

# Intelligent Assets and Condition Monitoring

## What is the situation?

Our challenge is to improve the Asset Condition Monitoring process and implement it across the network. One of the main goals is to enable us to make more informed decisions about maintenance and renewals. Improving asset

management through Intelligent Asset and Condition Monitoring will deliver a safer, more reliable railway that costs less to manage in the long-run.

Based upon consideration of asset failure characteristics, and the experience of European railway operators who have implemented condition monitoring equipment, we believe that a significant percentage of failures can be prevented by an effective Intelligent Asset and Condition Monitoring process. It is an area that we have focused on as a key enabler to move from a 'find and fix' approach to one of 'predict and prevent'. In terms of E&P equipment, the failures that have been identified as having the potential to be prevented by the Intelligent Asset and Condition Monitoring system include the following Overhead Line Equipment (OLE) failures:

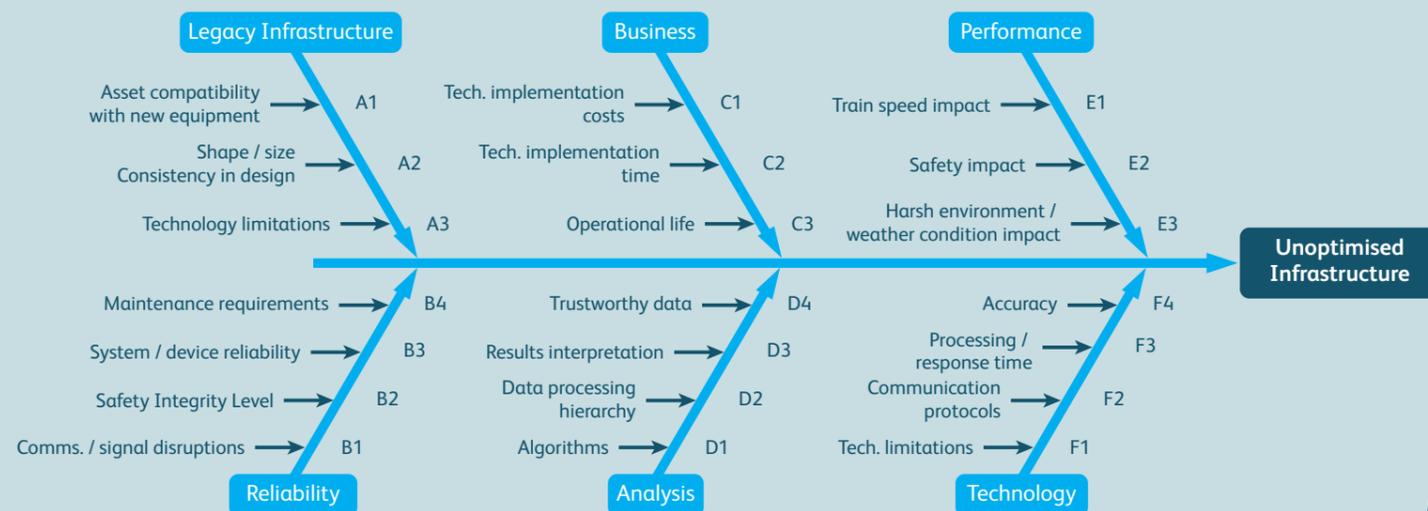
- Damaged droppers and dropper wires.
- Damaged conductor wire.
- Broken or displaced Insulators.

Currently we are experiencing an increasing trend of dropper failure due to fatigue of the dropper wire. Simple analysis of overhead line dropper failures provides the evidence to highlight the benefits Intelligent Asset and Condition Monitoring could generate if implemented. In the majority of cases it is expected that the failure's root cause could be prevented by utilising a system of devices such as ruggedised train roof mounted cameras and sensors.

R&D activities are required to unlock the following ambitions:

- To reduce the maintenance cost and time-related to E&P infrastructure failures.
- To reduce the number and duration of train delays/cancellations related to E&P infrastructure failures.
- To improve timetable reliability due to more reliable infrastructure.
- To improve the asset management process.

## Analysis of causes



## Scope

The overall scope of the challenge is to investigate the potential for new technologies and techniques to support the ambition of Intelligent Asset and Condition Monitoring. The enablers for this are:

- Network-wide asset data capture and inspection. Utilising in-service vehicles and portable monitoring equipment.
- Intelligent Assets that inform the Asset Management process.
- New techniques to analyse and translate monitoring data to unlock 'predict and prevent' maintenance activities.

## Priority problems

### Specific priority problems

- Development of new tools, techniques, equipment and understanding to improve the reliability of E&P assets as part of the Contact System and Distribution infrastructure.

### Related goals

- Improve the industry's understanding of the failure mechanism and optimise the reliability and design life of droppers.
- Improve the efficiency and accuracy of overhead line equipment asset data capture through:
  - Pattern recognition technology on in-service vehicles;
  - Pantograph gauging of OLE and fixed infrastructure;
  - Real-time object recognition and analysis for Pantograph cameras.
- Portable Vacuum bottle integrity monitoring
- Design and development of a new non-contact manual gauging tool for conductor rail. The train-borne fleet cannot cover 100% of the network and the industry needs the capability to carry out measurements manually.

### Benefits

- Reduction in the number of dropper failures incidents, and associated train delays.
- Automated inspection process, which is quicker, safer and more cost-effective.
- Increased understanding of Contact System condition compliance in line with Asset Policy as a result of better data coverage and accuracy.

- Development of new tools, techniques, equipment and understanding to improve the efficiency and effectiveness of the Asset Management process.

- Design and development of automated earth testers for proving earth farms for Signalling Power equipment.
- Design and development of Intelligent Insulation Monitoring for Signalling Power Supplies.
- Remote detection of parted conductors including:
  - Parted wires in the Contact System (e.g. Auxiliary wires);
  - Discontinuities in Return Screening Conductors;
  - Measurement of conductor tension in station areas and the facility to automatically turn off the power under a wire break situation.
- Development of algorithms for high accuracy fault location, to support faster maintenance response to the correct location, in the a.c. network
- Development of algorithms for remote detection of high impedance and arcing faults on the a.c. network.
- Investigation on the use of QR codes, or similar technology, for recognition of components/assemblies/ design for use on site by staff.

- Ensures life-saving rules are followed by supplying an easily used and effective toolkit for isolations.
- Ensures people do not inadvertently encroach live parts by making identification of live components simple.

## Expected impact & benefits

- Reduced E&P maintenance cost and time.
- Reduction in the number of train delay minutes/cancellations related to E&P infrastructure failures.
- Improved timetable reliability due to more reliable infrastructure.
- Improved asset management process.