# Rail Running Surface  Inspection

## What is the situation?

Eddy current inspection has been introduced to assess the presence and severity of rolling contact fatigue (RCF) in rail to assist in rail treatments such as grinding or milling. Ultrasonic inspection remains the safety critical inspection method.

Eddy current inspection is well established testing method, but has not been used in the UK for rail maintenance inspection due to difficulties with data management and testing probe reliability.

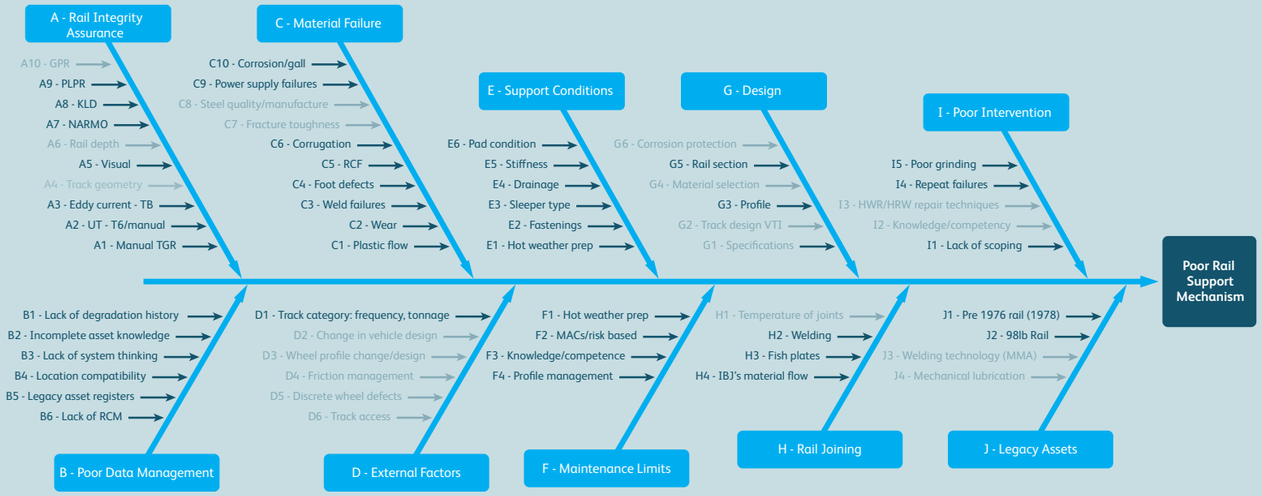
*fig1.*

*fig2.*

Network Rail's current supplier designed a probe array within a rubber wheel which is robust and operates at 30 mph when ultrasonic testing.  Data is captured and post-test analysed providing a report for the deepest crack at a resolution of every 1m.

Large amounts of data and correction for positional errors common to trainborne inspection is challenging, with work ongoing to improve repeatability and reliability of data.

## 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 trainborne visual inspection systems are being used to replace manual patrolling.

Early detection of defects is desired to facilitate cost effective removal by grinding, milling or provide enough warning to plan for a possession to re-rail. Therefore improvements to the current processes would be a welcome step forward.

Obtaining reliable degradation information for defects is dependent on locational accuracy (sub 1 metre) and the repeatability of the inspection system. Using a contact system at speed is challenging particularly when reliability and repeatability is important.

Surface crack measurement systems generate many reports and defect management tools are needed to manipulate data and provide run on run degradation data, but combining this other data technologies would 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.
- Trainborne location system to provide absolute position run on run.
- Inspection system to identify surface breaking defects accurately and repeatable.
- Able to operate in all weather conditions.
- Inspect track reliably at a minimum of 60 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 to identify features – welds, work hardening, material changes, etc.

## Expected impact & benefits

**Improved defect detection and management 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.

**Rail life extension:**

- Improved rail treatment based upon improved data.
- Possibilities of identifying RCF before cracks occur?