Visual Track Inspection

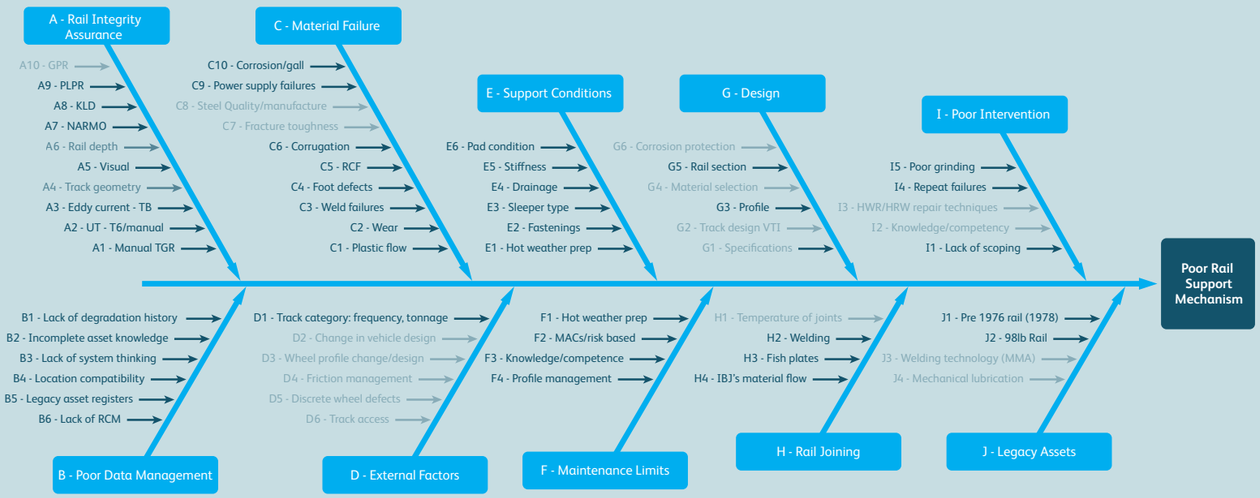
What is the situation?

Visual inspection is the underpinning inspection method used throughout all industries. As the railway becomes increasingly busy with the requirement to improve safety it has been policy to separate workforce from trains. This has led to increasing volumes of work being undertaken under possession and at night.

Programmes to automate visual inspection using train mounted video cameras aligned with location and geometry (PLPR – Plain Line Pattern Recognition) have started to replace track patrolling. Asset Information Services (AIS) manages the capture, analysis and reporting which is delivered to the routes. An annual programme of around 950 shifts utilising 5 trains delivers a 4-weekly cycle of inspections.

Undertaking visual inspection at night significantly reduces the ability of the inspector to see defects due to poor illumination and shadowing cast by lamps when compared to natural day light. Therefore, the risk of missing defects must be understood and managed.

Analysis of causes



Priority problems

Specific priority problems

- No access available.
- Improved detection.
- Data amalgamation.

Related goal

- Remove people from track.
- Reduced broken rails and improved safety.
- Earlier warning of track defect.
- Improved defect knowledge.
- Holistic risk control.

Benefit

- Improved workforce safety.
- Industry regulation measures.
- Less disruptive planning.
- Asset life extension.
- Safety improvement.

Scope

There is greater demand to run trains which reduces opportunities to maintain and inspect the track. Traditional methods of inspection cannot be achieved due to access restrictions therefore semi-automated train borne visual inspection systems are being used to replace manual patrolling.

Early detection of defects is desired to facilitate cost effective removal or provide enough warning to plan for a possession. Therefore, any improvements of the current processes are a welcome step forward.

Inspection at night where the ambient light levels are low is challenging, personal lighting is necessary to illuminate the components under inspection. Fixed box lighting and flood lights are used to assist with the inspections, but these can also cause environmental problems with light pollution and impact on lineside neighbours.

Automated visual inspection alone can generate too many reports to achieve the detection sensitivity desired, but combining other technologies can provide improvement. Projects such as the Intelligent Infrastructure programme are helping deliver the digital railway is considering this.

Specific research needs

To address these challenges further research and development will need to consider the following factors:

- Understand the detection criteria and risk associated with each defect type.
- Develop a visual inspection system to identify defects and areas of risk.
- Able to operate in all weather conditions (except covered by snow).
- Inspect track reliably at a minimum of 100 mph.
- Understand the assurance requirements and provide auditable records of inspection.
- Consider or provide a method to amalgamate other testing data into analysis to improve detection performance.
- System to manage defect population from inspection programme, compliance, detection and removal.
- Fully automated analysis of inspection using algorithms / neural networks.
- System has absolute position and compare change run on run.
- Fixed plant lighting – zero light pollution low energy.

Expected impact & benefits

More track inspection by train:

- Less people on track.
- Improved assurance.

Improved defect detection performance:

- Earlier warning for maintenance and repair leading to less disruption to the customer.
- Improved safety and reduced risk.
- Reliable data turned into useful information – delivering predict & prevent maintenance.

Combined data analysis:

- Improved detection capability.
- Localised risk mitigation possibilities for defect management.
- Rail life prediction and risk modelling possible with database/tools.

Improved relationship with lineside neighbours:

- Reduced light pollution.
- Reduced carbon footprint.