

NEWSLETTER No 7/2005



Railway Technical Society of Australasia
SA Chapter
Engineering House, Bagot Street
NORTH ADELAIDE SA 5006

AUGUST 2005

NEXT MEETING

The next meeting will be held on

**THURSDAY 1st SEPTEMBER 2005 AT
BAGOT ST, NORTH ADELAIDE
(Institution of Engineers) - at 17:30.**

Topic:

Upgrading of Glenelg Tramway Infrastructure

**Kylie Dwyer
Project Engineer
Coleman Rail**



Photo – Section of Upgraded Tramline at Forestville

TransAdelaide recently shut down the Glenelg Tramway for nine weeks to allow the rehabilitation and upgrading of the track and associated infrastructure.

This was no easy project as it required the complete rebuilding of the ballasted track sections from the formation up, refurbishment of the street running sections, the construction of new road crossings, new stations, upgrading of the power supply and improvements to the signalling system.

The work was successfully completed by Coleman Rail.

At the meeting, Kylie will describe the extent of the works carried out, how they managed to complete the required work in the limited time available, what difficulties did they face and how did they overcome them.

For those interested in the renaissance of light railway in Adelaide, this meeting is not to be missed.

Continuous Professional Development (CPD)

IEAust members are reminded that attendance at RTSA technical meetings contribute towards CPD requirements. Each RTSA technical meeting generally has a value of 1 CPD point.

LAST MEETING

Highlights of the 8th International Heavy Haul Conference

Robert Schweiger

Facts on Brazil

(For comparison Australia in brackets)

- i) Land area: 8,547,404 sq km (7,682,300) making it the 5th largest country in the world
- ii) Maximum distance North to South is 4,345kms (3,700)
- iii) Maximum distance East to West is 4,330kms (4,000)
- iv) Population in 2001 was 175,000,000 (20,000,000) Major language: Portuguese

Conference Summary

- i) Cocktail party held on Sugar Loaf overlooking Rio De Janeiro
- ii) Opening Ceremony with traditional Brazilian Folk dancers and singers
- iii) 96 Technical Papers presented over 3 days
- iv) Large number of Australian Papers
- v) Translations provided for all papers
- vi) Australian Paper awarded "Best Paper" on Vehicle/ Track Interaction.
- vii) 3 Streams of papers
- viii) Extensive Exhibition Area
- ix) Conference Dinner held at the Copacabana Palace
- x) Technical Tours at completion of Conference to Vittoria and Sao Lois.

Review of Technical Papers

Five papers were selected by the Robert for review. They are:

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Paper 1 - Common Elements of Successful Heavy Haul Railways: A Worldwide Perspective

Author: Michael Roney, General Manager Track Maintenance, Canadian Pacific Railway.

World demand for coal, iron ore, grain, copper, fertilizers and petrochemicals is on the increase.

Railways have had to respond to this challenge through:

- i) Solid management.
- ii) Understanding logistics
- iii) Understanding the science of railways.

There are 10 key areas that Railways must excel in order to attain excellence in these global markets:

Rule No 1 – Trains Run On Time

Best long-term economics are when railway schedules are aligned to the customers needs.

Europeans have understood that the maximum throughput capacity is achieved when:

- i) All trains leave on time;
- ii) Travel on their prescribed schedule; and
- iii) Deviate little from their time slots.

Large differences in travel speeds of rollingstock will compromise capacity

Rule No 2 – Safety is Job 1

No job is so important that it cannot be done safely. Leaders must walk the talk on safety and drive the message down. Worker Health and Safety committees upwardly drive the safety message and continuously improve safety.

Rule No 3 – Service is Market Driven

CPR President uses the phrase: "We sell what we can deliver and we deliver what we sell". Understand what the customer truly needs. Deliver those needs at a price he is willing to pay. Monitor Customer satisfaction.

Rule No 4 – Integrate the Plan and Align Processes to the Plan

Have operating plans for loading and unloading of trains with the objective of quick turnaround times. Integrate inbound and outbound train schedules. Link operating plans to external customers including shipping schedules.

Rule No 5 – Trains are Sized to Capacity

Best economics are achieved when:

- i) Trailing weight of consists are uniformly matched to the full capacity of the units
- ii) Train lengths fill passing sidings
- iii) Axle loads are the highest that can be carried Each train is powered just enough to get over the territory on schedule

Rule No 6 – Rails and Wheels are Treated as a System

Joint management of the contact between steel wheel on steel rail.

Track engineers:

- i) Rectify rails to reduce wheel defects;
- ii) Eliminate joints;
- iii) Undertake preventive rail grinding to maintain conformal rail head shapes

Rollingstock Engineers:

Respond quickly to shelled treads; and out of round wheels;
Some railways maintain impacts at no more than 85-90 kips.

Rule No 7 – The "Stress State" of the Railway is Controlled

Stress state refers to the match between the loadings imposed by the trains and the capability of the track and equipment to withstand those loadings.

Rule No 8 – Quality is Built In

Quality and safety intertwined are essential in being successful.

Rule No 9 – Employees Engaged in the Success of the Railway

Engaged employees understand:

- i) Where the railway is headed
- ii) What are the key factors that make it successful;
- iii) What their personal impact is in the success of the business

Rule No 10 – The Public is Behind the Railway

Railways must sell their benefits to the community and the government.

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Conclusion

The most successful railways worldwide:

- i) Run trains to schedules that meet their customers expectations
- ii) Achieve the best line capacity
- iii) Sweat their assets
- iv) Committed to work safely Infrastructure is matched to the load and in balance with the planned "stress state of the railway"

Paper 2 - Top of Rail Friction Control

Three papers were presented on this topic:

1. Top of Rail Friction Control: Reductions in Fuel and Greenhouse Gas Emissions;
2. Implementing Top of rail Friction Control North American Freight railroad Experience;
3. Trackside Top of Rail Friction Control at CN

By various Authors – see proceedings for details.

Friction Modifiers for top of rail contain no oils, greases or other liquid lubricant components. They do not replace normal gauge face lubrication. They are composed of engineered composite solids, polymers and other compounds and deposited on the top of rail in liquid form. The water evaporates and the remaining dry film (paint) maintains an optimal coefficient of friction of between 0.3μ to 0.4μ .

Benefits include:

- i) Reduction in bogie curving forces
- ii) Control train energy consumption Reduction in rail wear and noise

Benefits:

- i) Rail wear – 80MGT traffic

Conclusions

Application of Friction Modifier to top of rail:

- i) Reduces lateral forces by up to 30%;
- ii) Rail wear rates reduced by 30 – 40 %
- iii) Fuel savings can be achieved up to 744 Litres/Million Ton Miles

Future Direction

- i) Interaction of TOR FM with grinding
- ii) Interaction of TOR with gauge face lubrication Develop methods to measure efficiency of application

Paper 3 - The Effects of Short-Term Post-Weld Heat Treatments on Residual Stresses in Flash Butt Welds

Paper by: David Tawfik, Peter Mutton and W Chiu – Monash University.

Flash Butt welds produce a superior weld to Alumina-Thermite Welds's but:

- i) Typically exhibit high levels of tensile residual stress in the rail web; and
- ii) The surface condition of the web may contain shear drag.

When combined with torsional loading especially under high axle loads this may contribute to fatigue failure in the weld, as a horizontal split web.

The Authors presented their:

- i) Numerical model on post weld heat treatments; and
- ii) Results of real life experiment

Experimental Procedure

Flash butt welds for testing were produced by John Holland at Spotswood Victoria. After welding the foot was heated for 330 seconds by means of high pressure gas burners and then allowed to air cool to ambient temp.

Numerical Model

A sequential coupled thermo-elasto-plastic FE model was developed. It showed that:

Conclusions

Altering the post-weld cooling conditions, by reheating the underside of the rail foot, has been shown to reduce the magnitude of residual stresses.

Further work is required to optimise this process.

PS. Look out for the new Australian Standard on "Welding of Steel Rail" AS1085.20, which covers Flashbutt, Aluminothermic and Arc welding.

Paper 4 - Rail Requirements for 40 Tonne Axle Loads

Paper by Jonathan Duvel and Peter Mutton of IRT and Eugenio Alvarez and John McLeod of BHPBilliton Iron Ore

BHPBilliton currently haul 95 million net tonnes per annum over 700 route kilometres at nominal axle loads of 37.5 tonnes. They propose to go to 145 MNt and 40

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tonne axle loads in the near future. This provides challenges in Rail Failure Management.

Current Rail Management Methods

The rail section used is 68kg/m Head Hardened. Trials with Low Alloy Heat Treated (LAHT) are being carried out in sharper curves.

All mainline rail is ground on a regular cycle. Rail welding is predominantly Flash Butt Welding. A rigorous rail inspection testing regime has been implemented.

Main factors affecting rail:

- i) Rail breaks
- ii) Rail Welding
- iii) Rail Performance (size and composition)

Rail breaks have been decreasing between 2001 to 2004. Rail breakshave been categorised by type and position.

How have BHPBilliton reduced the rail breaks?:

- i) Ultrasonic Inspections carried out every 7 days (at 2.7MGT)
- ii) Introduction of radiographic inspection of all new AT welds to detect Centre Line Shrinkage (CLS);
- iii) Regular rail grinding to control RCF;
- iv) Introduction of mobile flash butt welding for the majority of in track welding;
- v) Optimal replacement of weld shears for FBW to prevent shear drag; Investigate use of post weld heat treatment;

What's in store for rail?

- i) Use of larger rail size that provides a greater rail head area compared to the 68kg/m (essentially 5mm higher);
- ii) Increased use of higher performance rail steels (hypereutectoid);

Paper 5 - Track Condition Monitoring: The Next Generation

Authors: Mike Darby, Eugenio Alvarez and John McLeod of BHPBilliton and Graham Tew and Greg Crew of IRT

Winner of the IHHA Best Paper Award

Instrumented Ore Cars (IOC's) are used to produce "daily" reports on Track Condition. IOC's are used to assess:

- i) Suspension travel;
- ii) Vertical sideframe accelerations;
- iii) Lateral sideframe accelerations;

- iv) Coupler force, brake pipe pressure, inter-car separation and longitudinal wagon acceleration;
- v) Bearing and wagon temperatures;
- vi) Body roll / tilt;
- vii) Car body stress levels
- viii) Low frequency bogie lateral acceleration (hunting)

Based on the above track maintenance is carried out.

Summary of IOC:

- i) Provides regular accurate data available that ensures the correct maintenance is carried out and prioritised.
- ii) Provides an excellent tool for assessing the effectiveness of maintenance.
- iii) Provides a tool for monitoring track and rollingstock health. Does not replace track inspection and track geometry recording but all are used to prioritise maintenance activities.

A VIEW FROM AFAR - by Max Michell

Airbus, the No. 1 manufacturer of commercial airliners these days, has a by-line in its recent advertising - "Non-stop innovation is the only way we know". A catchy concept and probably not far from reality. A separate piece of paper has also come in with advice that the Eureka Prize for Leadership in Business Innovation has gone to Dick Davies of AMIRA. Who and what you might say. Well Dick transformed AMIRA (Australian Mineral Industries Research Association) from a non-profit industry based national research broker, which was being overtaken by globalisation, into the international arena by harnessing the best of Australian research talent along with those from twenty other countries. AMIRA International is now a leader in international collaborative minerals research and has something like \$45 million invested in 60 worldwide research projects.

The common thread through both these stories is that of innovation and research. What is not stated but is self evident is that there must be vision if there is to be advancement, and that will need among other aspects a dedication to the longer term but quite fundamental things that can only come from research and development.

Brian Bock of QR is quoted as having pushed the line at the recent Heavy Haul conference that there is a need for vision that is not bounded by the past and that will take us forward faster than if we take the comfort zone approach of small steps at a time. Bock pointed to the

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45 projects being undertaken by the CRC's as evidence of the research effort currently under way in this country as part of fostering a 'vision'. At the same conference Roy Allen of the Transportation Technology Centre Inc (TTCI) in the USA raised what he sees as fundamental, but not forefront, issues such as that of capacity that will need to be significantly advanced within the next decade or so.

The reported message coming from the conference was one that dedicated heavy haul railways are putting in a lot of effort to push the technological boundaries, but all railways need to invest in research and development appropriate to their circumstances if they are to move ahead (or even just keep up with the competition). The conventional main-line railways in this country, although now rather fragmented horizontally and / or vertically, do not appear to be putting much effort into long term futures. There have been a couple of well documented ventures that with hindsight were little more than asset stripping exercises; others which thrive, but more from acquisition and compaction of the industry rather than from innovation and vision. There are several large investment rail projects running at the moment but some of these at least seem to be enmeshed in poor planning and even worse political advice, promising almost the antithesis of what they were supposed to achieve.

However there are some interesting developments that to my mind are illustrative of the innovative solutions that are implicit in the earlier Heavy Haul comments.

Exhibit 1: The QRN Hunter Valley coal trains which have introduced 30 tonne axle load locomotives for the first time outside the Pilbara, a.c. traction for the first time on standard gauge, electronically controlled pneumatic braking (ECP) for the first time on freight trains, and lighter tare higher capacity wagons that remain within the 30 tonne axle load limit. It is of note that the other coal haul company is importing wagons that have a tare weight approximately 3 tonnes heavier than the locally built QRN wagons, which will cost the equivalent of around 300,000 litres of additional fuel per year just to move the higher dead weight.

Exhibit 2: The proposal to create passing lanes south of Junee on the single track section of the Sydney – Melbourne route. This proposal has come from considerable analysis and research into elapsed freight train times on this corridor, a key factor of which was the choking effect of traffic growth as long as conventional crossing loops are employed. The solution adopted, to create very long crossing loops (or short sections of double track depending on your point of view), is planned to enable efficient operation of a number of patterns of freight traffic (peaked or evenly spread)

under conditions of substantial growth with little if any degradation of achievable transit times. This innovation should in fact set up the Sydney – Melbourne corridor with ample capacity for growth and just as importantly sufficient cushion to allow further capacity expansion prior to the need becoming a reality.

Australian railways have come a long way from the days not all that long ago when conservative traditionalism was able to rule with few untoward effects on the business (apart from leaving us in the 21st century with a legacy of under-investment and a conservative heritage to look back to). However times have changed and the need nowadays is more toward the ideal of 'non-stop innovation' if we are to remain and grow as part of a relevant land transport scene. Research and development is a key part of fuelling the fires of innovation.

Victoria Fast Rail Update

For readers interested in the progress on the Victorian Fast Rail Project, three updates issued by the Thies Alstom Joint Venture are attached.

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MEETINGS FOR 2005

Future Speakers/Dates/Topics				
Date	Speaker	Organisation	Topic	Venue
01/09/05 (joint PWI)	TBA	Coleman Construction	Upgrading of Glenelg Tramway Infrastructure	Engineers Australia Chapman Hall
06/10/05	Dean Lambert	Trans Adelaide	New Trans Adelaide Trams	Engineers Australia Chapman Hall (RTSA to host)
28/10/2005	Railway Quiz Night	PWI	Open to RTSA members	The Adelaide Baseball Club Urbrae Terrace, Plympton
03/11/05	George Erdos	TransAdelaide (Introduction)	Joint Meeting IRSE & RTSA	Riviera Motel and Function Centre
	Alistair Morrison	Alstom / United (Technical Presentation)	New CTC System for TransAdelaide	Site Visit to TransAdelaide Control Centre
29/11/05	Annual General Meeting of RTSA - SA Chapter Dinner Meeting Guest Speaker – Mr Bill Watson, General Manager TransAdelaide			

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Articles or editorial comment for Newsletter are very welcome. We have over 100 members locally some of whom will have stories, events or developments of interest that could be reported in Newsletter.

Part of the function of RTSA is to keep members in touch with what is going on in the industry and with each other and to that end we are only too happy to publish items of interest.

Send copy to the Editor, Stephen Townsend at st771048@bigpond.net.au or fax to 08 8218 4327.

Electronic despatch of Newsletter is undertaken by Malcolm Menadue – contact Malcolm on mmenadue@ozemail.com.au if you have any problems receiving Newsletter electronically or in hard copy. Note that electronic subscribers will get their Newsletters and flyers as soon as the editorial stuff is done, while the hard copy mail will of course be some days slower.

For all other matters relating to RTSA SA Chapter contact Robert Schweiger (Chairman) at e-mail robert.schweiger@jhg.com.au

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