RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD

FASTTRACK

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

Shift from predictor technology to axle counter technology in Victoria

This article summarises the shift in level crossing technology away from predictor technology to axle counter technology in Victoria. This has already occurred throughout most Metropolitan areas but is also occurring in regional areas where poor ballast conditions, increased maintenance, rail condition and various rolling stock have predicated a conscious move towards axle counter technology.

In the past, predictor-controlled level crossings have been used across Victoria. Predictor crossings provide the benefit of a constant warning time given train speed. This allows the level crossing to only operate for its set warning time and not ring excessively when a slow train is approaching. Also, predictor technology can be housed in a location case as a standalone unit to operate the level crossing without needing a controlling interlocking. However, due to the increased maintenance requirements for predictors, which require specific ballast and rail conditions, the benefit of a constant warning time for road users has not been seen to outweigh the associated maintenance costs.

Axle counters are currently a common form of train detection used in Victoria due to their reliable flange detection, long track length capability and ease of maintainability. In addition, axle counter technology can now communicate directly with interlockings over a vital communications link reducing the amount of interfacing equipment (such as relays) previously needed to interface axle counters to a signalling system. This allows a standalone interlocking and axle counter solution to be provided at level crossing locations, thus providing a similar standalone arrangement to existing predictor crossings. One should note that axle counters provide a fixed warning time regardless of train speed. Unlike predictor-controlled level crossings set to a constant warning time, a slow train can create excessive ringing for road users in an axle counter level crossing. However, Operator standards do allow differences in warning times for different services to an extent. For example, V/Line standard NIST 012.1 Section 6.11.1a states, "the approach and holding section controls shall be optimised to contain variations in warning time to 210% of the minimum warning time (MWT). For the intended train services..." This has allowed axle counters to be still used on mixed service lines as long as the difference in warning times is within certain limits as set by the standards. This, combined with the benefits of reliable flange detection regardless of rolling stock type, ballast, and rail condition, makes axle counters the current preferred technology.

In summary, Victoria is currently moving towards a fixed warning time approach due to the reliability of axle counter technology, its incorporation into standalone interlockings and the decreased maintenance activities associated with its use.

Priannka Kumar

Safety in Railway Construction – People Plant

In the 1970s and 1980s, reform of health and safety laws took place individually at a state level across Australia, resulting in increased accountability for businesses and their owners to ensure their workers were safe. This arguably was the catalyst for companies to take safety seriously, forming the beginning of the safety journey to improve behaviours adopted by their ancestors.

Fast forward to today, almost fifty years later, and Companies are struggling to move beyond maintaining compliance into a safety citizenship state. Q; What does this state look like? A; Increased effort, accountability, and motivation to improve safety for the benefit of the individual, their colleagues, and the broader business.

To understand this further, an example of this issue in the construction of railways is mobile plant and their interaction with people. In industry, it's the norm for workers to float in and out of exclusion zones without operators isolating mobile plants.

This is such the case for mobile plants, mainly front-end loaders and excavators of various sizes (6.5T through 30T+), where workers' perception of risk does not drive safer behaviours and often, workers, including operators, are comfortable working in and around each other without sufficient separation. Q; Why do workers choose to expose themselves? A; Worker's perception of risk and miscalculating the outcomes drive their decision-making. Operators believe they have complete control of the equipment, and the risk is low, i.e. the likelihood of an incident is low.

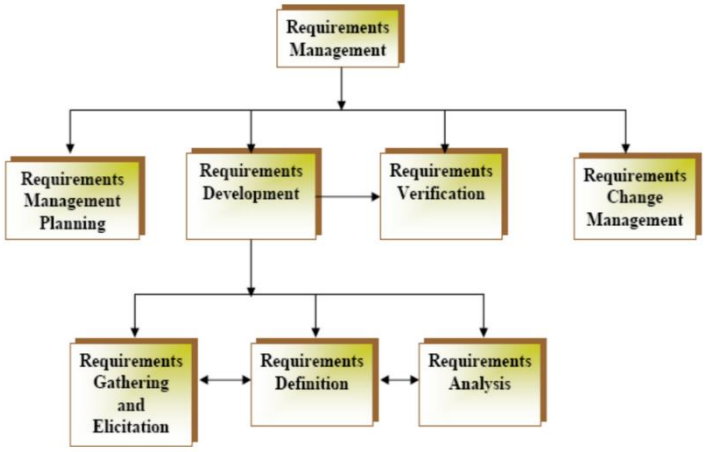
To drive safer behaviours relating to people plant separation, innovation and technology have been significant contributors over the past five years, with the following key innovations becoming more widely used to make railway construction safer.

- Artificial Intelligence & Pedestrian Recognition; HD cameras can recognise workers and other mobile plants and objects on the ground and limit the plant's ability to be used until the hazard clears.
- HALO Lighting; Lighting is installed on top of the mobile plant and clearly outlines the exclusion zone in ambient or night applications.
- Moving Object Detection (MOD); HD cameras with the ability to recognise moving objects within its 360-degree view to notify the operator of the hazard present.

These innovations and technologies, coupled with a commitment from businesses and their workers to improve safety behaviours, will further ensure a safety citizenship state in the future. The key to this safety maturity in people plant separation is achieved through technology adoption.

Deacon Wood

Project Requirement Management



So often, in the Rail environment, requirement management is considered costly and viewed by Project Managers and Designers as a time-consuming exercise that does not provide any value to project delivery. This misconception of requirement management has resulted in scope creeps, delays, cost overruns and low-quality deliverables in many of the complex projects currently being delivered.

A project cost statistic study at NASA indicates that projects that spent less than 5% of the total project or program costs on the requirements process experienced an 80% to 200% cost overrun). Conversely, an investment of 8% to 14% of total program costs on the requirements processes yields project results with considerably lower cost overruns (Young, 2003).

Therefore, it is crucial that the Project Manager and Design Manager to implement requirement management to realise the following benefits for Rail projects:

Traceability: visualising how requirements interact and depend on one another is crucial. Requirements can cascade across complex systems and decompose into subtasks and lower-level designs.

Meeting Scope and Program: The objective of requirements management is to increase the probability of delivering with the expected functionality and within the defined time. Effective requirements management goes a long way to eliminating most design mistakes and reducing failures during the project lifecycle. All design deliverables will be verified against requirement specifications using the Verification Cross Reference Matrix (VCRM).

Managing Change: Any project requirement changes can be effectively analysed, tracked, modified, and linked to existing requirements within the Systems. A Change Control Board (CCB) will act as a 'gatekeeper' to oversee and manage the process.

All design deliverables will be verified against all requirement specifications to ensure

Minh Nguyen

Track Augmented Reality View

Sydney Trains is the operator and maintainer of Sydney's metropolitan rail network and fleet assets and the maintainer of NSW TrainLink fleet and infrastructure assets and is responsible for the effective maintenance, operations management and stewardship of rail assets. Sydney Trains delivers an annual works program of approximately $1.4 billion to ensure the delivery of a safe, reliable passenger fleet and metropolitan rail network to meet growing customer demand and keep Sydney moving.

To help meet increasing customer demand and ensure minimal customer impact from the annual works program, Sydney Trains has optimised network access through strategic planning and developing and investing in new technology. One of the latest technologies that the organisation uses is the Track Augmented Reality (AR) View mobile application.

The Track (AR) View app is a mobile application that aims to make finding assets on the Sydney Trains' network more straightforward and efficient for those working on the track. It uses augmented reality and satellite imagery to highlight the location and confirm assets, allowing for further information to be accessed where needed and links to on-device navigation, streamlining current processes. In addition, through a digital workflow for protection placement, an extra layer of validation will be added to improve our teams' safety working in possessions and to reduce the likelihood of an incident occurring due to an incorrectly placed possession protection.

The development of the Track AR View application was designed to provide an enhanced way of searching for and identifying assets, as well as reducing the potential and risk of possession protection incidents through:

- The satellite and augmented reality view will assist in accurately identifying the track/turnout where protection is to be placed, with access to WebGIS data helping to confirm the location. This is invaluable for staff working at night and in adverse weather conditions.
- A possession manager (at the management centre) receives a photo and location of the protection being placed, allowing them to verify it is the correct placement, in addition to GPS and date/time metadata that can be plotted in the management centre, adding a further layer of safety to the process.

These measures help support the integrity of the protection process, which is a significant additional safety measure for workers in the danger zone.

Efficient Network Access management requires continuous improvement in planning processes and the adoption of new technologies to improve efficiency and safety. Through the development and implementation of new technology and by using strategic planning to optimise network access, Sydney Trains has been able to align its asset management principles and business priorities to ensure the delivery of a safe, reliable passenger fleet and metropolitan rail network to meet growing customer demand and to keep Sydney moving.

Mary Nguyen

Suitability of Predictor Crossing Technology in the Pilbara Region

The extreme conditions in the Pilbara region (Northern WA) presents unique challenges to rail operators. Train operations in the region are almost exclusively heavy haul, transporting iron ore from mine to port so that it can be loaded onto a ship and exported. Heavy haul consists are almost identical and generally the sole vehicle type to transverse the network (with the exception of hi-rails, work trains etc). The network itself is quite basic, consisting of only basic passing loops and a 'balloon loop' at each end to facilitate the redirection of each consist within its mine-port cycle.

Source: Pilbara Iron Company (Services) Pty

In total there are over 100 active level crossings across the region. Many are located in excess of 100km from the nearest town or population center, making maintenance and general site interaction difficult. Predictor crossings provide a suitable control to this issue since they act as an overlay to the signaling system (in a typical arrangement). The benefit this presents is the ability to continue normal operation following a failure of the signaling system.

Another benefit of Predictor crossings is the ability to provide road users a constant warning time for train arrival. This is beneficial due to the 'dynamic scheduling' component of heavy haul operation leading to trains interacting with the crossing at varying speeds. If a traditional 'relay-based' crossing configuration was installed, some road users may experience extended warning times (due to the assumption of constant train speed by the control system).

Predictor crossings are not without their drawbacks, however. As with traditional track circuit technology, the interfacing components suffer performance issues due to poor ballast conditions, rail contamination, light rail vehicles (poor shunting characteristics) and track connection failure. Many of these hazards could be mitigated using axle counter systems, with the tradeoff of losing the constant warning time feature of the system.

Oliver King

Thanks for reading

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