Institution of MECHANICAL ENGINEERS

AUSTRALIAN BRANCH

NEWS BULLETIN

50 YEARS

Improving Australia through engineering since 1960

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Institution of MECHANICAL ENGINEERS

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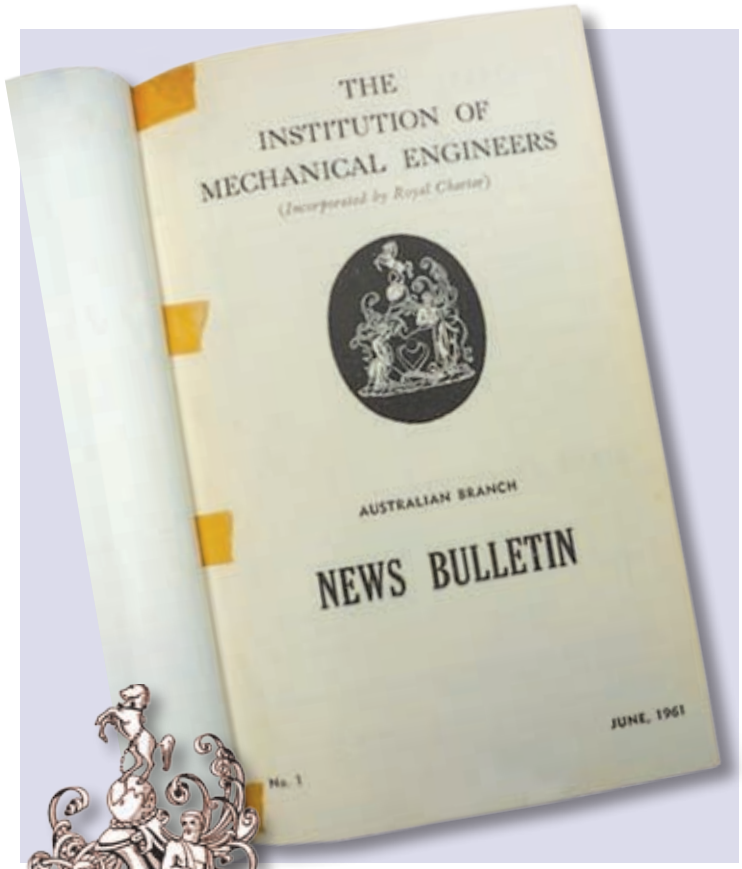

FIRST NEWS BULLETIN

IN THIS ISSUE

		PAGE
From the Chair		2
Editorial		3
From the IMechE President		3
State News:	QLD	4
	NSW	5
	Victoria	6
	SA	6
The Importance of Safety Moments		7
Durability in Desalination Plants		7
Sunswift IV		8
Reengineering vs Engineering		9
Speak Out For Engineering Australia Finals		10
Guaqui Locomotives		10
Something to think about		11
Vulcan – Getting there first		11
Australian Branch Contacts		12
Notices		12

From the Chair

Welcome to the first edition of the *News Bulletin* for 2010, our 50th year. Yes, the first Committee Meeting of the IMechE Australian Branch was held 50 years ago in May. But more on the establishment of the Branch later. With the outlook for this year promising to be bright, exciting and somewhat of a challenge, there are more younger members with some modern ideas appearing on the Panel committees. This augers well for the future of the Branch in Australia.

Here is a taste of what the Branch Committee is planning for 2010.

Not only will there be some commemoration events planned around Australia for the 50th Anniversary, but also our President, Keith Millard, will be visiting Australia in March. The President will be visiting each state in turn, at which he will be presenting the 2009 George Stephenson Lecture. The Presidential itinerary has been drafted and is awaiting confirmation from HQ.

In addition to these two major events, annual Speak Out For Engineering competitions are again planned for South Australia, Victoria, NSW and Queensland.

The AGM and Branch Committee meeting, normally held in February, has been moved to March to coincide with the Presidential visit. The final of the Speak Out For Engineering competition, to determine who will represent Australia at the next Asia and Oceania regional meeting to be held in Singapore in early April, will be held the same day.

The Young Members Section is progressing well and now has joint committee meetings with the SA Panel. Former YM Chairman Nathan Valente has resigned as he is taking a year off to travel, and the new YM Chairman is Mark McKenzie. The formation of a UniSA-based group called AERO (Amalgamated Engineering Recreation Organisation), which brings together the IMechE YMs, UniSA's SME (Society of Mechanical Engineers) and young members from IET (Institution of Engineering and Technology), has recently been announced. An AERO programme for 2010 is being developed.

Unfortunately, the Trustee Board's temporary suspension of the financial component of the Frederic Barnes Waldron and Institution Project Prizes is still extant. London is aware of our concern that this may discourage universities from applying for these prizes, which the Branch Committee considers would be a step backwards. So, we ask that Panels work hard to encourage universities to continue nominating for these prizes. Hopefully, 2010 will be the year when these financial components will be restored.

Now for a little more on the foundation and early history of the Australian Branch. The material comes from past *News Bulletins*, starting with number 1.

In 1946, Professor A. Burstall (Member), Professor of Engineering at the University of Melbourne, wrote to the Council requesting the establishment of a Victorian Branch of the Institution and saying that a petition from some 27 members was en route to London. The Council subsequently declined the request, as there was already a number of other engineering institutions active in Melbourne and, presumably because of a relatively small membership in Victoria, IMechE members were encouraged to join other appropriate institutions.

In 1956 during a visit to the UK, Professor P. L. Henderson (Member), Professor of Mechanical Engineering at the University of Melbourne, took the opportunity to raise again the question of a Branch in Victoria and referred to Professor Burstall's previous letter on this subject. The following year, he again requested Council to review the establishment of a Branch in Victoria.

Between April and December 1958, a series of events occurred, including a visit to Melbourne and Sydney by two members of Council, and another petition signed by 46 Victorian members requesting the establishment of a Branch in Victoria. Consequently, a Committee for Australia was formed in Melbourne, with powers to hold meetings, social functions etc.

In December 1958, in view of the current membership strength, Council agreed to establish a Branch in Australia, provided there was a substantial demand and some assurance of continued support, the evidence for which would be a questionnaire to all members. The Council regarded the large increase in membership in Australia since 1945 – approximately five to one – as fully justifying a reassessment of the position. (Refer to the table on page 5 showing the distribution of membership in Australia from 1920 to 1958.)

The Council considered there were three possible alternatives for the future development of the Institution in Australia, namely:

Alternative A. A Branch for the whole of Australia, with meetings arranged in the main centres of membership concentration.

Alternative B. A Branch for the whole of Australia, with Sub-branches in states where the Institution warrants them.

Alternative C. Two separate Branches, one based in NSW and the other based in Victoria, with other states attached to one or other of these states.

The results of the questionnaire disclosed an overwhelming majority of members in Australia voting for the establishment of a Branch in accordance with Alternative B.

As a consequence, the Branch was finally founded on 19 May 1960 at the University of Melbourne and approximately 100 members from all the states in Australia attended the meeting. The first Chairman was University of Melbourne Professor P. L. Henderson, the Vice-Chairman was Professor Mansergh Shaw of the University of Queensland, and the Hon Secretary was Dr J. N. Hool of the University of NSW. Although an Hon Treasurer is mentioned in the archives, his name is not known at the time of writing. Fifteen members were elected to the Branch Committee. It is interesting to note that of these 18 committee members, eight were academics. This contrasts with the structure of the current Branch Committee, which comprises 10 members (five in the Executive and the five State Panel Chairmen), with no academics.

In order to administer the functioning of the Branch in such a vast country as Australia, two Sub-branches were formed, the first being the Southern Sub-branch. The Committee members were elected by postal ballot in early September 1960; the Chairman was Mr R. Ross, the Vice-Chairman was Mr E. Godfrey, and the Hon Secretary was Mr E. Freidin. Six ordinary Committee members were elected. This Sub-branch covered the states/territories of Victoria, South Australia, Tasmania, Western Australia and the Northern Territory.

The Northern Sub-branch was formed in Sydney in November 1960 and the founding Chairman was Dr D. C. J. Dalton, the Vice Chairman was Mr H. W. Hiscox, and the Hon Secretary was Mr R. A. A. Bryant. Nine ordinary committee members were elected. This Sub-branch covered the states/territories of New South Wales, Queensland, the Australian Capital Territory and Papua New Guinea.

In addition to these Sub-branches, three further Sub-committees were formed to cover papers and publications, engineering education and the *News Bulletin*. (Now, all of this type of work is covered by the ten members of the Branch Committee.)

The first visit from an incumbent President occurred in February 1962, when Sir Kenneth Hague attended a Branch Committee Meeting and presented a paper describing the development of the Institution.

It appears that the South Australian members may have been showing some feisty independence in the early days, because in December 1960, 27 members residing in SA signed and sent a petition to the Australian Branch Chairman requesting the formation of a Panel. Subsequently, at a Branch Committee Meeting in Melbourne on 24 February 1961, Professor H. H. Davies was appointed Chairman of the SA Panel. However, it is interesting to note that the supervision of the Panel was delegated to the Southern Sub-branch. The first general meeting of the SA Panel was held in the Staff Club of the University of Adelaide on 20 June 1961. *(The SA Panel Committee may like to consider celebrating 50 years of operation in 2011!)*

Following on from the formation of the SA

Panel, members residing in WA requested the formation of a Panel in Perth, which was granted in February 1963. The founding Chairman was Mr. T. T. Ferrero. Similarly, Queensland residing members requested the formation of a Panel in Brisbane, which was granted around May 1963, and the founding Chairman was Mr W. I. George. *(Perhaps there is further scope for these two Panels to celebrate their 50th anniversaries in 2013.)*

The structure of the Northern and Southern Sub-branches (now essentially NSW and Victoria respectively), together with the SA, WA and Queensland Panels, continued until 1978. At the AGM on 24 February of that year, the Australian Branch was reorganised into the structure it has today in an attempt to simplify communications between Panels and HQ, and to streamline Branch Committee arrangements, thus reducing costs. The first Branch Committee under the new structure comprised five members of the Executive Committee and the Panel Chairmen from NSW, Victoria, SA and WA, together with the Tasmanian representative. Strangely, there is no mention of the Queensland Panel Chairman.

Further historical events will be published in the next *News Bulletin*.

Finally, I encourage all the state Panels to continue organising their activities with enthusiasm, encouraging membership recruitment at all levels and promoting the IMechE, especially in our 50th year.

Clive Waters

Editorial

The purpose of the *News Bulletin* as stated in the editorial of the first issue is 'to keep members informed of the activities of the Australian Branch, Sub-branches and Panels, and give news items of topical interest' (*News Bulletin* No. 1, June 1961). I think it's fair to say that, 50 years on, the *News Bulletin* has lived up to its purpose and continues to keep more than 1500 members around Australia and PNG informed. It's also worth mentioning that copies are posted to IMechE UK and many other branches in the Asia-Pacific region. When going through some past issues of the *Bulletin*, I came across the souvenir issue of October 1997, published to commemorate the 150th anniversary of IMechE. The editorial by Ken Sumpter raised issues of greenhouse gases and developing a sustainable society. This is a great example of the way the *News Bulletin* not only covers topical issues but also looks ahead.

On the front cover, along with the photo of the first issue of the *News Bulletin,* is a photo of the UNSW Sunswift solar car. I found this inspiring as it's a low-budget project done by engineering students that compete with entries from around the world, many of them with large corporate funding and dedicated engineering teams. In a time when Australian manufacturing is in decline, the Sunswift is one of many examples of the possibilities this country has to offer.

Another article featured in this issue addresses the durability of mechanical components in desalination plants. This also relates to a crucial challenge Australia will have to face in the future. With the population projected to be as high as 32 million by 2050, and especially if weather patterns keep changing, there is a good chance that our water requirements will have to be met by desalination. As the article by Geoff Stone emphasises, the role of mechanical engineers is crucial to the design, operation and maintenance of plants. Our own President, Keith Millard, has a wealth of experience project managing desalination plants in the Middle East. This is ample proof that we do have the expertise and skills to deal with future challenges.

As part of the Australian Branch 50th anniversary celebrations, the three editions for 2010 will be special issues. Apart from the special front cover, articles highlighting the formation, journey through 50 years and the issues we must tackle as professional engineers to contribute towards Australia and on a national basis will be discussed. In this respect your contributions will be welcome. If you have something to share which you think was an important event in the history of the Branch, please write and tell us about it, or if you have photos relating to Branch activities that might be of interest to readers, please forward them to the editor. And do write about your aspirations for the future and what you expect the future course of the Branch to be.

Roshan Dodanwela

From the IMechE President

IMechE President Keith Millard

The Australian Branch of the Institution of Mechanical Engineers is celebrating its 50th anniversary in 2010. As part of the celebrations, Institution President Keith Millard will be touring Australia on a ten-day visit. Here, he talks about his plans for the second half of his term as President, the importance of overseas members to the Institution, and what he hopes to achieve during his Australian sojourn.

'I am incredibly honoured to have been invited by the Australian Branch to join them for their 50th anniversary. Half a century of hard work in promoting the mechanical engineering profession and supporting engineers across Australia is an extraordinary achievement, and it gives me immense pleasure to be able to share in the celebrations with our Australian members.'

'It is apposite that we will be celebrating the achievements of overseas members in 2010, as this is a vital year for the Institution's long-term goal of 20 000 international members by 2012 – the equivalent of 20 per cent of our membership. International members are at the very heart of the Institution's corporate strategy of member acquisition engagement and inspiring the next generation of engineers. From my own personal experience gained as an IMechE member for over 40 years, and through my visits overseas, I know that the Institution simply could not operate internationally without the tireless work and support of our members. International members' efforts for this Institution have been, and will continue to be, invaluable, and as President, I am extremely grateful for everything that they do for us.'

'The Australia Branch has proved to be an especially effective hub, extending its reach to support members in New Zealand and Papua New Guinea – the latter country's relative remoteness representing a particular challenge for efforts to deliver meaningful member engagement.'

'Publicly thanking our Australian members for their achievements over 50 years will be a very pleasant task for me on my visit. I think that what makes this achievement even more remarkable is that the sheer scale of the country and its geography means the Branch has a tough job on its hands to support its membership in a meaningful way. Despite these difficulties, in 2009 the Branch recruited over 40 new members across all membership levels and continues to be robust and effective in supporting its 1500 members through respected, well-designed events and communications, and continuing to grow its membership.'

'During my time in Australia, I will be endeavouring to visit universities and companies in each of the five Branch panels

From the IMechE President

in Queensland, New South Wales, South Australia, Western Australia and Victoria, and hope to be able to support this membership growth in the region. What I also hope to do is to cement our relationship with Engineers Australia, enabling our members to enjoy valuable benefits from that organisation and the continuation of our reciprocal agreements and mutual partnerships. I am committed to helping to raise the profile of the Branch and assisting with direct member recruitment.'

'I am very proud that the George Stephenson Lecture will be delivered in Australia as part of my visit. This presidential lecture is a key platform in helping to raise the profile of the Institution outside the UK.'

'As President, two of my key goals are to inspire the next generation and to engage with members. I am delighted, therefore, that my visit will coincide with the Australian national final of Speak Out For Engineering. This competition is extremely close to my heart, and I feel privileged to be able to support young engineers as they hone the presentation skills that, during their career, will enable them to ensure that their engineering expertise and knowledge reaches the widest possible audience. For me, there could be no finer way of raising the profile of the engineering profession and highlighting prolonged Australian achievement to a global audience.'

'The other key goal I have is to raise awareness of the importance of energy sustainability in all that we do. This should be at the heart of any engineering endeavour and is a goal that engineers worldwide are signing up to. I hope during my visit that I may see some leading-edge examples of engineering solutions that are based on such designs.'

16th George Stephenson Lecture by IMechE President Keith Millard CEng FIMechE – *An Overview*

Managing to Improve the World Through Engineering

The overall theme of Keith Millard's year of office is 'Using management techniques to improve the world through engineering'. Keith's engineering education, training and experience provided the foundations for his management capability, which draws its strengths from three main areas: project management, strategy and leadership.

As President, using the interdependent pillars of good leadership, sound strategy, effective project management and excellent people, Keith has focussed on inspiring the younger generation, engaging with the membership and addressing energy sustainability.

Keith Millard joined the Institution in 1968 and became a Fellow in 1977. He chaired the Technical Strategy Board until recently, is a past Chairman of the Power Industries Division Board, and was founding Chairman of the Management Group Board. He has been a Trustee since 2004.

He began his engineering life as a seagoing marine engineer, followed by a period as an operations engineer with the Central Electricity Generating Board. Since 1970 his career has been centred on consulting. Much of his early work was in the power sector and he has had some 30 years general management experience. For 11 years he was Managing Director of Gilbert Associates, before becoming Business Development Director for Balfour Beatty Construction International and then a Vice President of Parsons International, responsible for Europe, Africa and the Middle East. He has worked in some 40 countries. In 1998 he founded Kea Management, advising clients on strategy development and providing a coaching and mentoring service to chief executives through Vistage International.

Keith is a Liveryman of the Worshipful Company of Engineers and an active Rotarian.

The full address can be found at

http://presidentschoice.imeche.org.uk/Presidential+Address.htm or refer *News Bulletin* 156 (September 2009) for a more extended summary.

Provisional Schedule

President's visit for 50th Anniversary Celebrations and George Stephenson Lecture (GSL), March 2010

Tuesday 23 March
Arrive in Perth and meet WA Panel Committee

Wednesday 24 March
am – tbc (organised by WA Panel Committee)
pm – tbc (organised by WA Panel Committee), followed by evening presentation of GSL

Thursday 25 March
am – Fly to Adelaide and meet SA Panel Committee
pm – tbc (organised by SA Panel Committee)
1730 for 1800: GSL, S112, Engineering South, University of Adelaide

Friday 26 March
am – tbc (organised by SA Panel Committee)
pm – Fly to Melbourne and meet Vic Panel Committee

Saturday 27 March
am – Attend Australian Branch Committee Meeting
1400 –1600: Speak Out for Engineering Australian Finals
1700–17:30: Branch AGM
1900–2200: Dinner and GSL presented as an after-dinner event

Sunday 28 March
Free day/entertained by Victorian Panel Committee

Monday 29 March
am - Fly to Brisbane and meet Queensland Panel Committee
pm – tbc (organised by Qld Panel Committee)

Tuesday 30 March
am – tbc (organised by Qld Panel Committee)
Lunch and presentation of GSL, Hawken Auditorium of Engineers Australia
pm – Dinner (organised by Qld panel members)

Wednesday 31 March
am – Fly to Sydney and meet NSW Panel Committee
pm – tbc (organised by NSW Panel Committee), followed by evening presentation of GSL

Thursday 1 April
am – tbc (organised by NSW Panel Committee)
pm – tbc (organised by NSW Panel Committee)

Friday 2 April (Good Friday)
Depart for UK

State News

State News QLD

Annual Dinner

Our Annual Dinner, the highlight of the year, was held on 26 August at the 433 on Logan Conference and Banqueting Centre, in conjunction with Engineers Australia Mechanical Branch.

The guest speaker was Professor Hal Gurgenci of the University of Queensland, who is the Director of Queensland Geothermal Energy Centre of Excellence. His topic, which is very timely and in line with IMechE's current strategic themes of energy, environment, education and transport, was 'A New Age in Geothermal Electricity'.

Hal said that Australia has enough geothermal resources to satisfy our current electricity demand for thousands of years and talked about how this energy should be harnessed using Enhanced/Engineered Geothermal Systems. He explained that geothermal energy has no greenhouse gas emissions and is cheaper than most other renewable alternatives, including solar and wind.

There were over 60 people at the dinner and those who attended found it an exceptionally enjoyable event and a great opportunity to meet old friends and make new acquaintances.

UQ Student Evening

The Queensland Panel hosted a student evening on 14 October at the University of Queensland. The target audience was third and fourth-

Appendix 1

Distribution of Institution Membership in Australia

Year		N.S.W.	Victoria	S. Aust.	Queensland	Tasmania	Northern Territory	W. Aust.	Grand Total
1920	Corporate	49	23	4	8	4	-	19	109
	Non-Corporate	2							
	Totals	51	23	4	8	4	-	19	
1930	Corporate	64	39	4	12	4	-	14	164
	Non-Corporate	10	6	1	1	1	-	8	
	Totals	74	45	5	13	5	-	22	
1940	Corporate	44	46	3	19	4	-	12	150
	Non-Corporate	7	10	1	1		-	3	
	Totals	51	56	4	20	4	-	15	
1945	Corporate	51	57	4	15	4	-	9	171
	Non-Corporate	14	12	3			-	2	
	Totals	65	69	7	15	4	-	11	
1950	Corporate	112	99	27	21	8	-	18	514
	Non-Corporate	75	120	13	12	4	-	5	
	Totals	187	219	40	33	12	-	23	
1958	Corporate	205	180	36	35	14	1	35	815
	Non-Corporate	100	133	32	33			11	
	Totals	305	313	68	68	14	1	46	

Distribution of Institution Membership in Australia 1920 –1958

The table above is an appendix attached to a memorandum titled 'Institution Activities in Australia' circulated to all members in Australia in 1959, along with a questionnaire. The questionnaire was designed to enable the Council to ascertain the views of members so that the future development of Institution activities in Australia could proceed in the best way forward for both members in Australia and the Institution.

From our membership of 109 in 1920, the Branch membership stands at approximately 1500 today.

year mechanical engineering students. It was an extremely successful social gathering for university staff, students and our Panel. Panel Secretary Leslie Yeow was the speaker for the evening. Leslie presented his diverse range of employment and engineering experience since graduation. Drawing examples from his career, he showed the value and benefits of IMechE membership.

Panel members then mingled with students over food and drinks. All students signed up for affiliate membership at the end of the event. IMechE is grateful to Professor David Mee for his continuous support.

Joint Technical Meeting

A joint technical meeting with Engineers Australia Mechanical Branch was held on 11 November. Eminent speaker Dr Tony Armstrong delivered his presentation, 'Engineering excellence on the move: The development of high-speed ships'. The meeting was well attended and followed by extensive questions.

Christmas Barbecue

The Panel held its traditional end-of-year Christmas get-together on 29 November. Members and their families spent the morning visiting the historical Ipswich Workshops Rail Museum before moving to a nearby park for a relaxing barbecue lunch on the banks of the picturesque Bremer River.

Dayaratne Dharmasiri

State News NSW

Speak Out For Engineering 2009

The third running of the Speak Out For Engineering competition in NSW on 15 October 2009 proved to be another successful event. Held again in the splendid IEAust auditorium in Chatswood, the audience enjoyed three very different papers from authors at various stages of their careers.

Speak Out For Engineering is, first and fore most, a competition aimed at promoting the ability to communicate mechanical engineering subjects effectively. It is specifically concerned with describing and explaining technical subjects verbally and visually. It is also designed to promote interest in the art of communication.

Competing for the title of NSW winner – and the small matter of a cheque for £200 (first place) or £100 (second place) – the participants were assessed by three willing judges, who had a difficult task in ranking the competitors. The judges were Geoff Stone (Chairman of IMechE in NSW), and Stan Ash and Jim Vickery of IEAust.

Ultimately, Jared Holmes, a final-year Mechanical Engineering undergraduate at the University of Sydney (USYD), was declared the NSW Winner in what proved to be a very close final result. During 2009, Jared was USYD Formula SAE race team leader, and he presented on the design of formula race car impact attenuator using finite element non-linear analysis.

Matthew Cook of Downer EDI Rail presented on his learning and experiences in Systems Engineering, and came second. Carl Ingleton of Interfleet Technology based his paper on a project providing new train build and resident engineering services on a Chinese train manufacturer for an Asian Railway Operator.

All the competitors were commended for the quality of their presentations. The NSW Panel wishes Jared every success in representing them in Melbourne on 27 March 2010 at the national final.

Change in NSW Panel

In addition to the successful running of the 2009 Speak Out For Engineering Competition, this quarter has marked the implementation of some succession planning in NSW. Having served the Panel faithfully and energetically, both Geoff Stone (Chairman) and Neil Gillies (Treasurer) had indicated a desire to pass the baton on (not surprising, having contributed five and 17 years respectively). My heartfelt thanks go to these two gentlemen, without whom our panel would not have been resurrected.

Our new Chair is Monika Sud, who becomes the first (to the best of my knowledge) female Panel Chair in Australia. Monika works for KBR, where her most recent projects include Sydney's desalination plant and SE Queensland's award-winning Southern Regional Water Pipeline, on which she was lead pipeline engineer. Prior to this, Monika was Group Manager for KBR's NSW Water and Environment group.

Monika Sud

Jason Groombridge

Jason Groombridge has assumed the role of Treasurer, and brings with him a wealth of experience in Institution activities. Jason has over 15 years experience in the railway industry and has been a full member of the Institution since 2000. Starting his career as an undergraduate engineer with British Rail, he subsequently worked in a number of project- and fleet-management roles with train leasing and operating companies in the UK. For the past four years, he has worked in Sydney for an international consultancy company. Jason was an active member of the Railway Division in the UK, and is a former Young Members Chairman. He is looking forward to getting involved in committee activities again.

Monika and Jason will be supported by Geoff and Neil, both of whom have expressed a desire to step back; they will definitively not be allowed to step away!

The triumvirate of roles is completed by Ian Mash, who retains the Hon Sec role – and so the NSW membership can be reassured that the usual typos and email bombardment will continue unabated! (Editor's note: Ian wrote this – and I had to correct it!) Ian is a Project Manager with Downer EDI Rail, and has been an active member of IMechE since 2000. A Fellow of the Institution, Ian also fulfils the role of Hon Sec for the Australian Branch.

State News

So, NSW moves into a new period of growth and consolidation with an active team of members (averaging in their mid-thirties) who bring the youth, energy and enthusiasm required to take the Panel forward, and to build on the substantial foundation (civil engineering reference there) laid by Geoff and Neil.

I trust you will join with me in thanking Geoff and Neil for all that they have done, in wishing Monika and Jason the very best, and in providing our support to these two willing and able volunteers.

Ian Mash

State News VIC

Speak Out For Engineering 2009

The Victorian Speak Out For Engineering took place on 19 November in the Auditorium of Engineers Australia in Melbourne. Four contestants entered, and all gave their presentations before a small but interested audience.

Victorian Speak Out For Engineering Entrants 2009. L to R: Mathew King, Danyal Alakus, Ian Mackay and Daniel Mitchell

Ian Mackay, a young, recently qualified engineer, gave a presentation on the manufacture of specialised seals made by CNC-machining a thermosetting super-polymer billet. A new seal is created with unique dimensions, allowing for wear on mating components, and thereby providing a quick replacement for moulded seals of standard dimensions.

Danyal Alakus, an undergraduate from RMIT University, described existing methods and proposals for updating the fire protection systems for armoured fighting vehicles. He outlined existing systems in detail and looked at modelling associated with the provision of alternate systems.

Daniel Mitchell, a postgraduate student at Monash University, presented on the use of lasers to study shock tube flows and temperature distributions using a 'state of the art' planer laser-induced fluorescence technique.

Mathew King, an undergraduate from RMIT University, described a computer simulation of the performance of an electrical vehicle using 'Matlab' software. The vehicle under consideration is currently being designed by RMIT students for the Formula SAE electric race car, and the simulation was aimed at modelling a virtual vehicle's dynamic behaviour, thereby assisting the design group in the optimisation of their final vehicle over a short lead time.

Judging was carried out by Mr Neil and Ms Heather Addison from Rostrum, together with Mr Tony Creedy from IMechE. The winner was Daniel Mitchell and second prize went to Mathew King. The night concluded with the Rostrum representatives giving valuable feedback to all contestants on their presentations, and Dr Patrick Russell-Young thanking all involved in the competition.

John Burt

State News SA

Following the amalgamation of the Senior and Young Members panels in the middle of this year, the new Joint Panel has been busy organising a number of events over the last three months. Things kicked off with the award of the Frederick Barnes Waldron and Best Project prizes at the University of Adelaide (see extended article). This was followed, at the beginning of October, by a visit to the Echuca Steam Festival by a number of Panel members. Those who attended found the experience highly enjoyable. At the end of October, the South Australian Speak Out For Engineering competition took place (see below). At almost the same time, the School of Mechanical Engineering at the University of Adelaide held its final-year project exhibition, and volunteers from the SA Panel manned a stand to promote IMechE; a number of new affiliate members were signed up while yours truly formed part of the Industry Judges Panel at the exhibition during the day.

Currently, the SA Panel is deeply involved in the preparation of events for the coming year, beginning with the traditional New Years Lunch. This will be followed towards the end of February by a Panel Discussion on man-made climate change with British and Australian speakers as part of a Joint Technical Program. A YM event on the use of nuclear power in Australia is also being planned.

We are all looking forward to an interesting and enjoyable 50th anniversary of the Branch here in Australia.

Dr Michael Riese

Student Prizes

At a special ceremony held at Adelaide University on 25 August, SA Panel Chairman Michael Riese presented the 2008 IMechE Best Project and Frederic Barnes Waldron Best Student prizes. In making the presentations, Michael gave a short address during which he emphasised the need for continuous professional development. The ceremony was attended by members of University staff and SA Panel members, and afternoon tea was served. The SA Panel extended special thanks to the University's Executive Assistant, Mrs Vicky Samra, for organising the function.

(Left to right) Professor Colin Hansen, Head of School of Mechanical Engineering; Best Project prize winner Aliya Valiyff; Fredric Barnes Waldron Prize winner Simon Golding; Dr Michael Riese

Speak Out For Engineering 2009

The 2009 South Australian Speak Out For Engineering competition was held at the Mawson Centre, University of South Australia, on 29 October. There were originally four entries but unfortunately one withdrew another was too ill to attend on the day. We went ahead with two entrants, but were afterwards informed by HQ that there should be at least three competitors.

Dan Burdett's paper outlined the work he has undertaken as a team member to identify aircraft noise emanating from the airframe. This work is of particular importance in a suburban environment, where aircraft noise can cause considerable disruption. There is legislation in place to reduce aircraft noise significantly in the next decade. Dan pinpointed two areas of concern – an aircraft's flaps and its undercarriage – and outlined some measures that could be taken to lessen the noise produced.

In her paper, Rachel Harch of Adelaide University outlined techniques used to analyse the aerodynamics of a retractable float pack. The float pack under consideration was fitted to the revolutionary Tigerfish float plane, which has been described in a previous issue of the *News Bulletin*. Foam software was used to 'mesh' the surface of the airframe in 20mm squares, in order to measure aerodynamic forces.

Our judges were Ray McGrath from Apex and Keith Olsen of the DSTO, representing industry; and SA Panel Treasurer Peter Stopford, representing IMechE. The judges unanimously found Dan worthy of first prize, albeit by the narrowest of margins.

After presenting certificates, MC Dr Michael Riese thanked the judges, audience and Elizabeth Smith for organising the event and refreshments.

Stan Gafney

The Importance of Safety Moments

Prior to one of the Western Panel meetings, one of the group suggested that we should start the meeting with a 'Safety Moment'. The response to the suggestion was split pretty equally between noises of assent and those of puzzlement along the lines of 'What is a Safety Moment?'

The former group consisted of those who work in the resources sector or are involved with construction while the latter was from manufacturing and academia. As part of the former group, I was surprised to hear that this type of focus on safety is not more widespread. Having been immersed in safety culture for the last three years, it has now become second nature to me.

A Safety Moment can be provided by anyone participating in the meeting – for example, someone might recount a safe act that they've seen a colleague perform; a potential hazard on an upcoming task; a particular job that was completed safely; or a safety recommendation. Having a Safety Moment is a great way to focus everyone's mind on the value of safety and what they should consider before performing their work that day.

Providing Safety Moments in an office environment can sometimes be difficult since it can be hard to convince people that safety is something they should be thinking about. However, they are worth pursuing to develop an improved safety culture, which is not something that can be created overnight. It is an unfortunate aspect of human nature that we become complacent when working in a known environment and completing familiar tasks. Safety Moments are a good way to maintain the focus on safety and raise awareness of relevant issues that could impact on our safety.

The most effective safety cultures are those where everyone in an organisation embraces safety as a core value. Safety Moments allow us to explore how each of us values safety in our everyday lives, and provide a way of enhancing that commitment. Safety Moments are not intended to focus only on hazardous situations that we might find ourselves in during our everyday work; the majority of accidents happen at home. It is everyone's right and responsibility to work safely and we would all benefit if we applied what we learned and practise at work to our home lives, too.

'Safety Moment for breakfast, anyone?'

Andrew Gagg
Western Panel Member

Durability in Desalination Plants – The Mechanical Aspects

The durability of the mechanical equipment and piping aspects of a seawater reverse osmosis (SWRO) desalination plant is an important part of modern mechanical engineering practice. In delivering the plants in Australia, emphasis has been placed on the sustainability of the engineering. Much of the desalination plant experience and technology has been introduced to Australia by overseas designers, construction companies and operating companies – mainly from Europe, although their operating plants may be elsewhere in the world. Ideas of *durability* have existed in Australia but not necessarily in the water industry. So, skills from the marine, power generation, petrochemical and other industries have been employed in this fledging industry to augment those in the water industry.

Durability, or resilience, is important in sustainability. The mechanical equipment and piping used in desalination plants contains *embedded energy*. Thus the mechanical engineer needs to consider not only the initial energy required to manufacture and install an item, but also the embedded energy throughout its design life in terms of maintenance and replacement. This is at the core of sustainability in design.

Desalination of seawater is challenging because it involves processing highly corrosive fluid (seawater) as well as a range of aggressive chemicals. The process fluids consist of seawater, brine and permeate. Aggressive chemicals include hypochlorous acid, sulphuric acid and caustic soda. The processes involve pressures greater than 7000kPag. The operating environment is made more complex as plants do not operate fully 24/7. This is because the cost of desalinated water is higher than water from bulk storages using conventional water-treatment technology. So, parts of the desalination plant may remain idle for long periods, necessitating drain-down and flushing to prevent corrosion from stagnant fluids.

Durability requires different solutions for different exposure zones. The zones to be considered range through atmospheric, splash, submerged and tidal. Each presents differing corrosive fluids (stagnant, refreshed or high velocity) and different oxygen exposure regimes.

A fully *submerged* zone may be oxygen depleted, compared to a *splash* or *tidal* zone. For structures wholly submerged in seawater, without an atmospheric interface, the corrosion rate is controlled by the availability of oxygen for cathodic reduction. When oxidising conditions are experienced, the corrosion rate needs to be kinetically limited by a tightly adherent metallic oxide film. Hence the uniform rate of steel corrosion is largely controlled by the availability of oxygen. Chloride ions and dissolved oxygen compete for absorption into the oxide films of stainless steels. The major concern of chloride ion absorption is that it promotes the anodic dissolution of the base metal.

An *atmospheric* zone may be exposed to corrosive fluids but may be protected by surface coatings, linings or cleaning procedures. For instance, hot dip galvanised steelwork may be acceptable in such a zone if exposed to regular rain intervals that wash away the salts that build up on surfaces and are subsequently dried. Importantly, surfaces protected from the wind are especially vulnerable because they spend more time 'wet' due to less drying action, and are unlikely to be effectively cleaned by rain.

The *splash* zone exists anywhere moving seawater presents an atmospheric interface and meets a surface. Splash zones exist in seawater containing structures that include pump intake structures, screens, filters, surge tanks, outfall structures and ultra-filtration pits. Coatings and protective films normally deteriorate most rapidly in the splash zone because of the available oxygen and renewed corrosive fluid.

Surfaces covered between the low and high-tide marks are *tidal* and are characterised by contact with well-aerated seawater for at least part of the day. Surface temperatures are influenced by solar radiation, air temperature and seawater temperature, but are typically closer to water temperature. Marine fouling due to plant and animal infestation occurs in the tidal zone. An important feature of the tidal zone is its ability to impart anodic dissolution of metals that fail to passivate. Great care in the selection of metals is needed when partial immersion in sea water is required. The risk of differential oxygen potentials driving anodic dissolution must be addressed.

Equipment operating at low pressures, with high chloride content, can be designed and fabricated in non-metallic (GRP) or lined or coated metallic systems. Alternatively, stainless steel, cupro-nickel, titanium or other metallic materials may be selected to meet the durability requirements. Piping systems operating at low pressures (< 1600kPag) and temperatures are generally in non-metallic materials such as GRP, ABS, PE, PP, PVC or

PVDF. For pressures greater than this, stainless steels are generally chosen. These may include super duplex (ASTM A890, UNS 32750 or 32760), duplex (UNS 31803 or 32205), super austenitic (904L) or austenitic (316). Generally the material is selected based upon the Pitting Resistance Equivalent Numbers (PREN). PREN are a theoretical way of comparing stainless steels using their chemical compositions. The formulae are based mainly on chromium, molybdenum and nitrogen contents. Grades with a PREN of 40 or more are known as 'super' duplex/austenitic or duplex types, according to which basic family they belong. Life expectancy is estimated from pitting depth measurements made on exposed test samples *(refer ASTM G48 Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steel and Related Alloys Using Ferric Chloride Solution)*. The results depend on steel grade, environment and surface finish. The material specifications have a wide tolerance and the engineer needs to ensure that the manufacturer provides a suitable alloy that meets the specified PREN.

In these aggressive environments, some grades of stainless steel will be susceptible to localised attack. Especially in stagnant conditions, they are likely to be subject to one or more of the following corrosion mechanisms: pitting corrosion, crevice corrosion, bimetallic (galvanic) corrosion, stress corrosion cracking (SCC), general (uniform) corrosion, intergranular (IGC) and/or weld decay attack. So, the selection of material is an important mechanical engineering activity.

Stainless steels are protected by a thin layer of chromium oxide. This layer needs to be protected in order that the design life is maintained. Fabrication processes such as welding impact the surface chemistry, in particular the formation of intermetallics. The welding temperatures, adequacy of shielding gases, filler material and post-weld treatment (pickling and passivation) all play a part in providing a weld that meets the durability requirements. Reference should be made to international standards such as *ASTM A380 Standard Practice for Cleaning, Descaling, Passivation of Stainless Steel Parts and Equipment*. Many websites carry information on this important topic, including www.nidi.org, www.avestawelding.com and www.ramaterials.co.uk. Questions may be posed in forums such as www.eng-tips.com, which have a specialist stainless steel section offering advice on corrosion aspects.

Another equally important criterion is to design equipment and pipework so that there are no crevices or stagnant areas where the chromium oxide layer may not be renewed. Corrosion can be rapid and weaken components to the point of failure. Refer to 'Corrosion of Duplex'.

Stainless Steels in Seawater' at www.outokumpu.com/applications/upload/acom_10292653.pdf for further information.

Corrosion of stainless steels is temperature-dependent. Even the higher classes of stainless steel will corrode rapidly when temperatures exceed 40°C. Such corrosion is accelerated when the seawater is stagnant. Care must be taken in seawater used for hydro-testing and procedures must ensure that pipework is drained and flushed after such practices.

Copper-nickel alloys of the Cu90-Ni10 and Cu70-Ni30 type are expected to perform very well in low velocity environments, with a suitable corrosion allowance, but will suffer breakaway film corrosion in seawater above 2.5 m/s. Care in the specification of pump internals is needed.

Durability generally focuses on the corrosion of the mechanical equipment and piping systems. However, durability covers all matters related to the design life of the plant and the ability to maintain the equipment or pipework. Other engineering aspects that the mechanical engineer is required to address include but are not limited to over-pressure, cavitation of pumps and control valves, bearing life, noise from slamming check valves, vibration, fatigue, fretting, erosion, wear, water hammer, operational excursions, mechanical damage and occasional loads.

In the past, Australian project delivery methods have not encouraged durability. The concept of a defects correction period of 12 months does little to cover durability issues that may not manifest themselves for years. Although contracts provide for life-cycle costing analysis, this is rarely effected. The contractor and owner generally enter into contracts based on the lowest price. Owners in modern times have divested themselves of their own engineering capability and are thus unable to challenge matters related to life-cycle costing. Even if matters arise, there exists the prospect of contract variations to increase the Capital Expenditure (Capex), to benefit the Operational Expenditure (Opex), and perhaps delay a project. The decision-making process is often slow and frustrated by competing challenges. It is arguable that an *alliance* type of contract would deliver more certainty in durability. However, this is by no means guaranteed, as there are generally cost-sharing arrangements that lead to cost influences in engineering matters.

The point is not to invest in superlative solutions, but in appropriate solutions that meet the risk and reliability needs of a project. Success comes from employing experienced and/or specialist engineers from the owner, designer, constructor and operator with a common goal of achieving the defined design life and life-cycle costs. Durability criteria need to be clearly defined in any contract, otherwise, since each party tends to have competing interests in cost, time and quality, there is uncertainty about what each party is trying to deliver.

Geoffrey D. Stone FIMechE C.Eng

Geoffrey Stone is a consultant at Blenray Australia. Geoff has been part of the engineering teams involved in major desalination plants in Australia. This article covers only an outline of issues related to durability. Members of IMechE are able to access related books using virtual libraries or other Internet sources. For more information, contact Geoff at <blenrayaust@yahoo.co.uk> or (02) 8850 2313.

Sunswift IV

The University of NSW Solar Racing Team's entry in the Global Green Challenge Darwin to Adelaide race 2009 was Sunswift IV affectionately known to the team as 'IVy'. IVy gained a ranking of fourth overall, and was the winner in the 'Challenge class Silicon', as well as being the first Australian entry to complete the race.

Sunswift is a full-scale, multidisciplinary, student-led organisation dedicated to designing and crafting a high-performance solar racing vehicle. Since its formation in 1995, Sunswift has been the flagship engineering project within the Faculty of Engineering at UNSW. It has also brought together the most talented students, multiple university faculties, and

Sunswift IV

many corporate entities to work more closely in the sphere of sustainability.

IVy's predecessor, Sunswift III, set the transcontinental world record from Perth to Sydney in 2007. It completed the race in 5.5 days, shattering the previous record of 8 days. Sunswift III also won the CSIRO Award for Innovation in the same year.

IVy is a three-wheeled, hand-built carbon-fibre machine which can reach a top speed of 115km/h using just 1300 watts. With about the same footprint as a small sedan but half the height and one-tenth the weight, the single-seater car produces no carbon emissions and can cruise at 85km/h.

IVy's specifications:

Dimensions:	(L) 4.6m (W) 1.8m (H) 1.8m
Weight:	less than 150kg
Body & chassis:	(frame) monocoque (body material) carbon fibre
Suspension:	(front) double wishbone (rear) trailing arm
Steering:	rack-and-pinion
Wheels & tyres:	(number) 3 (wheels) carbon fibre (tyres) Dunlop Solarma
Brakes:	(front) hydraulic dual redundancy (rear) handbrake (regen) CSIRO wheel motor
Energy storage:	(chemistry) lithium polymer (weight) 24.75kg
Motor:	(type) brushless CSIRO 3 phase DC (power) 1800W (efficiency) 98%
Controller:	(type) tritium wave sculptor (power) 20KW (efficiency) 97%
Performance:	(solar only@ 5.998m2) 1300W (max. speed)115 km/hr (est. avg.) 85 km/hr
Project cost:	$280 000
Project time:	18 months

Compiled with help from Peter Trute, Media Officer, Faculty of Engineering, UNSW

Reengineering Vs Engineering

The term 'reengineering' sounds related to our profession (engineering). Are these two words linked? In fact, they differ, not only in their outcomes but also because of the different training required to practise them. However, engineers who have moved into managerial roles have the opportunity to perform reengineering activities. Reengineering is also being applied to engineering education, the operation of engineering institutions and the management of engineering businesses. In fact, 'reengineering' was rolled over from 'engineering' to reflect the functional similarity between the two.

Even though engineering is our profession, it is worth recapping its meaning to help us understand the formation of the term 'reengineering'. To engineer means to develop. The role of engineers is to develop plans and products. Plans are generally in the form of paperwork covering concepts, layouts, configurations and methods of crafting products. Products are physically created by the process of manufacturing, assembling, building, constructing or a combination of these. Thus, any development always involves engineering. Without the contribution of engineering contribution, civilisation would hardly exist.

Nowadays, the scope of engineers has gone beyond development into other forms of technical support for research, teaching, operations, inspection, maintenance and repairs. Many engineers have gone beyond their traditional role to become successful entrepreneurs, administrators, managers, sales/marketing experts or politicians, without receiving any formal training in those fields.

Engineers excel everywhere, including in non-technical fields, because of their education and training. They first acquire a basic knowledge in fluid behaviour, material characteristics, electron movements and processes for changing product properties together with the application of mathematics. This knowhow refines their analytical capability, inspires innovative ideas for professional contributions and endows them with the ability to comprehend complex issues. Moreover, their rigorous industry on-the-job training, plus guidance from engineering institutions, makes them able to handle issues independently. This ability impresses others and creates a demand for qualified engineers in many fields outside the professional engineering sphere.

In contrast to engineering, reengineering is defined as a business process for enhancing the operation of a system. In a nutshell, reengineering implies reviewing the current operational procedures and (sometimes radically) redesigning them to boost effectiveness and efficiency – with remarkable results.

The term 'reengineering' was first tossed around in the 1990s and became very popular after the 1993 publication of *Reengineering the Corporation – A Manifesto for Business Revolution* by Michael Hammer and James Champy. Since then, there have been many more publications on this subject. Was it a new concept? No. Since the beginning of civilisation, people have been fixing their problems by applying reengineering principles – without necessarily using that term. Nevertheless, when the term began to be used and reengineering was recognised as a discipline in its own right, several consultants took the opportunity to set up business.

Similarly, various other management philosophies have periodically arisen along with buzz words. These terms, like 'reengineering', have a limited life cycle which reaches a rapid peak, with a visible impact, then slowly fades away. In future articles, I intend to describe other pseudo-technical terms, such as 'risk mitigation'; trends in the management of technology, such as 'knowledge capital'; and other techniques of value in the workplace, such as dealing with difficult people.

Varan Karunakaran

Varan is the Honourable Secretary of the Victorian Panel of the Institute of Mechanical Engineers. By education, he is a civil engineer with a Master's degree in geotechnical engineering. He has been involved in oil and gas projects. Varan holds an MBA (in Technology Management from Deakin University), another Master's degree in System Engineering (RMIT) and a Graduate Diploma in Arbitration (University of Adelaide). He is interested in coaching and self-improvement with new management concepts.

NOTICE OF AGM

A nomination form for office bearers for 2010/2011was included in *NB156* (September 2009) and the only entries received by the deadline were for existing office bearers.

The following will be nominated at the AGM: 1700-1730 hrs, 27 March 2010
Hotel Novotel, Glen Waverley, Victoria

Branch Chairman – Clive Waters
Branch Honorary Secretary – Ian Mash
Branch Treasurer – Ken Tushingham
Branch Assistant Honorary Secretary and *News Bulletin* Editor – Roshan Dodanwela

The AGM will be followed by a dinner commencing at 1900 hrs ($55 per head including drinks) at the hotel, and the visiting IMechE President will deliver the George Stephenson lecture as an after-dinner talk.

Please contact Victorian Panel Chairman John Burt (03-9560-0763 or j_w_burt@hotmail.com) if you wish to attend the dinner.

Speak Out For Engineering Australian Finals 2009/10

Judging by presentation topics and reviews from panel competitions, we can anticipate an interesting and closely contested final. Contestants are winners of panel competitions and the winner of the Australian finals get an opportunity to compete in the regional finals. Contestants for the finals, and their topics, are:

Joshua Brimblecombe (QLD)
– Nocturnal cooling tests

Jared Holmes (NSW)
– Design and testing of a race-car crash zone

Daniel Mitchell (Vic)
– The use of lasers to study shock tube flows

Dan Burdett (SA)
– Airframe noise: generation and attenuation

All are welcome for the Australian finals. Please join us if you can and help provide a good audience.

Date: Saturday 27 March

Venue: Oakleigh Room, Hotel Novotel, 285 Springvale Road, Glen Waverley, Vic

Time: 1400–1600 hrs

Guaqui Locomotives

Continued from NB156 . . .

Locomotive Overhauls

General

Although there are two workshops – one in Guaqui and one in La Paz – for the small and cash-strapped Guaqui system, their facilities are limited. Much of the Guaqui shop's machinery dates from the 1900s. The La Paz shop machinery is rather more modern. Each workshop has a small forge for blacksmith's work, and welding facilities, but no furnace for case-hardening, let alone a foundry.

Overhauls of the five main-line locomotives are usually planned to be carried out in Guaqui, in four stages, and to occupy about a year each. So, each locomotive should, in theory, be overhauled every five years, having run about 400 000 km.

The four stages can be summarised as:

1. The locomotive is withdrawn, cleaned, stripped of boiler tubes and of moving parts, and generally inspected.
2. The parts to be sent to Arequipa (head-quarters of the Southern Railway of Peru, where extensive and fairly modern workshop facilities are available), are despatched. Wear or damage on other parts is made good or parts replaced.
3. The parts are returned from Arequipa and machined to fit as required.
4. The locomotive is reassembled, inspected, tested and returned to service.

That is the theory. In practice, the return of parts from Arequipa often holds up the process. Other hold-ups include breakdowns, which can result in a locomotive being withdrawn 'out of sequence'. Both the workshops allow two locomotives to be overhauled at once if circumstances dictate.

Overhaul Procedure

Numbers below refer to the stages summarised in 'Locomotive Overhauls' above.

1. The selected locomotive is run onto a pitted road in the shop and allowed to cool overnight. The locomotive and tender are drained and separated, and the hoses between removed for inspection and storage. The tender is then removed to the freight-car section. The water and fuel tanks are cleaned out and painted internally. Much of the under-floor equipment is similar to that of a freight car, and its overhaul treatment is the same.

   The main and side rods and their brasses, the pistons and piston valves, the axel-way keeps and the valve gear mechanism are all removed, inspected and stored. Two large beam jacks are used to lift the locomotive off its wheels. The wheels are run out, the axle boxes and liners set aside, and the locomotive is lowered onto two temporary beds of sleepers to allow the jacks to be removed.

   The steam-dome bolted cover, as well as the throttle and its mechanism, is removed to give access to the boiler interior. All boiler tubes are then cut about 25 mm behind the firebox tube plate and withdrawn. The part remaining in the tube plate is removed by grinding off the weld, and the tube plate is left for later tube refitting.

2. The equipment to be repaired or replaced is prepared and despatched to Arequipa. This equipment includes boiler tubes, brasses, axle boxes and liners, and scrap iron.

   With the throttle and tubes removed, access can be gained to the boiler interior. All scale is cleaned off. Stays are checked and any broken or suspect stays are changed. Access to stays at the rear areas of the firebox is difficult. Skilled boilermakers can often detect broken stays by tapping on their firebox ends, but the only sure way is a meticulous inspection. The whole boiler, less tubes, is then inspected. The firebrick protection of the firebox sides is removed. Usually this has to be discarded.

   The boiler external fittings, injectors etc. are also inspected. Usually there is little work required to these, other than cleaning. Compressors and selected air-brake equipment parts are bench-overhauled.

3. With the parts returned from Arequipa, the overhaul can proceed.

   The boiler. The tubes are refitted at the smokebox end with their copper rings in place. Both ends are then expanded into position, and the firebox end welded. New superheater elements are located in the superheater tubes, and fitted to the manifold. The boiler is then virtually complete and can be inspected.

   The motion. For correct tracking of the locomotive, the lateral and longitudinal position of the wheels must be correct. Correct tyre profile and fit of the axle boxes on the axle is also important.

   The first step for each axle box is to skim the wheel-side bearing face and to bore each axle seat to suit its axle. A punch-mark on each box marks the axle centre position for boring. The liner rear-side face is also skimmed. The wide slot into which the locomotive frame fits is machine-planed.

   The front and wheel-side liner face thickness is machined so as to locate correctly the axle box and the wheel. Quite intricate dimensional checks and calculations are required to determine these critical dimensions, which are set from:
   - longitudinal – by a punch-mark on the frame above the axle centre
   - lateral – from the cylinder centre line.

   Once the axle box machining is complete, the oil ways are cleared, the oil grooves hand-cut in the axle-bearing faces and the side rod brasses machined all over.

   Wheels and axles. Wheel-centre or axle-changing is rarely required, and attention is confined to the shrunk-on tyres. The tyres of driving wheels are turned, if required, to return the profile to the correct (slightly coned) shape. As turning reduces the thickness, and thus the life of the tyre, only the minimum practicable is removed, and it is avoided if possible. The coupled driving wheels must all be turned at the same time, and to the same diameter.

   A groove on the outside of the tyre marks the turning limit. When this is reached, all tyres of the locomotive coupled wheels must be changed.

   Valve gear operating mechanism. As already described, the joints of this mechanism are formed of steel pins and bushes. These last are usually found worn beyond repair, and new ones are turned up and hardened. The bushes are pushed in under pressure.

4. The locomotive is reassembled. The inspected boiler is ready for throttle-fitting. This will have been bench-ground in, any damage made good, and it and its linkage bench inspected. It is inspected again after installation into the boiler.

   Much importance is attached to work on the throttle and mechanism. A major leak or a linkage failure could be disastrous. The work is usually entrusted to the shop foreman, and the final inspection is by someone independent. With the throttle installed and connected up, the boiler can be filled with water (as full as possible) through the steam-dome, for which a cover joint can then be made and the cover bolts tightened. Any external insulation removed from the boiler

Something to Think About

is replaced and the outside covers are re-installed. The boiler cold-water-pressure test is now carried out. The firebrick protection in the firebox is rebuilt using locally sourced clay-based cement.

In the meantime, the motion and valve gear are reassembled and the piston and valve-rod glands are replaced. The main bearing packers are set to locate the piston about one-third of the way along the cylinders with the wheels at dead centre (allowing room for the piston to move forward as the brass wears).

Setting the valve gear involves adjusting the eccentric rod length. The axle boxes are blocked to prevent movement. The reverse handle is placed in full-forward gear, and the driving wheels rotated onto a dead centre. The reverse handle is moved to full reverse and the eccentric link should not move; the rod length is adjusted to achieve this.

Any other equipment removed for attention is now replaced and any paintwork required is carried out. The tender is retrieved and coupled on. The locomotive is now complete except for final testing. The boiler has already been pressure-tested cold. The fire is started to raise steam for a steam-pressure test. All that remains to complete the overhaul is to carry out a test run.

Incidental Work

Many minor repair jobs become apparent when the locomotive is stripped down, and it is not possible to describe them all. Worn motion parts are often found. Such parts are repaired by building up with weld. Boring out of openings may be required when the wear impinges on a pin or on a bush seat.

Conclusion, with hindsight

In the 1950s, Bolivia was recovering from a particularly bloody revolution and experiencing galloping inflation. US aid was relied upon to feed the population. A large component of our freight was basic foodstuffs – wheat, rice, sugar etc. – that stretched our facilities to the limit. On my way to Bolivia, I spent a few days in Arequipa. There, Neville Bellerby C.M.E. of the Southern Railways of Peru instructed me that I should concentrate on:

- improving the condition of the steam locomotives;
- improving the lighting on Guaqui Mole;
- keeping the trains moving.

This account describes how we overhauled locomotives, pursuant to the first of the C.M.E.'s instructions and consequently the last also. I have made no reference to the modest 'improvements' that I introduced, encouraged by Charlie Ricketts, the Arequipa Assistant C.M.E. Indeed, I had left before most of these had been proved in long-term service. I owe a debt of gratitude to Charlie for his encouragement. As a young man, he had held the Guaqui post and knew the problems.

I like to think I satisfied all of the C.M.E.'s instructions. The trains never stopped running, but it was a very near thing once or twice!

Luke Marsden-Smedley

Media Matters

It has been said that a nation may be judged by its newspapers. If there is a grain of truth in this, one should consider not only the big-circulation dailies, but also the suburban and country town weeklies, plus the astounding number of specialist journals to be found at the average newsagent. Some of these will be of overseas origin, but their very presence indicates a level of interest.

Newspapers may be classified in several different ways. One is to separate the tabloids from the broadsheets; their relative circulation numbers is a sure pointer to the population's average intellectual status . . . A more searching criterion would be the source of editorial control. It may be the government of the day – an infallible guide to less-than-democratic societies – or it may be via private ownership.

In the latter case, the newspaper is a strictly commercial affair geared to making a profit, and thus virtually dependent on support by its advertisement income. The late George Bernard Shaw once made the profound remark that the freedom of the press meant the freedom of the owner and/or editor to print anything that would not offend its advertisers or, perhaps, their readers. In practice, therefore, editorial policy has to avoid either imprisonment or bankruptcy.

For several generations, the hardcopy media has been supplemented (superseded?) by radio and television, and more recently the very pervasive Internet. Surprisingly, however, most of the homilies noted above still apply. One has noted that media ownership tends to embrace all available vehicles, with varying degrees of success, presumably to have an each-way bet on the future. One fairly obvious confirmation of this has been the disappearance of the evening newspaper, except for free 'advertiser-supported' literature to be read (and probably discarded) on the train home.

Vulcan

Something to Think About

Thanks to those who sent in the solution to the 6th number in the sequence (*NB156*). The answer is 3263442. Although the problem claimed that engineers take three minutes to find the solution, I was informed that it can be done in three seconds.

The problem in this issue is a bit trickier and can be solved using geometry (does not require calculus):

On the edge of a circular field of unit radius, a goat is tethered. What is the length of the tether such that the goat can graze exactly half the field area?

Submit a caption

The winning entry for the caption in *NB156* is:

'No drop shots allowed!'

Prizes have been despatched to the lucky winners and there are more excellent ballpoint pens and rulers waiting to be awarded!

Please submit your captions for the picture above by 30 April 2010.

Name the motorbike

The motorcycle in *NB156* is a Moto Guzzi V8 Grand Prix, introduced between 1955 and 1957. It was the first V8 DOHC motorcycle engine. The 500 cc engine produced around 80 bhp (60 Kw) at 12 000 rpm and was capable of achieving 172 mph (280 kph). Although the engine and bike were without precedent, it had many technical issues and was withdrawn in 1957.

Identify the device

What is the function of the mechanical device in the picture? Bonus points will be awarded to those who can name the device.

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NOTICES

AFFILIATE MEMBERSHIP

The Affiliate Grade of Membership is available, with no joining fee or annual subscription, for students studying an approved Mechanical Engineering degree course. Upon Graduation, the student can apply for Associate Membership. For details, students should contact their nearest Panel Hon Secretary.

MEMBERSHIP

For information on how to apply for membership of the Institution, or transfer membership grade, refer to the website at www.imeche.org. Alternatively, contact Membership Helpdesk, c/o IMechE, 1 Birdcage Walk, London SW1H 9JJ. Telephone 001144 84522 69191.
Email: membership@imeche.org

Sponsors for membership should be Chartered Engineers, although not necessarily members of IMechE. Sponsors must be satisfied that the applicant should be considered for election to corporate membership and may be contacted for further information regarding the applicant at any time during process.

Applicants for grade of Fellow must be sponsored by at least one Fellow.

Engineers Australia members are eligible to apply for the equivalent grade of IMechE membership under the terms of the Mutual Recognition Agreement.

UPGRADE OF MEMBERSHIP

Those Australian members having the necessary experience and qualifications are urged to upgrade from Member to Fellow. The appropriate forms can be downloaded from the above website, or hard copies can be requested from the Branch Hon Sec.

SUBSCRIPTIONS

Payment of subscriptions by MasterCard or Visa can be made by registration on Other methods of www.imeche.org/imember/login.asp Other methods of payment include bank transfers in UK Sterling, bankers drafts and cheques made payable in UK Sterling.

CHANGES OF ADDRESS

If you change your address, please log in to www.imeche.org/imember/login.asp to make the changes. Alternatively you can write to IMechE, PO Box 87 Oakengates DO (District Office) TS3 3WT UK. (Phone number: 001144 1952 214060).

IMECHE PRIZES

The Following Prizes are administered by Australian Branch and details can be obtained from the Branch Hon Sec or from your nearest Panel Hon Sec:

- The Frederic Barnes Waldron Best Student Prize
- The IMechE Project Prize
- The Speak out for Engineering Prize
- The Paul Henderson Prize
- The Andrew Frazer Prize (PNG)

ARTICLES FOR NEWS BULLETIN

This Australian Branch Magazine is published three times a year. It features news of events being held at Branch level and in the various Panel areas. The Editor is constantly on the lookout for good articles on a wide variety of engineering topics. If you have an interesting theory, mechanical engineering experience or invention, please contact the Editor.

Articles or Letters for publication in *News Bulletin* should not exceed 3000 words, and are preferred in Microsoft Word format. They can be sent by email or posted on compact disk. Alternatively, clearly typed hard copies can be submitted.

Articles should be accompanied by good quality diagrams or photographs of about 1Mb for clarity, with captions, and not embedded in the Word document.

CIRCULATION

The *News Bulletin* is circulated free of charge to all Australian Branch Members. Should you prefer to not receive a copy of the *News Bulletin*, please advise the Editor, using the contact details in this publication.