Speed Restrictions (including speeds caused by cyclic top)

What is the situation?

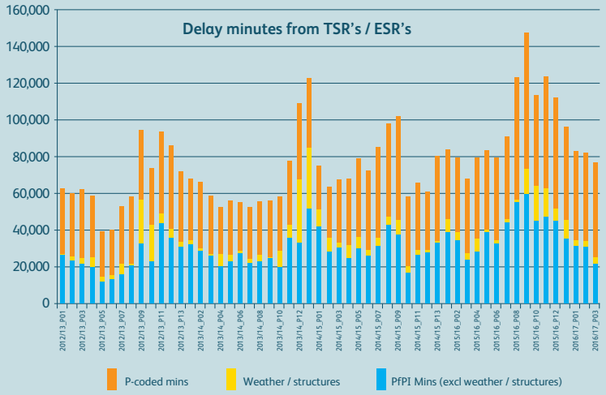
Temporary Speed Restrictions (TSRs) have reached an 8 year high. The main causes of Track TSRs are cyclic top faults, resulting in performance related delays to passenger and freight services. Cyclic top is a set of 3 or more equally spaced geometric wavelength faults which excite train vehicle suspensions (mainly freight), resulting in the risk of derailment.

Our ability to predict or detect cyclic top and other track related faults, which lead to TSRs is inconsistent and has resulted in the rise.

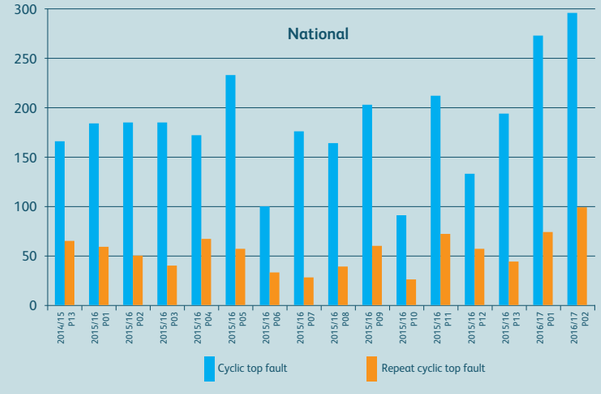
Lack of software to support TSR and Emergency Speed Restrictions (ESR) design on the frontline, results in poorly positioned ESR/ TSR equipment, leading to Wrong Side Failures and train delays.

TSR's can significantly affect train services contributing to performance delays, impacting on our customers and affecting our reputation.

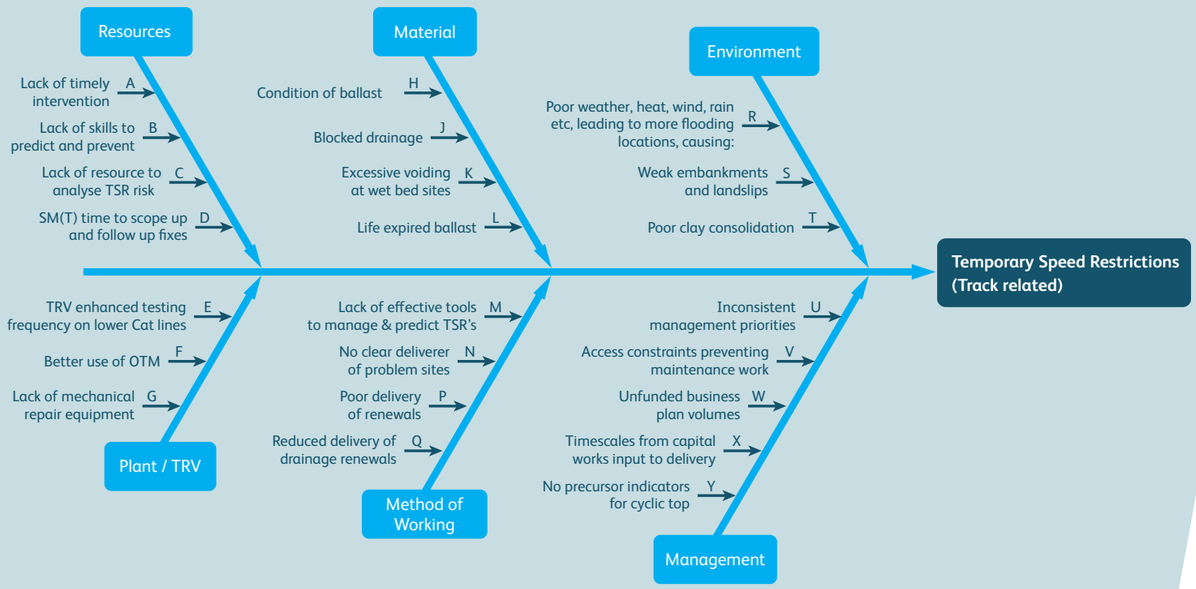
TSR delay min trends from 2012/13



TSR causes two year trend



Analysis of causes



Scope

We need to improve our ability to identify cyclic top faults and other significant geometry faults to reduce unplanned temporary speed restrictions.

In order to enhance this capability, further research is required on the wheel/rail interface and vampire modelling to develop an updated threshold report for cyclic top. This will enable the development of predictive algorithms for cyclic top deterioration.

This will provide decision support information to maintenance engineers to assess the condition and repairs required to eliminate the fault and therefore the risk of a speed restriction being imposed.

It is essential maintenance teams are provided with the relevant skills and tools to perform effective and robust repairs.

Priority problems

Specific priority problems

- Unable to identify sites with risk of TSRs.
- Unable to clearly define root cause of TSR and define action plans to correct.
- Unable to plan and align suitable resources and access to deliver scope.
- Poor positioning of ESR equipment due to lack of ESR design capability and understanding. Also lack of design system for ESRs within maintenance and works delivery.

Related goals

- Early identification and greater visibility of TSR at risk sites to intervene earlier and avoid TSRs.
- Development of tools, information and training material to aid frontline engineers' capability to identify and implement effective controls.
- Develop standardised processes and strategies for more effective and efficient targeting of sites to minimise imposing TSRs.
- 50 % reduction in the number of cyclic top TSRs by end CP5.
- ESR design system for improved management and positioning of ESR equipment to minimise wrong side failures and train delays.

To address these challenges it is expected that R&D actions will need to address the following issues:

- Is the current cyclic top algorithm consistent and accurate enough when aligned with more modern vehicle suspension behaviour?
- If there is a reduced threshold limit to enable earlier intervention to remediate faults?
- Is there sufficient data to produce deterioration trends and predictive reports that will aid more timely planning and repairs?
- Are there means to manually measure cyclic top more effectively with a readily available method of detection?

To improve the design and installation of ESRs, software is required that accurately calculates the positioning of equipment to avoid unnecessary risks to the safe running of trains. This software needs to use our topographical data of the network to account for any track obstructions and conflicts. A visual output to support frontline teams installing equipment at the correct locations would also be of use.

Expected impact & benefits

- The development initiatives will provide predictive information to engineers to enable earlier intervention and deliver robust repairs to prevent TSRs being imposed.
- An improved ESR design system will help improve compliance with standards and reduce the risk of unnecessary failures.
- These improvements will provide a significant benefit to a reliable and safe train service, while improving train performance and customer satisfaction.