RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD

FAST TRACK

THE NEWSLETTER OF THE HORIZONS PROGRAM I DECEMBER 2019

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

Structures Monitoring and Alert System

Queensland Rail has 164 rail bridges spanning over public roads. More than half of these structures have a clearance of 5.5m or less which can pose a significant safety and operational risk to commuters due to over height vehicles impacting the bridge. When a bridge strike occurs and is reported, trains are restricted from travelling over the bridge until a qualified Structures Inspector has attended site and assessed any structural damage. Depending on the location on the network and the time of the day that the strike occurs, this can result in significant customer delays and flow on effects to the whole network.

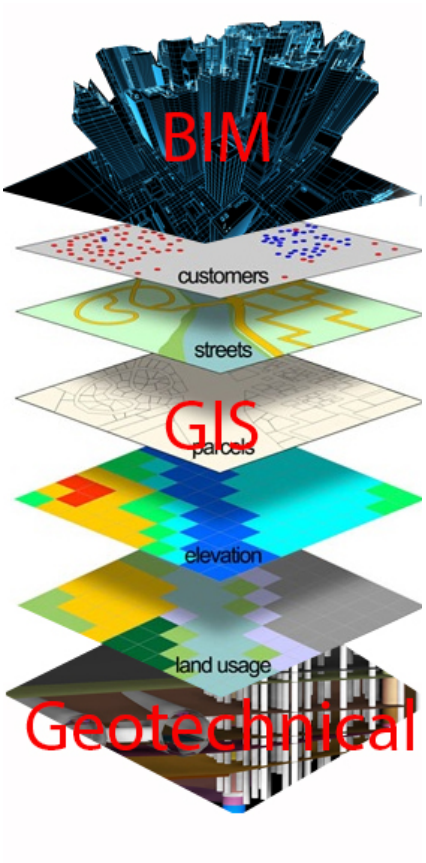
To help address this risk, Queensland Rail has undertaken a program to install cameras and accelerometers at these structures. The Structures Monitoring and Alert System (SMAS) has been developed internally through collaboration between Queensland Rail engineering teams. The SMAS works by automatically detecting bridge strikes using accelerometers attached to the bridge.

When a strike is detected, CCTV footage of the impact is automatically sent to a distribution list within the organization which allows very quick assessment of which spans of the bridge were struck (depending on bridge configuration) and the severity of the impact. This assessment then allows the right risk control measures to be put in place. These measures can include allowing trains over the bridge at reduced speed and/or allowing trains to run on certain tracks that weren't affected by the bridge strike etc.

In summary, the SMAS provides a means to:

- Generate a remote alarm notification when an over height vehicle strikes a bridge
- Provide remote Closed Circuit Television (CCTV) coverage of the area
- Provide remote bridge strike and vehicle damage assessment via CCTV
- The SMAS is an important aspect of Queensland Rail's Bridge Strike Protection Strategy for rail over road bridges in SEQ.

BIM, Geotechnical and GIS



Data and information are often lost and are required to be recaptured and relearnt throughout the lifecycle of a project. Even at the end of a project, data that has been handover are limited in richness and value. Sometimes incompatible with operator's software systems or are difficult to interpret. Therefore, it becomes unused and stored (possibly lost) in a file somewhere. This is proven to be inefficiency and costly for most projects.

With the rise of digital engineering and data driven trends. Software companies are utilising the BIM principles (i.e. process, collaboration, whole Life & digital data -3D) and integrating this with Geotechnical1 and GIS2. This integration will bring crucial information and data into one holistic environment where it can be managed, shared and analysed to achieve better decision making; reduced costs and risks throughout the lifetime of projects.

References:

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- July 2018 - GIS and BIM Integration Will Transform Infrastructure Design and Construction https://www.autodesk.com/redshift/gis-and-bim-integration/
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Blind Spot Detection

Blind spot detection has become a common feature in passenger vehicles. Could drones provide similar coverage and alert train drivers to hazards well beyond the windscreen?

On average, one person dies on Victoria's rail lines every week. These incidences impact the family and community but can also have a devastating effect on the train driver.

Drones could be one tool to reduce this toll by automated scanning of corridors, providing real-time images / information on trespassers alerting the control room and driver as well as emergency services.

Mental health is a complex issue, but drones could help to reduce the frequency of these tragedies and provide a safer workplace for drivers.

[1] Geotechnical investigation is required for both underground and above ground projects, it provides crucial data about ground conditions i.e. physical properties of soil earthworks and foundations.

[2] GIS (Geospatial information systems) is a framework for gathering, managing, and analysing spatial data.

Recycled Ballast

Reconstruction a track formation is always tie into generating spoil which needs to be disposed off-site into a certified EPA land-fill. It could turn into drama and eat up project budget significantly in major reconstruction project, specifically if you are working in metropolitan area or bio sites.

V/line's delivery team recently managed to conduct major formation reconstruction and disposed whole contaminated soil in to certified repurpose-it area for being recycled rather than just dumped it in land fill. This would not only keep the cost down and benefit us to utilize potential recycled ballast, also has much more benefits from Environmental perspective in long run.

In addition, adopting spoil train to cart out the spoil adjoining to recycle them, come out as a cost effective and enviro-friendly methodology to get ride off contaminated soil in major track renewal projects.

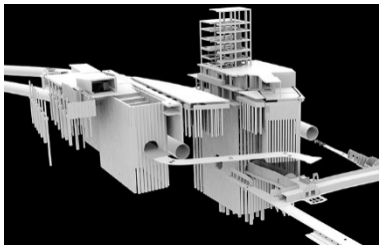
To find out more about this recycling technology, have a look at below link:
www.repurposeit.com.au


Recycled Railway Ballast

The Future of Train and Track Assets Maintenance

Time-based maintenance (TBM) is a traditional method which has been widely applied in assets management. However, TBM can be costly due to over maintenance or human errors and preventing breakdown can still occur prior the next maintenance work. As a result, Turner (2019) stated that train and track companies are now moving into the condition-based maintenance (CBM) which has proven the advantages over the TBM such as long-term planning, early fault prediction and minimizing the loss of productivity as well as resources.
At the present time, there have been a few of technologies and tools which were introduced to improve the efficiency and effectiveness of CBM. These are Automatic train and track inspection products, Digital Twin and Artificial Intelligence technologies to name a few.

Automatic Train and Track Inspection Products
Beena Vision—A Trimble Company introduces different products regarding the train and track inspection tools. These includes Train View and Track View tools and equipment. The products can carry out condition monitoring of train and track component such as side wall condition and high wide detection for train components or track profile and rail profile for track components. Furthermore, these tool and equipment provide and capture the train and track data along with the imaging systems including thermal images for further data analysis.



Digital Twin Technology
As per Sanmartino (2019, p.1), "a digital twin is a virtual replica of any physical thing or process". Nowadays, the digital twin technology is enhanced by the development Internet of thing, Augmented reality and Virtual reality technology. This technology allows the system to carry out real time data monitoring, hence it enables the CBM system to "head off problems before they even occur, prevent downtime, develop new opportunities and even plan for the future by using simulations" (Sanmartino 2019, p.1).

The entire £14.8 billion Crossrail train (Elizabeth Line) network was built with the digital twin. Once network is completed, the 3D Model – digital twin will greatly support the CBM to get ahead of any problems, hence it will make the network become safer, smother and cheaper (Peplow 2019).

Artificial Intelligent Systems
Artificial Intelligent (AI) can process a numerous amount of data and information which sometime is impossible for human brain to process. Furthermore, with development of the machine learning application, the AI become even more important than ever for works requiring data analysis which includes track and track maintenance.

An example of AI being used in the train and track maintenance is the MOXI technology. A team of Palo Alto Research Centre (PARC) has developed MOXI – an AI suite to improve the CBM system. With MOXI, the collected data and information from the field will be analyzed with high accuracy hence it will improve the safety and the operational cost by diagnosing and giving the right recommendations.

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- Trimble 2019, Trimble Beena Vision Solutions, viewed 25 November 2019, <https://rail.trimble.com/wp-content/uploads/Brochure-Trimble-Beena-Vision-Solutions-English-USL.pdf>.
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The Next Stop is Hydrogen

Decarbonisation is becoming key focus of the rail industry across the world, and hydrogen-powered trains could well be the answer to providing a low-carbon alternative to diesel fuelled trains.

Following in Germany's footsteps, the UK's Rail Safety and Standards Board (RSSB) has commissioned Arup to develop a 'route map to enter service' for hydrogen-powered trains on the Great Britain (GB) mainline. The study will outline safety, operational and regulatory issues ahead of its wider adoption across the country's rail network. Hydrogen trains provide a lower-carbon alternative to diesel and, alongside a mix of electrification, hydrogen and battery technology, it is hoped the move will help the country to transition to cleaner energy and create new skilled jobs.

The study follows the UK governments commitment for the UK economy to be net carbon zero by 2050, including a challenge to the industry to remove all diesel only trains of the UK rail network by 2040.

The next stop is hydrogen.

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https://www.arup.com/news-and-events/rssb-appoints-arup-to-review-case-for-hydrogen-trains

Thanks for reading

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