Mentee. Keeping in touch with the young Engineering community on a regular basis is a good way to keep in touch with new industry developments. It is also a way to maintain enthusiasm for an industry in which time-served seems to directly correlate to increased cynicism.

A Mentor is useful, not only for the IMechE, but also for development within your company. Sometimes it helps to have someone on the inside as they will be able to help advise which role change will offer the greatest benefit. Mentors can be from within your own company or from your local network. The further from your working team, the more impartial the view will be when discussing the more difficult issues.

The IMechE will support all young Engineers through professional development and will provide a Mentor to review your membership application. I had a fantastic relationship with my Mentor; so much so that we continued our reviews when I moved to Australia. A Mentor is typically someone based in your locality but, given the international community of the IMechE, many Mentors and Mentees operate across the globe. With the IMechE there is no geographical limit.

It is you who has the most interest in your success. Your development is in your hands; as a Mentor or as a Mentee. Take the initiative and #GetInvolved. ■

Amy Lezala

Young Members Chair

HMAS CASTLEMAINE TOUR



The Victorian region of the IMechE are currently organising a tour of Royal Australian Navy's World War II corvette HMAS Castlemaine located at Gem Pier in Williamstown. The tour will show the workings of the Bathurst class vessel which saw active duty throughout world war II. The tour is planned for the afternoon of Saturday 24th of May. Please see the IMechE Nearyou pages for more details:

<http://nearyou.imeche.org/near-you/oceania/Australia/victoria-panel>

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MECHANICAL
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as well! Follow the links on their nearyou page.

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