NEWSLETTER No 8/2006

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

AUGUST 2006

NEXT MEETING

The next RTSA meeting is a joint meeting with and will be hosted by the IRSE. The meeting will be held on

Thursday 7th September 2006
at the Adelaide Riviera,
31-34 North Terrace Adelaide
commencing at 6:00pm.

The subject of the meeting will be:

"ALCAM"
Australian Level Crossing Assessment Model

which will be presented by Graham Cook from the Department of Transport, Energy and Infrastructure.

The presentation will provide a brief overview of the processes and systems that have been developed by the South Australian Government to undertake the identification, survey, risk assessment, prioritisation and dissemination of level crossing information to the State's rail/road owners/operators within SA.

The South Australian Government has undertaken the task of identifying the risks associated at every public road access level crossing within the State using ALCAM. This task has required surveying and data collection to be undertaken at over 1400 public access crossings. It was anticipated this survey and risk assessment program would take approximately four years to complete. As the assessment is quite detailed and the process lengthy without question it has meant collating and storing large amounts of data.

In an attempt to expedite the process, the Department for Transport, Energy and Infrastructure (DTEI) has developed a database called the Level Crossing Management system (LXM). The assessment data plus other information about a crossing, such as accident/incident data and other local background knowledge is collected. The information is then analysed and a prioritised plan for remediation work compiled within the database. Intervention/remediation options can be assessed the LXM system, where changes to the crossing Characteristics and Controls can be made to evaluate and identify the best and most cost effective solution to lower the risk. The risk assessment score and any identified issues are then made available to the road/rail owners/operators through the Internet.

Following the meeting, light refreshments will be provided.

To assist with catering arrangements, please RSVP to Malcolm Menadue by 4 September 2006.
Phone: 0418 827 126 Fax: 08 8370 7004 Email: mmenadue@ozemail.com.au

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.

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AUGUST 2006

LAST MEETING

The topic of the July meeting was a presentation by Roy Nancarrow on the History of Ultrasonic Flaw Detection. Details of his presentation follow.

RAIL TESTING IN SOUTH AUSTRALIA

INTRODUCTION

The search for defects in rail has a very long history. As early as 1877 in the United States a patent was issued entitled "Mode of Detecting Defects in Railroad Rails" which indicates that an effort was being made to find rail defects. No information is given as to the proposed method. In 1911 at Manchester, New York a number persons were killed or seriously injured when a broken rail with transverse defects resulted in a derailment. In 1912 the railroads requested the U.S. Bureau of Standards to investigate the prevalence of transverse defects and to aid in developing an inspection method.

Efforts were made to find a reliable method of testing rails and, in June 1928 the first rail testing vehicle using magnetic induction was tried. It not only detected transverse defects but also found a number of split-heads defects and detected other visible defects. Dr. Sperry who later founded the Sperry Rail Service carried out this work.

ULTRASONIC TESTING BY THE COMMONWEALTH RAILWAYS

From information I have obtained from Ted Gade it seems that perhaps the Commonwealth Railways at Port Augusta was involved in the testing of rail before the SAR carried out rail tests. As early as 1965 an industrial chemist, from the mechanical branch, carried out some testing. In later years other testing was carried out around Port Augusta, and on the old Ghan line. Jock Welsh, later to work in the test house at Islington, also had some involvement I am told. The Commonwealth Railways had two Krautkramer ultrasonic machines as well as a Krautkramer test trolley type SZ 65 M supplied by Watson Victor Ltd, Adelaide. This trolley had a dual normal angle search unit and a double, dual 70-degree search unit, looking both forward and in reverse. In use all the information from all three search units could appear on the one display. Alternatively, each search unit could be used independently and adjusted for sensitivity on the trolley during a rail test. I had the opportunity to try it once and found it difficult and confusing to use. The two ultrasonic machines ended up being used at Whyalla by the two Australian National Rail Inspectors.

After the formation of Australian National, during the construction of the Tarcoola to Alice Springs track it was realised that perhaps some testing of the new thermite welds was necessary. Ted Gade was given the job and came down to Adelaide in 1977 to be instructed in the use and application of an ultrasonic machine and the testing of welds. He continued in this role until it was taken over by Bill Foster, a qualified metallurgist. In the final days of the construction of this track the Sperry Rail Car 141 tested the track, finishing the test the day before the track was officially opened.

ULTRASONIC TESTING BY THE OUTH AUSTRALIAN RAILWAYS.

As this paper is about the testing of rail in South Australia perhaps it should start with the introduction of ultrasonic testing within the South Australian Railways. It was in the late 1940s or early 1950s when the mechanical branch of the SAR purchased their first ultrasonic instrument. It was probably a Kelvin Hughes machine, loaded with valves and a very small cathode ray tube as the display. I recall seeing it at the test house in the late 1970s stored away in a couple of large boxes. Later the Mechanical Branch was to purchase Kraut Kramer machines (USIP10?) and these were used for axle testing. This inspection was done using a procedure developed by Fred Tarrent from within the test house at Islington.

The first Civil Branch "ultrasonic" testing of rail was done using an "Ultrasonic Hand Test Flawtone Model 3SE-HT-100", set up to test for bolthole cracks. This testing device used different tones when searching for bolthole cracks. The operator ran the search unit across the mechanical joint and listened to the tone generated from the rail base and the boltholes and was sensitive to the sound "pattern" generated during the test. Suspect rail joints were then examined by removing the fishplates and carrying out a visual inspection. Two of these machines still exist and one is still in working condition.

In the South Australian Railways with the introduction of continuously welded rail (CWR) it became necessary to consider the testing of the thermite welds that were replacing the mechanical joints. At about the time of the first thermite welds and the manual arc welding on the Broken Hill line, an ultrasonic machine was purchased from Phillips, however, my understanding is that it wasn't a success and was seldom used. I still have some of the search units that were used with this machine. They are the old quartz crystal search units and are of some interest but not of any practical use. When it was realised that the testing of these new welds was necessary the Test House at Islington was approached for their expertise in the field of ultrasonic testing. As I understand it, while they were prepared to offer advice, they were not keen to venture into the field to carry out the necessary inspection work. It would be up to the Civil Branch to obtain their own ultrasonic machine and train their own operators.

This resulted in the calling of a tender to both supply an ultrasonic machine and also train several persons in the use of the machine and, in particular, the testing of the new thermite welds on the Main South Line. While there would be no problem in obtaining a suitable battery operated ultrasonic machine, finding an operator in South Australia who had experience testing this type of weld in track could have been a problem. The firm, Automation Sperry in Adelaide had a suitable machine and perhaps I was the only person in South Australia who had experience in testing this type of weld, having tested thermite welds in Queensland.

The South Australian Railways purchased a Sperry UCD Ultrasonic Flaw Detector, and a short time later at Tintinara, Martin Kitchener and I set about training the welding gangers and the welding supervisor in the "art" of testing their thermite welds. In the months after, I was called upon several times to come in to the Adelaide Railway Station and "sort out" the machine. Some large fingers had got about the many knobs, and the machine was not being used as it should have been. It was then decided to train the Flawtone operator (and Gauge Master), Mick McCarthy, to specialise in ultrasonic testing rather than leave it to the gangers. At this time in 1975 Automation Sperry was about to close the Adelaide office, and, due to the non-appearance of the Mr. McCarthy for training, I was invited to consider joining the South Australian Railways.

INTRODUCTION OF RAIL TEST VEHICLES.

The Sperry Rail Service introduced the first Rail Flaw Detector vehicle into Australia in October 1969. The road/rail test car, 801 was first used on the heavy haul lines in northwest Western Australia. This was an all-ultrasonic vehicle and came complete with experienced operators from the United States. These operators trained the first Australian operators then, all but one, Paul Larson, returned to the States. In March 1973 the induction and ultrasonic test car, 141 was sent to Australia from the USA, and 801 was then transferred for use in NSW. In September 1976, 141 was replaced by yet another test car 140, and 141 was then also used in NSW. While still employed by Automation Sperry I had the opportunity to work on 801 when it tested from Bathurst to Lithgow, back to Bathurst (dual track to Kelso) then out west to Bogan Gate.

THE FIRST RAIL TESTS IN SOUTH AUSTRALIA.

The Ultrasonic Rail Flaw Detection Vehicle 801 was the first test car to be used in South Australia. It was used to test rail on the Broken Hill line, Bill Lade being the engineer in charge on behalf of the South Australian Railways. It took some time to set it up after its trip from WA and took two weeks to test from Port Pirie to Broken Hill. In later years when test car 141 was often in transit to test rail in Western Australia it would test selected sections of the Broken Hill line in a "Service for Transit Fee" deal. Still later when the Adelaide to Crystal Brook section was converted to standard gauge, test car 141 once tested Adelaide.

Sperry Rail Service, using 801, it being gauge convertible, carried out the first broad gauge rail test in South Australia. On arrival in Adelaide by road in October 1977, it had gearbox problems that delayed its schedule starting date by about a week. When all was repaired, the track from Gawler to Lyndock was the first board gauge test carried out. Rail workers swept the dirt off the level crossings and much interest was shown in the operation of this vehicle. During the week it worked away from Adelaide and returned to the metro area on the weekend when the local train service was less and, on Sunday mornings, no trains at all, except the Overland. In later years with different contractors the metro system was tested in the early morning hours before the suburban trains got moving.

The Sperry test vehicle carried out a number of tests on the broad gauge system in South Australia. It was the only rail test vehicle able to test broad gauge track at that time. In Western Australia another company ULTRASOUND had now developed a test vehicle and I went with Jim Harry to Ballarat in Victoria to see what Don Searle from this company had developed. We spent two days in the area on the test car watching it test rail, and once being repaired when the test carriage stuck on a pedestrian crossing and the test vehicle ran over the top of it. There wasn't a great deal of damage and it was quickly repaired as a bearing factory was conveniently next to the track. A plastic bag full of bearings and some quick spanner work got it going again. Some time later this same test vehicle gave a demonstration run on the Port Pirie track running from Adelaide to Lake View, just north of Snowtown, Don Searle again being the operator. Ultrasound carried out several complete rail tests at later dates in South Australia.

Other operators to test on our tracks included a test vehicle from V/Line, Rail Technology International (RTI) and in recent years Speno Rail Flaw Detection, which has been carrying out what has become an annual rail test.

EARLY RAIL TESTING

Much has changed from the time of the early tests to the methods we employ today. The use of magnetic induction ceased when the Sperry Company ceased rail testing in Australia. This method of rail testing required a very large current at a low voltage (1800 amps at 2 volts, end to end on the rail car and 3650 amps at 2.5 volts between the test brushers) to magnetise the rail and then detect flux leakage caused by cracks at, or near, the rail surface. The weight of the dedicated diesel powered generator required to supply the high current limited its application to large rail bound test vehicles such as Rail Car 141. All test vehicles now working in Australia are ultrasonic only Hi-rail type vehicles.

Ultrasonic Search Units.

The Sperry Company “invented” the roller search unit (RSU) and it has almost become the standard method of getting the “ultrasound” into the rail. Although the Victorian test car used sliding search units to good effect, their system required large amounts of water and would have been unsuitable for many sections of the track we now test every year. Some sliding search units are still used in conjunction with the normal RSU array to locate specific longitudinal defects, such as vertical split heads. While the method of putting the sound into the rail hasn’t changed and the angles and frequency used are similar, the processing of the returning echoes has evolved with the introduction of faster computers and more memory in the computers. The test carriages are now all towed behind the test vehicles or attached to the rear. Earlier vehicles had them suspended between the front and rear wheels.

Recording the Defects.

All the early test vehicles used a paper tape to record the processed information being received from the various ultrasonic search units. In vehicle 141, the information from the search coils associated with the magnetic induction system was also recorded on the large tape but could be switched to run in parallel with a smaller faster running tape to increase the visual information. A dedicated pen actuated by the driver and the specific information written in by the operator indicated location information, road crossings, bridges and other points of interest. The tape speed was synchronized to the test vehicle speed and suspected defect location by scaling off the tape using a dedicated ruler. On 141 the drive for the chart recorder came from a large belt powered off one of the vehicles rear axles.

Later test vehicles are now able to spray paint near suspected defects.

Sizing the Defects.

Hand testing to confirm and size the defect was carried out by the operator “on the tape”. This involved stopping the vehicle using a buzzer code, one short beep to stop the vehicle, three beeps to reverse, two to go forward and one long beep to stop quickly. Other beeps were used to warn of hazards such as bridges, road crossings and other trains. After reversing back to the suspected defect the operator carried out the hand test and if thought significant gave it a defect number and painted the defect or the affected area. All the necessary defect information was then hand recorded on the company defect sheet and the defect indication on the tape marked as required with the defect number and location. The paper tape was the permanent record of the test. If required at a later date, this tape could be reviewed if say a rail weld broke that wasn’t marked out. At the end of the day or at the end of the complete test, a typed copy of the defect list was presented to the railway. The railway representative supervised the test, organized for any serious defects to be removed as soon as necessary and was part of the quality control function, such as seeing that previously marked defects still in track were still being detected.

In more recent years the paper tape has now disappeared and the processed information is presented to the operator on a computer screen and the complete rail test recorded on a hard drive. If required, the complete rail test can be replayed after being transferred to a compact disc and presented to the rail authority. The information now recorded will include all the machine settings such as the amplitude of the search units and the pulse count settings etc.

Location of Defects.

Deciding the location of a new defect has always been a problem. In the early “Sperry” days the test vehicles had no distance measuring equipment fitted. All locations were estimated, the decision being by consensus if a full kilometre or half kilometre post was in view. In the northern region where there are no half-kilometre posts a count of the telegraph posts was undertaken and, knowing their spacing, the location was calculated. Later test vehicles use the pulses from the encoder, used to generate the pulse repetition rate, to compute the location and display it whenever a suspected defect is found. If the system is calibrated correctly the accuracy can be within a meter of the correct position. Unfortunately in the South Australian rail system not all kilometres contain one thousand metres. Some are up to one hundred metres short, some have more than their share and I won't talk about where the half posts can be. To find some defects after a test it can be important to know from what direction the testing was done, and work from the right direction. Rail identification has at times been confusing. Terms such as "Up and Down" rail, "Left" and Right" rail as well as "North, South, East and West" were common as well as rail "One, Two, Three etc" counting from one side or the other in rail yards.

Marking of Defects.

The marking of defects has also changed over the years. On the first "Sperry" runs, as well as painting the rail web and giving the defect a number, a wooden garden stake was set in the ballast adjacent to the defect. Sometime later numbered metal tags were nailed to the wooden sleepers or wired to the boltholes in steel sleeper areas or otherwise attached. When the defect was removed this tag was returned to the District Engineer and the defect removed from the defect list. With the introduction of concrete sleepers and, at about the same time, the use of hi-rail vehicles by the two NDT Inspectors it became necessary to also paint the clips to enable the marking to be seen from the vehicle. We now also colour code the clips to indicate the defect priority. We still have problems; the painted clips attract ballast trains after which the regulator and tamper machines scour them. I now have an accurate tripmeter that is of some assistance, given all the above information. In a tight situation testing with Sperry in the Adelaide hills when we couldn't stop they did what was called a "green run". On this one occasion they just threw out a garden stake at each suspected location, on the run, and all welds in the general area were checked at a later date.

Safe Working.

The early safe working was carried out using a guard borrowed from the traffic branch. Radio communication was then something for the future and was first used during rail testing on the new Tarcoola to Alice Springs test. No record of rail testing in the SAR would be complete without a mention of the Maintenance Inspection Car driver, **John McFarlane**. John was able to get extra track time from reluctant train controllers and during the rail test supplied tea and coffee to all as needed. He swept and tidied up and had no equal in charming publican's wives in supplying early breakfasts, making them feel privileged to do so. He would enquire about the temperament of some operators at the start of the day and if necessary keep a low profile until things got sorted out.

Skip Testing.

Before the wide spread introduction of both radio and mobile phone communication, all contact with train control was by the land-line phone service. These phones were located at the various stations and sidings and at all absolute signals. In between these various locations it was possible to "hook up" to the train control line with a portable phone, if the location of the two wires was known. The local gangs knew which wires to use but there seems to be no "common" wiring system throughout the rail network.

For rail testing this meant that instead of being able to cross trains in the section, as we do today, the test vehicle was require to report at specified times at the next station or siding. If the testing of the section was not completed the option was to ran back into the section or leave it and pick the missed sections on the return trip. This was called "skip testing". This method was satisfactory when working away from Adelaide and returning for suburban work on the weekend but could not be used when working on "a face" which means a return trip on the line was not being carried out.

Test Vehicle Maintenance.

The reliability of the early test vehicles was at times a problem. All the machines are very complex with many hundreds of connectors and joiners, all potential problem areas. Problems are also experienced with the hi-rail section of the vehicles due to the equipment, large amount of water carried and the on-board crews all adding to the weight. Getting on and off the track at restricted road and occupation crossings added to the strain in this area. Problems of power supply, normally a 240-volt generator, as well with the strip recorders, were also common. It is a credit to the various operators that they were able, and still do, keep such complex machines operational in remote locations. Since the introduction of concrete sleepers and a more consistent gauge, derailments are now far less common. It was never a nice feeling to have the vehicle "go down".

Test Vehicle Types.

Since, and during, the Sperry days a variety of vehicles have been adapted to operate as rail flaw detection cars. 141 started life as railcar R1 9050 in the USA and 801 was a hi-rail bus. Other vehicles developed in Australia and used in South Australia included Toyota Dyna trucks, Mazda trucks, Mercedes Benz Unimogs and Toyota Landcruisers. Other vehicles used in Australia include Land Rovers, VW Kombi and even a

Daihatsu Terios, it being used in Queensland and South Australia on the narrow gauge tracks.

MODERN RAIL TESTING.

Some years ago it was realised that if the test vehicle didn't have to stop and reverse to check suspected defects then the rail test could be done in a shorter time. With the technology now being able to transmit all relevant defect information to a chase vehicle and have it appear on a laptop computer in the chase vehicle it is now possible for defect testing to be carried out without the test car stopping. The chase vehicle, having checked the suspected defect, and logged the details of the examination into the laptop was then free to travel at a speed necessary to "catch" the test car or proceed to the next defect in the buffer. At the end of the day, a hard copy of all the activities of the chase car can be included in the final report. As a backup, a written record is also kept and this is then used to develop the final "working" defect list.

Using The Information.

At present all defects are given a priority, ranging from priority one for defects that have to be removed as soon as possible or, even require trains to be stopped, down to priority five, which are small defects worth watching. Unlike some other rail authorities, we have never removed all defects when detected but monitor them on a time schedule. It is now the task of the NDT Inspectors to carry out these scheduled inspections, up-grade the defects as they are seen to grow, and pass this information to the relevant Area Coordinator. The NDT Inspector is then responsible for checking that these defects are removed, as well as testing the new welds placed in track due to the removal of these defects. All the defects that are still in track, as well as the removed defects are kept on the relevant database. The removal date is recorded for the defects that are removed and it could be expected that this information could be of some importance in the future. It was used in the past when Australian National rail maintenance was being contracted out, and various interested contractors were assessing the potential work. This database has been in operation since 1995 when computers became more "user" friendly. Before this time the defect list was kept on hand written pages and re-written from time to time as it became necessary.

HAND TESTING EQUIPMENT.

Early mention was made of the first ultrasonic machines used by the civil branch. I think the first one they had was a Branson battery operated model that could also be powered off 240 volts. The Sperry UCD was used consistently from August 1975 until it was replaced in 1980. During that time it gave good service except for continuing battery problems. The final solution to this problem was a small motorcycle battery attached externally to the machine that made it rather heavy to carry around. In 1980 a Toko Keiki SM80D Ultrasonic Flaw Detector replaced it and later Ted Gade was equipped with a Toko Keiki SM100 machine. This machine was a later model, somewhat smaller and lighter than the SM80 D model. Both machines were very reliable, the SM100 having something of a hard life, having rolled down a bank or two. In about the mid ninety's two digital ultrasonic machines were purchased, these were Panametrics EPOCH 111, Model 2300 machines, one for the Adelaide and one for Port Augusta. These machines could be programmed to use various search units, retain waveforms and download them into a computer for later use, such as including the waveform of a particular defect in a report. In 2002 two more Panametrics machines were purchased, these being EPOCH 4B models. While all the machines up to this time had either a cathode ray tube (CRT) or electroluminescence display (ELD), the EPOCH 4B came equipped with a Liquid Crystal Display (LCD). This enables the display to be viewed more easily in daylight and also gives extended battery operating time.

Other Inspection Methods

So far we have only talked about rail inspections that have been carried out using either ultrasonic instruments or the various test cars. Long before the introduction of this type of inspection the rails were being looked at and examined by the track workers. There was very limited, if any, written information or books about rail defects and therefore any information on this subject was gained by "on the job" training. I believe one of the early rail inspection tools may have been what was caller the "Sands Mirror". This was essentially a mirror on a stick and was used to look at the head and web junction without having to bend down or crawl along the track. The use of magnetic particle and dye penetrant testing is being used in some states, particularly in the areas of turnouts.

An early rail defect manual published in 1942 by the Sperry Rail Service was a small loose leafed book and covered most of the important rail defects. The South Australian Railways at least owned one copy. With the introduction of the Sperry test vehicles in Australia a later edition with a yellow cover, published in 1964, was introduced and a number circulated within our rail system. It is doubtful however if many of these small books fell into the hands of the track workers. This "new" book was more comprehensive and, as well as something about rail history, also covered the manufacture of rail. Until it became possible to "look" inside the rail, using ultrasonics, other than examining broken rails and welds, it was difficult to positively identify suspected surface "marks". When I first started to test thermite welds between Adelaide and Brighton, I noticed that some thermite welds, found to be defective, had visual indications in common to many of these defective welds. A visual examination prior to testing the weld indicated, with a high degree of accuracy, the possibility of the weld being defective. Over time other visual indications were discovered and our thermite welders are now trained to recognise these signs. We now have a structured and on-going programme to train the track workers to look for and recognise visual indications of possible weld and rail defects.

Rail information contained in the yellow Sperry book relating to "A" rails was found to be extremely relevant to some defect types such as shelling rail and other longitudinal rail defects. The NDT inspectors examine rails thought by track workers to be defective, and the written results of the examination passed back to the track worker concerned. Techniques, other than ultrasonic examination, such as measuring the head width on tangent track can assist track workers identify vertical split heads. Track inspectors are being issued with gauges that measure at the 16mm gauge point to conduct this additional test.

Alignment and Grinding of Welds.

The examination of alignment and grinding of welds is another function carried out by the NDT inspectors in this state. When concrete sleepers were introduced it became necessary to improve the alignment and grinding all welds. Much work was carried out to determine the limits that the track structure could tolerate in terms of misalignment, dips and peaks. Up to this point not much thought had been given to the grinding procedures or the means to measure the results of this operation. During the welding of the track between Bordertown and Mount Gambier, encouraged by Trevor Freeth, the assistant engineer at Murray Bridge, different methods of using the rail grinder were tried and a final procedure set. The alignment tolerance of the welds was established and a small gauge, (the P1 gauge) to measure ramp angles was invented and later manufactured at Islington.

The P1 gauge and the alignment and grinding procedures are now being introduced into the various rail networks managed by the Australian Rail Track Corporation. The P1 gauge is also now produced and used in New Zealand.

Testing For Specific Defects.

From time to time our rail tests concentrate on some particular rail defect. In the UK, as a result of the Hatfield rail disaster, spalling became known as "rolling contact fatigue" and was "found" through out our system. As it generally occurs on the gauge corner on the high leg of the curve there can be some difficulty in testing this part of the rail. Curve wear, altering the rail shape, as well as flange lubrication add to the problems of testing in this area. The test car operator will report that a satisfactory test could not be carried out and other arrangements made to hand test these sections of rail. Recently, in NSW, there was found to be many vertical split heads in track. A check of the test records indicated that the "standard" rail test, carried out by all contractors, was not particularly sensitive to this type of defect. Both the major testing companies now have additional search units that test across the railhead, still having to work from the running face of the rail. The hand test to confirm suspected defects will still be across the railhead, scanning from either the gauge or field side.

Rail Testing in the Future.

What of the future? Within the general NDT industry there is a movement towards specialisation for various types of industry, such as the aviation industry and for various types of testing, such as foundry and pipe work. While a general qualification for a particular type of testing, such as ultrasonic testing, is necessary I can see a requirement to have a specialized qualification for rail testing, which would also include magnetic particle and dye penetrant testing. With the rapid advances being made in the field of eddy current testing and the possible application of this method to rail testing, this could also be included in the future. At this time there is no published information available about the testing of rail. All the various states and various testing companies have their own methods and techniques. I feel that the experience and knowledge of the senior operators should be sought to form the basis of a universal rail testing qualification within this country.

This paper so far has concerned the visual and ultrasonic examination of rails. The use of X-rays has been carried out in other states, such as WA, where it was used to examine the foot section of thermite welds on the heavy haul tracks. In the United Kingdom there is work being carried out on the full radiographic examination of alumino-thermic rail welds using a Selenium 75 isotope with a computed radiographic detection system (so called "filmless radiography"). This type of test is sensitive to volumetric types of defects, such as gross porosity, but is less sensitive for tight transverse defects.

New types of search units are being developed such as the piezo-composite probe, useful for testing course grain material such as our manganese crossings. Information about these techniques can be found in the June edition, 2002, of Insight, Volume 44 Number 6 published by the British Institute Non-Destructive Testing. The desire to run the trains faster and increase the axle loads will ensure that more testing will become necessary in the future.

At the present time no rail test will find all the significant defects that are in track. Some defects, such as horizontal split heads (HSH) are very sensitive to the testing that is presently being carried out. Other defects like vertical split heads are more difficult to find and generally rely on the “loss of bottom” indication.

The test vehicles, as used today, will only ever find defects if the sound put into the rail reflects from an interface and returns to the transducer. This principle also applies to hand testing. As indicated, research and new techniques will improve the detection of existing defect types and problems that may appear in the future as we increase axle loads and increase train speeds.

NOTICE OF SPECIAL GENERAL MEETING

Notice is given that a special general meeting will be held on Thursday 5th October 2006 (in conjunction with the general meeting) to discuss a proposed alteration of the RTSA SA Chapter Constitution.

Previously, a vote on this matter was conducted in February this year. While the SA Chapter passed the proposed amendments, other RTSA Chapters did not pass them. As a result, the amendments have been redrafted using clearer wording. A new vote on the reworded RTSA Constitution is necessary and will be held at the Special General Meeting.

A copy of the proposed revised Constitution may be found on the RTSA website or may be obtained from Robert Schweiger – RTSA SA Chapter Chairman. Robert would also be happy to receive any correspondence or queries regarding the proposed changes.

All SA Chapter members are advised to review the proposed document and vote at the Special General Meeting.

A FUTURE FOR ADELAIDE’S URBAN RAIL SYSTEM

Stephen Townsend

Aldinga to Adelaide in 40 minutes, Noarlunga to Adelaide in 30, Gawler to Adelaide in 40 minutes, Nuriootpa to Adelaide in 75 minutes and a train every 15 minutes - A figment of imagination? Not if we could apply to Adelaide’s rail system the learnings from the Perth’s suburban system’s development.

Over approximately the past 15 years, Perth has rebuilt its suburban rail system from one facing closure into one of the best in Australia and certainly one extensively used. During a visit to Perth some years ago I was amazed at the number of people using the system. Arriving in Perth on a Sunday and with time to spare I went to Perth station to observe the activity. Train services appeared to be provided on 20-minute service intervals and the trains, which were mainly two car sets, appeared to be at least half full.

This was not always the case. When I first went to Perth in the early 1980’s, the situation was quite different. The Fremantle line had been closed in 1979. The remaining lines to Midland and Armadale were diesel powered using a mixture of railcars and locomotive hauled wooden bodied carriages. Patronage on the lines was falling and costs were rising. The closure of the Fremantle line was an attempt by the government of the day to reduce costs under the perception that suburban railways were no longer viable.

The Fremantle line closure provided some good lessons. Investigations and studies by the government prior to the closure suggested that, with the closure of the Fremantle line and the substitution of train services by buses, the patronage on the Fremantle route would increase. In fact, with the closure of the line, patronage dropped immediately by approximately 30% and remained that way while the line remained closed. Luckily, the line was retained for freight services, so that the reinstatement of passenger services in 1983 with a change in government was easily achieved. The interesting result of the reinstatement of train services was that overnight the patronage on the Fremantle route returned to pre-closure levels. The two main lessons from this experience are that firstly, people prefer rail based public transport and secondly that government policies favoring rail-based transport win elections.

The lessons of the Fremantle closure were not lost on any of the subsequent WA Governments. In 1988, after 5 years of evaluation, the decision to electrify the suburban rail system was announced. Electric operations started in 1991.

In 1990, the decision to build the Northern Suburbs Line to Joondalup was announced. This line was opened in 1992 and patronage on the line has exceeded all predictions. This line has since been extended twice firstly to Currambine and latterly to Clarkson.

The Mandurah Line to the south of Perth was announce in 2003, is currently being built and its opening is planned for the end of 2007.

The reasons for the success of the Northern Suburbs Line and indeed the significant increase in patronage of the older lines since electrification are:

i) The ability of the electrified system to provide a high average speed. The high power of electric trains allows the trains to accelerate faster and thereby reduce travel times. On the Northern Suburbs Line, stations were spaced further apart at approximately 3 km intervals, reducing the number of stops and allowing both a higher top speed and a high average speed of between 65 km/hr and 70 km/hr depending on whether it is a stopping or express service. The result is a journey time from origin to destination that for many people is either quicker and or less costly overall when the train is used compared to driving directly.

ii) The low maintenance and high availability of electric trains allows a more frequent service. This reduces passenger wait times at stations and has a significant effect on the ability of the railway to compete on journey times.

iii) The cost of operating electric rail cars is significantly less than that for diesel-powered railcars. As an example, the total cost per km of maintaining a Perth electric railcar is approximately half that of TransAdelaide's diesel powered cars.

iv) The higher average speed and high availability of electric railcars means that less railcars are required to carry the same number of passengers than when compared with a diesel rail system. For example compared to Adelaide, the Perth rail system carries significantly higher numbers of passengers per day with less rail cars.

v) The rail lines are designed as an integral link in the transport chain. Stations are provided with extensive car parking facilities, bus interchange facilities with the bus stops being positioned either beside or over the platforms and kiss and ride drop off points. The importance of car parking should not be underestimated as Perth's experience has shown that car parking is the most important factor in attracting riders and is the major limitation on total riders using the system.

vi) Both the Northern Suburbs Line and the Mandurah Line are being used as a developmental catalyst. The two extensions of the Northern Suburbs Line have been into relatively undeveloped areas, which now, as a result of the railway, are being rapidly developed as Perth's urban areas expand. The Mandurah line will serve the rapidly developing coastal areas to the south of Perth.

It should be noted that the development of the transport system in Perth is not totally rail based. During the 1970's and 1980's and indeed continuing up to the present day, there has been heavy expenditure on roads. Perth has a highly developed network of freeways and multi-lane highways that extend over most of the Perth metropolitan area. This road network has been highly successful in generating additional traffic such that in peak hours they become heavily congested and journey times significantly increased. In the 1980's, the response was to redevelop the roads to add additional lanes and therefore capacity. This writer can remember the Mitchell Freeway being rebuilt during this period as it was reconfigured to accept the additional lanes within the confines of the corridor.

By the mid-1980's, Perth's transport planners realized that continually widening the freeways and major roads would not meet the future transport needs and it was as a result of this that the Northern Suburbs Railway and subsequently the Mandurah Railway were conceived. They were not built to supersede road traffic but to supplement it. They provide additional capacity by taking unnecessary road journeys off the roads. It is estimated that at present the railway capacity is equivalent to approximately three or four lanes of road traffic but taking up significantly less width along the corridors.

The Perth experience is directly relevant to Adelaide. Adelaide's rail system is much where Perth's system was in the 1980's. However, Adelaide's road system is quite different.

Adelaide does not have the inner city connecting freeways nor has set aside corridors for new freeways or major highways that would easily allow it to develop a road system such as that developed in Perth. At present the approach is to redevelop existing major roads such as South Road. The redevelopment includes the construction of tunnels at major intersections to provide grade separation. This will be a slow, laborious and expensive task that during the various constructions will create extensive disruption and congestion for road traffic over a long period of time, possibly decades. It is a mute question as to whether the timetable for the reconstruction of these roads will meet the projected growth in road traffic. It is suggested that, as in Perth, by upgrading the rail system and providing a viable alternative that will remove unnecessary road journeys, will relief be provided for these roads.

If Adelaide's rail system is to be brought up to a similar standard and meet the demands of the next 50 years, then based on the Perth experience, the following changes are suggested:

i) An upgrade of the existing track to provide higher speeds, increased reliability and reduced maintenance costs.
ii) Electrification to provide increased acceleration, higher speeds, a reduced journey time, increased availability and reduced operating costs. It will also reduce the reliance on diesel fuel, which is significant in these times of high and increasingly higher fuel prices.
iii) The selection and upgrading of specific stations to provide significantly increased car parking, improved bus interchange and kiss and ride facilities. The lack of space at most Adelaide railway stations may require the construction of multi-story car parking facilities.
iv) Extension of the existing rail network to serve the rapidly growing urban areas south of Noarlunga to Aldinga and in the Barossa Valley between Gawler and Nuriootpa.

Can Aldinga to Adelaide in 40 minutes, or Nuriootpa to Adelaide in 75 minutes become reality? Can the Adelaide rail system be redeveloped to become the backbone of the Adelaide public transport system and upon which much of the future development of Adelaide is based? To both questions the answer, based upon the experience in Perth, is clearly yes.

It won't be easy. South Australia does not have the huge budget surplus based upon mining revenues that WA has. But money is not the primary requirement. The primary requirement is the will to develop a balanced transport system that will serve the future development and prosperity of Adelaide. If the will is there, a way can be found. The Governments of WA found the will, time will tell if the Governments of SA can demonstrate a similar will.

IRSE TECHNICAL CONVENTION

<u>ADELAIDE</u>

3RD & 4TH November 2006

MATCHING TECHNOLOGY with OPERATIONAL REQUIREMENTS

OVERVIEW

The Institution of Railway Signal Engineers (IRSE) Australasian Section is holding a two-day Technical Convention in Adelaide on Friday 3rd and Saturday 4th November 2006.

The theme of the Convention will be
"Matching Technology with Operational Requirements".

The Friday Technical Sessions and Conference Dinner will be held at the Holiday Inn Adelaide.

The Keynote Speaker will be Mr Peter Foley, Deputy Director, Surface Safety Investigations, Australian Transport Safety Bureau.

The program will include the following technical presentations:

i) TransAdelaide CTC Upgrade Project – Operational Benefits – TransAdelaide
ii) TransAdelaide CTC Upgrade Project – Project Technical – United Rail Group
iii) 3G850 – The next Generation of ARTC Train Communications – ARTC
iv) Advanced Train Management System (ATMS) for the ARTC – ARTC
v) ICAPS In Cab Activated Points System – ARTC & Westinghouse Rail Systems
vi) Darwin Train Control System – Westinghouse Rail Systems
vii) Signalling the Adelaide Yard – Connell Wagner

NEWSLETTER No 8/2006

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

AUGUST 2006

A Panel Session will follow the technical sessions with senior representatives from ATSB, ARTC, Pacific National and TransAdelaide.

The Saturday program will include an inspection at TransAdelaide of the recently commissioned Centralised Traffic Control (CTC) system for the Adelaide Metropolitan area. This will be followed by a technical inspection at the GWA Train Control Centre at Dry Creek, where delegates will see the control and monitoring of the trains operating to Darwin. The Saturday program will conclude with lunch and a networking session.

Registration details for the convention will be distributed to all IRSE Australasian Members and RTSA South Australian Members in mid August 2006. Full registration or Partial registration is available.

For further details, please contact:

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MEETINGS FOR 2006

Future Speakers/Dates/Topics

Date	Speaker	Organisation	Topic	Venue
7/9/2006	Graham Cook	Department for Transport, Energy and Infrastructure	ALCAM "Australian Level Crossing Assessment Model"	Joint with IRSE – Adelaide Riviera, North Terrace Adelaide
5/10/2006	Mike Sowden	ARTC	Wayside Detection and Wheel Profile Measurement	Joint with PWI - IEAust Building – Bagot Street
Nov 2006	No Meeting Currently Planned			
28/11/2006				RTSA AGM

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N/L Editor	Stephen Townsend	0400 135 481

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 8297 0992.

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, or by phone on 0413 128 775.