FASTTRACK

THE NEWSLETTER OF THE HORIZONS PROGRAM I JULY 22

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

Compact Overhead Wiring Tensioning Device

Introduction

Most modern electrified railways with an overhead wiring system use some form of tensioning system for the traction power overhead wiring. A tensioning device is typically applied to the end of the conductors to provide a constant line tension throughout a given ambient operating temperature range. Without a tensioning device, the tension in the overhead wiring will vary with a change in ambient temperature resulting in a change in conductor height. The variation in tension is caused by thermal expansion or contraction of the copper based conductors. Variations in conductor height, particularly in high speed rail, can be detrimental to the pantograph and contact wire interface performance.

Figure 1 - Weight Wheel Tensioner

Conventional Tensioning Method Risks

The most common form of weight tensioning devices are weight wheel tensioners and pulley wheel tensioners. Both devices work on similar principles and have a stack of cast iron weights attached to the end of a wire rope providing a constant tension (+/-2% tolerance). In some scenarios the weight stacks may pose a security risk to the system or safety risk to the general public. For example, if a weight wheel tensioner or pulley wheel tensioner were placed on an elevated viaduct with parkland below, during an overhead wiring fault, cast iron weights may dislodge severely injuring anyone below. They also pose a security risk when installed in a publically accessible area. Vandals can easily foul the weight stack which could cause a significant overhead wiring failure.

There have been past attempts to tension the overhead wiring with helical formed springs, thereby removing the risks associated with weight stacks. However, most springs will not output a uniform force throughout the tension or compression range required for traction power overhead wiring.

Figure 2 - Pulley Wheel Tensioner

Pfisterer Tensorex C+ (TRC+)

In 2008, Pfisterer's rail division (now Mosdorfer) developed a spiral spring tensioning device with a variable pulley which provides a constant tension with a tolerance of +/-4%. The TRC+ addresses both safety and security risks with common tensioning devices. The compact design is also suitable for space constraint areas or where there may be a signal sighting concern. In 2017 Metro Trains Melbourne provisionally type approved two units to be installed on the Altona Loop near Seaholme station for a one year trial. During the trial, the ambient temperature, variable pulley position and tension (taken from wireless load cells) were captured bi-daily. At the end of the trial, the actual values were compared to the design values. All measurements were within the design tolerances and satisfied the pass criteria and the units were fully type approved. Minor product improvements were recommended to the manufacturer which would improve the lifecycle and maintainability of the TRC+. These improvements were all adopted by the manufacturer.

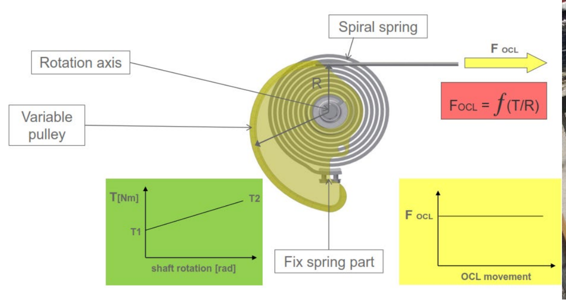


Figure 3 - Tensorex C+ (TRC+) Basic Working Principles

Figure 4 – Tensorex C+ In-Service Trial Unit

Spy Tram

Over 10 nights through early June, one of Melbourne's iconic trams, decked out in state-of-the-art 3D lasers, sensors and cameras, criss-crossed the city collecting vital data about the condition of network infrastructure.

The equipment attached to the pantograph, bogies, and on the front, back, and sides of the tram, with data mapped accurately using GPS.

Every tiny detail, from the smoothness of the rail to the condition of the surrounding concrete road, to identifying where foliage growing too close to the track, was captured and sent back to a powerful server for advanced data analysis.

Figure 1 - Monitoring Equipment

Operated by Keolis Downer in Australia, Yarra Trams (YT) uses data from the asset survey, along with physical inspections, to prioritise maintenance and renewal plans. The data gathered in this asset survey will help YT plan out Infrastructure works for the next five to 15 years.

Each year, trams travel approximately 25 million kilometres, the equivalent of more than 64 trips to the moon. So it's important that infrastructure is up to scratch.

Until it was interrupted by the pandemic, this asset survey was a twice-yearly affair, with technology and specialists from Germany flying out to join forces with the network experts from Yarra Trams; including asset survey veteran Tram Driver, Brenden Schonfelder.

"Most of us on board have done a number of YT asset surveys together, so it's like catching up with old mates every time we all return" says Brenden. "The great thing is everyone knows each other and their respective jobs. We all know our role in the overall project and just get the job done."

The tram covers every section of the network and is on a tight schedule.

"The whole project has its challenges and it's not just as simple as driving across all tracks to get the data" said Brenden.

"For example, weather conditions or something as simple as an emergency occupation to fix a track fault can throw the nightly schedule into chaos which also impacts the rest of the week, so things need to be reworked."

On one of the final nights of the asset survey, the team welcomed Ian Cushion, Chief of Rail Services at the Department of Transport on board. Back when he worked at Yarra Trams (2010 to 2016), Ian was involved with the asset survey and was keen to take a look at the 2022 operation.

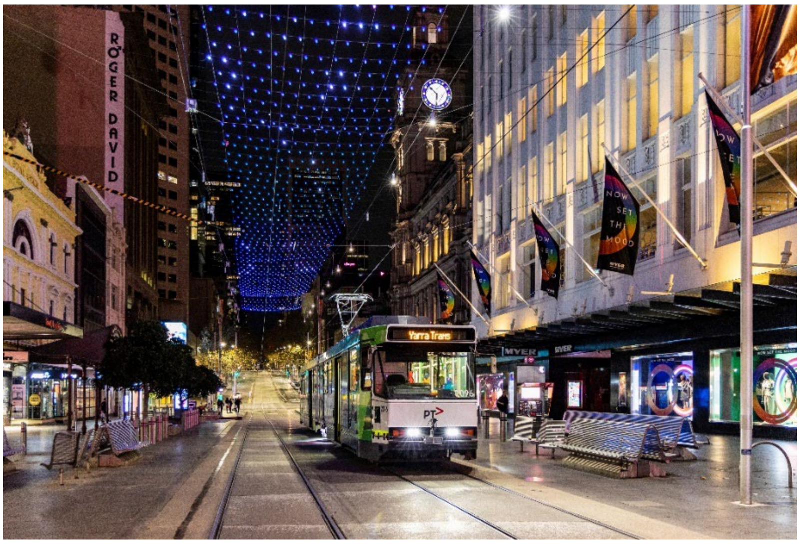


Figure 2 – Condition Monitoring Equipped Tram Travelling

Alternate train detection system for level crossing

One of the challenges with the use of track circuits technology is the potential delay detection of an occupied track section due to poor wheel to rail interface. As a result, delayed level crossing activation may occur leading to an unsafe condition, this is also referred to ‘reduced warning time’.

To mitigate the poor contact surfaces, railway operators are required to perform rail scrubbing at a set interval or at the end of each major occupation event which leads to additional operational and project cost.

While there have been major investments for grade separation in recent years, there are still a significant number of existing in services level crossings, particularly in the outer suburb and regional areas.

Some typical constraints when considering axle counter system:

- Required trenching and cable work to connect the counting sensors and the evaluators and its impact to environmental no go zone or heritage sensitive areas
- Track work to remove existing rail joints
- Complexity of the system – increase in design and construction cost
- Additional system reset hardware and maintenance procedures

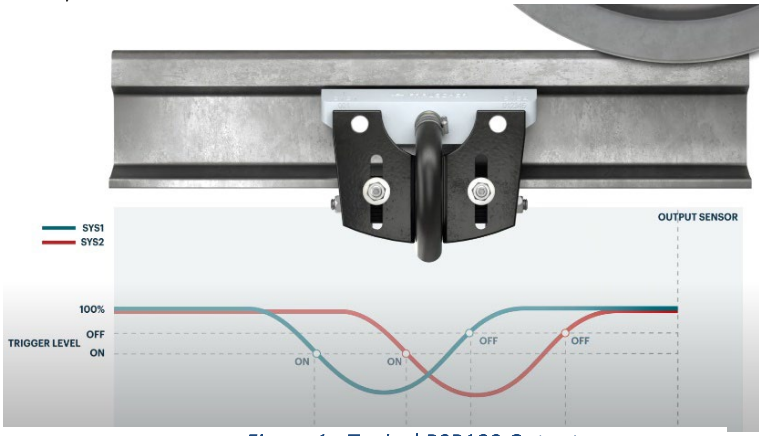
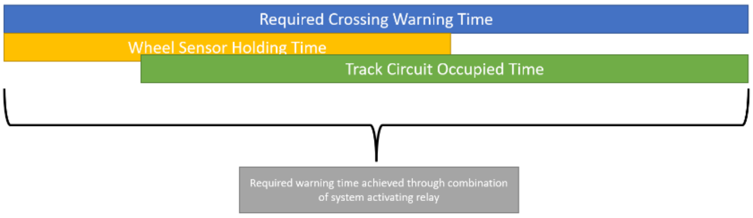


Figure 1 - Typical RSR180 Output

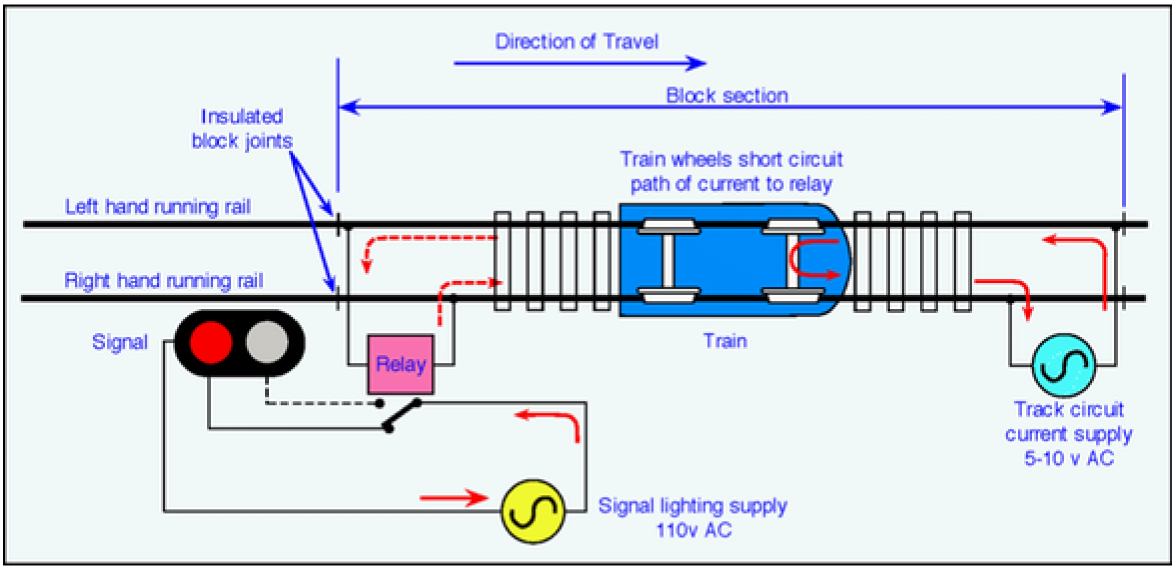
As such an alternate solution utilising identical hardware are proposed to act as wheel detectors. This reduces the complexity of the overall system by altering the functionality from “counting” to “detecting” while providing an additional layer of assurance for the track circuits.



The Frauscher RSR180 sensor will provide an output to the existing track circuit relay once the direction of the train has been confirmed (i.e., approaching the level crossing). This forces the relay down, indicating an occupied track.

Maximum system output time is determined by the length of the track section and rolling stock traverse time to avoid an occupied track with no train.

At the end of the holding time, it is expected that the track circuit will function as per required.



Thanks for reading

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