INSIDE THIS ISSUE – WHAT IS SHAPING THE RAIL INDUSTRY TODAY AND INTO THE FUTURE

Netflix for Rollingstock

The Public Transport Authority (PTA) utilize driver only operations (DOO) across the network. In order to facilitate safe DOO within a commuter rail setting, all the Electrical Multiple Units (EMU) within the fleet are fitted with a Driver Assist Video System (DAVS) to allow the driver to see the platform train interface on a screen within their cab so they can safely decide when to close their doors and depart. This is a technological solution to replace the tradition requirement for guards in the center of the train or station staff. When the system was initially implemented in the early 1990s it consisted of simple analogue transmission equipment at each station broadcasting CCTV images to a receiver on the railcar.

The imperative to change from the existing analogue transmission system utilizing the upper UHF band (shared with analogue terrestrial broadcast TV) was brought about by the Digital Dividend which started in 2010 and aimed to repurpose the existing analogue TV spectrum to 5G (digital TV's much greater spectral efficiency allowed for this dividend.). The new system was implemented at the start of 2015. The PTA chose to develop a new system based on the open 802.11 WiFi standard utilizing Commercial Off the Shelf (COTS) WiFi equipment and a custom made, in-house designed railcar based controller. The system was able to provide functionally the same result to the railcar drivers and allow for the continued safe driver-only operation of trains on the PTA network.

The PTA learnt a number of valuable lessons as part of the transition to the modern WiFi solution. Firstly, that the organization did not have sufficient internal experience in the new technologies to be able to have confidence in a solution. In particular the PTA was lacking expertise in WiFi and given the short timeframe post ACMA announcement it was hard to up skill existing staff in time. Secondly, as the project was being undertaken, there was not sufficient thought given to the operations and maintenance of the system. In particular there was a lack of documentation and training for the maintenance team at the initial delivery of the project. It would have been beneficial to either have maintenance staff embedded in the project team or to create new positions in the maintenance team for WiFi and electronics experience. Finally, the project team could have managed the expectations of the stakeholders better.

At the commencement of the project there was a misconception among drivers that the new system would improve the quality of the video, whereas in reality the cameras and screens were not going to be upgraded as part of the project (camera upgrades have since taken place to make the most of the improved image quality in recent years.) On completion of project there was a feeling within the driver community that the performance had worsened and the Communications maintenance team has had to make ad-hoc improvements over the last 5 years with minimal resources being committed to the project. Although there were a number of lessons to be leant, overall the PTA proved it is possible to do a hybrid COTS and bespoke solution to provide a good technological outcome to a problem faced by rail networks around the world.

Level Crossing Obstacle Detection

In the rail corridor, level crossings remains as one of the dangerous areas for both pedestrians and road vehicles. Multiple cases involving near misses or collision have been recorded at these locations, and some of these incidents potentially lead to fatality. Constant works on improving the safety aspect of level crossings are explored by various railway organizations. A type of technology that is adapted by many Railway Operators, especially in Europe is the Level Crossing Obstacle Detection System.

The Level Crossing Obstacle Detection System is a type of technology that automatically detects the presence of obstacles at level crossing intersections, which subsequently prevents accidents to an incoming train. Generally, a Level Crossing Obstacle Detection System consist of multiple subcomponents that function together to form the entire system.

An example of the Level Crossing Obstacle Detection System is the Manually Controlled Barrier – Object Detection (MCB-OD) technology utilized by Network Rail in the United Kingdom (UK).

The system is a cluster of CCTV, RADAR and LIDAR technology. The RADAR system is used to detect vehicles or any large objects that can potentially cause damage to an incoming train while the LIDAR system is used to detect the presence of small objects such as pedestrian, animals that are accidentally confined within the barriers of the crossing.

The MCB-OD is an automated technology which functions in a manner where, the signaling system will communicate with the LIDAR system when the level crossing has been activated. The detection systems will then scan the defined perimeter of the crossing and ensure there are no obstacles within its boundary. Once it is all clear, the signaling system will enable the train to proceed and traverse through the crossing safely. If by any circumstance, an object is detected to be within the boundary of the crossing, the safety barriers of the crossing will be raised, enabling the object (vehicle or pedestrian) to leave the crossing boundaries.

The implementation of the Level Crossing Object Detection contributes towards improving the safety aspects of a level crossing.

MCB-OD Level Crossing Technology [1]

For more information, please refer to:

[1]. http://www.railtechnologymagazine.com/Rail-News/network-rail-upgrading-level-crossings-in-north-lincolnshire
[2]. https://www.optex-europe.com/stories/railway-crossing-safety
[3]. https://www.youtube.com/results?search_query=mcb+od+level+crossing

Improving Rail Safety through Targeted Independent Investigation and Public Reports

The Australian Transport Safety Bureau (ATSB) is the national body tasked with investigating rail transport safety matters. However, with increases in public and corporate awareness of the value of safety, it has become increasingly normal for other parties to conduct safety investigations. So if everyone is doing it, why are ATSB investigations still important?

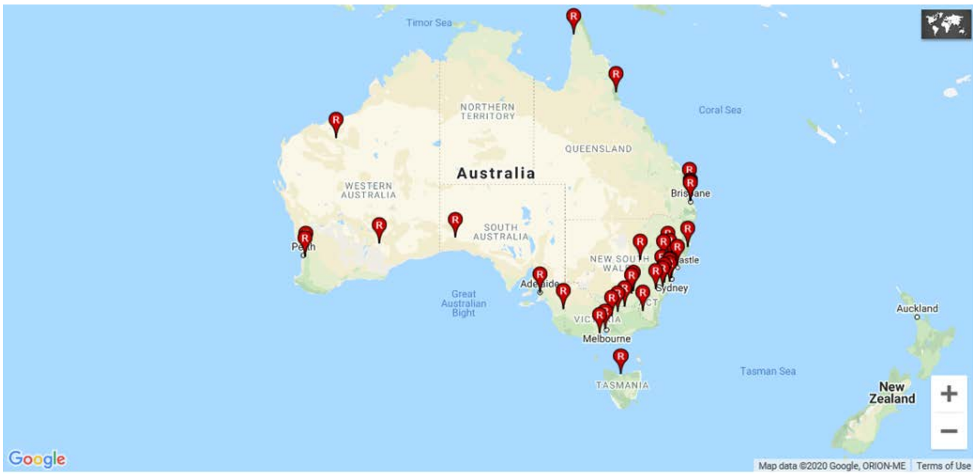
In the most recent (2019) Statement of Expectations, the Minister for Infrastructure, Transport and Regional Development tasked the ATSB to *'give priority to transport safety investigations that have the potential to deliver the greatest public benefit through improvements to transport safety'.* Therefore, when choosing to commence an investigation, the ATSB considers the actual and potential harm caused by the occurrence (both to people and operations) and the potential for improvement through the investigation process. The ATSB cannot investigate everything, so it needs to decide where public resources are best spent. This targeted process focuses on the occurrences with the highest potential for safety improvement for the public good.

When the ATSB does investigate, it has powers through the *Transport Safety Investigation Act 2003* (TSI Act) to gather information from all parties involved in an occurrence and protects that information from further use (for instance as evidence in court). It then assesses the information using a documented, evidence based analysis process to develop findings on what happened, how it happened, and why it happened. Traditionally, occurrence investigations were limited to identifying safety factors that were contributory to an occurrence. However, for safety enhancement purposes, ATSB investigations will identify safety issues (conditions that can continue to increase risk into the future), regardless of whether they can be shown to have been contributory to the occurrence or not. The findings and supporting analysis are published in a public report, which is freely available to the broader industry and community, so that they can access and learn from.

The ATSB's independence means that it is well placed to investigate matters that involve interactions between multiple parties including manufacturers, maintainers, operators, regulators and standards bodies and assess them as part of a broader 'system' rather than separate entities. This is an important distinction between ATSB investigations and operator or regulator investigations. Operators are often limited to affecting change within their own organisation and regulators need to maintain separation between separate accredited organisations. This limits their opportunity to identify 'system' or interface level risks.

In a recent submission to the Productivity Commission, ARC Infrastructure commented on this approach, stating, "*The role performed by the ATSB is vitally important from a system wide perspective. The ATSB has the power to conduct no fault investigations of entire systems, with the goal of identifying flaws and combination of factors that contributed to a negative safety outcome".*

The ATSB currently have 37 active rail investigations spread among the states of Australia, with the aim for each investigation to provide value through targeted investigation, public reports, and the independence to enable investigation across organisations. These factors allow the ATSB to continue to influence industry to deliver ongoing, meaningful, improvement to safety.

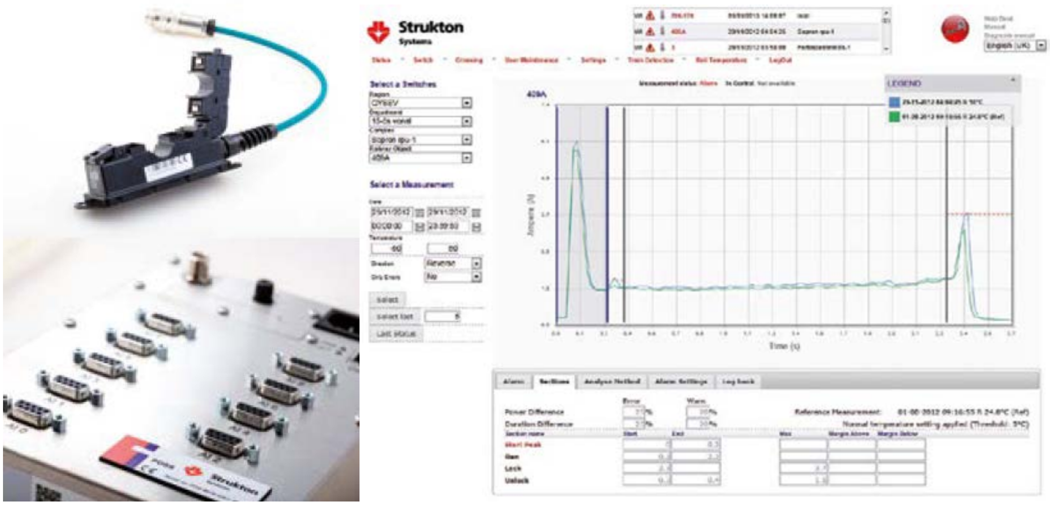


Points Conditioning Monitoring

Points conditioning monitoring is the process of continuous monitoring of points and track circuits. The smart maintenance approach enables early detection of asset's deviation from the standard operation settings. Some of the benefits of points conditions monitoring is the ability to analyze captured data to add predictive value to maintenance strategies and reduce delays on rail networks.

Reliability and efficiency in rail transport are key to customer satisfaction. Therefore, rail network operators and contractors aim to have minimal disruptions. By measuring and monitoring components most susceptible to failures can provide early warning signals to alert network operators and maintainers to intervene and avert any disruption. An example of one of the causes of the warning signal is an increase in power consumption of a point, which can be an indication of a rough running blade which is generally a start of a failure.

Points condition monitoring supports asset management and the optimization of maintenance planning to increase network availability. The condition based-maintenance approach allows for repairs to be only undertaken when required which leads to lower operating costs. The data captured can also be used to carry out trend analysis on the nature of the breakdowns.
In fact, a network maintainer that has incorporated points condition monitoring POSS® into their smart maintenance approach has reported a reduction of points breakdowns by up to 30%.



Maintenance Strategy using Data and Simulation

Track maintenance will be become harder to schedule as production increases and throughput is more focused on the heavy haul rail lines. To ensure sufficient windows for the maintenance requirement become a significant issue to achieve the reliability of the network.

Data analysis (geometry car results, historical condition monitoring data, maintenance records) has to be used to make important decisions on strategy change to accommodate the production target at the same time. Gaps of given length per day (60min/90min/120min) can be simulated from train simulation for certain network to know exactly how many gaps per day and time between each gaps. Time between gaps (TBG) of given length will be valuable to determine the best strategy, allocated resources and rosters for certain maintenance activities.

The model can give optimized grinding strategy including curves/tangent grinding or both given the network throughout requirement. Shut based maintenance has shown great benefit to continuous grinding strategy compare to opportune maintenance. Shut strategy also leads to higher total km grind, but in fewer, larger blocks and with less metal removed each time.

The results also give valuable information to determine the most efficient roster for the maintenance team. Especially the night shifts will benefit any rail welding related jobs which reply a lot on the temperature. With shut dates added to the model, it also can forecast maintenance with variety of rosters to be considered. E.g. to have both mainline grinder and switch grinder present to work on some section of track during shuts further, the simulation also suggests the optimized operation strategy to ensure maximum window provided to the maintenance. For example, implementing distributed power across the rail fleet will remove banker's returns, providing far great maintenance access to certain section in particular. With distributed power, it is expected maintenance could be achieved under the current strategy. Shut based maintenance will remain a superior and easier option.

In conclusion, utilizing train modeling data can give us an optimized track maintenance strategy based on historical track maintenance data. This will not only secure better windows to complete the maintenance but also help the railway to achieve the operation target.

Rolling Stock Signalling Interference Testing

While rail networks around the world are moving to, or already have, signalling systems which use some level of ATP/ETCS, a large number still use traditional train detection systems i.e track circuits. As such, there is a need to ensure that rolling stock does not generate any interference which may impact the safe and reliable operation of said train detection systems.

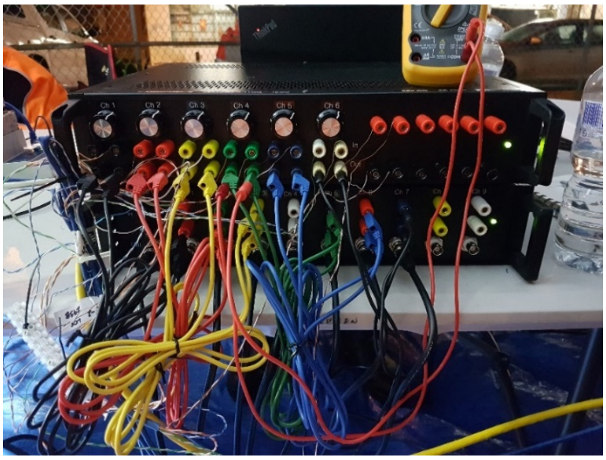
The main purposes of signalling interference testing is to demonstrate that a wrong side failure can never occur due to interference generated by the rolling stock, and that right side failures won't occur. EN 50238 is a generic compatibility standard which outlines a complete test process which can be used when undertaking this type of testing. This standard identifies stakeholders, roles and responsibilities, and further specifies an acceptance methodology which can be utilized. EN 50238 references the relevant standard of the railway on which the rolling stock will operate.

The high-level requirements of signalling interference testing can be summarized as:

- Confirming compliance with the relevant standards (e.g. T HR SC 00006 ST, NSW ASA standard), which ensures:
    - The train shall not cause a right side failure.
    - The train shall not cause a wrong side failure.
    - The train shall not cause a right side failure with lock-up.
- Verify the frequency and magnitude of harmonics in the traction return rail current in all acceleration and braking modes.
- Verify the frequency and magnitude of any underbody rail currents in all acceleration and braking modes.
- Establish the base frequencies and related harmonics produced by the traction inverter in all acceleration and braking modes.
- Verify that the spectral components of any inrush current spike is adequately managed to limit the effect on 50 Hz track circuits.
- Verify that the train can reliably shunt each track circuit under test.

The wrong side and right side track circuit failure modes have become more prevalent since the 1980's, when DC chopper controlled trains were first introduced in Sydney. Since then, rolling stock has progressed to use power electronic (three-phase inverter) controlled three-phase induction (AC) motors, which pose higher risks, if track circuit characteristics are not considered by traction suppliers.

This testing is a critical part of the rolling stock approvals process. Upon the successful completion of testing, the asset will be able to move from testing in a possession, to full self-propel working (essentially operation as a train in revenue service).



Thanks for reading

FASTTRACK