Case Study

Selection of an Inspection Technique for Assessing Corrosion in Passenger Rolling Stock

THE CHALLENGE

Many of the UK's passenger rolling stock fleets, particularly mid-life steel bodied rolling stock, suffer from a variety of corrosion related issues, including corrosion to primary structure. This can range from very localised corrosion, through to significant areas of material thickness loss. One of the primary structures of concern where significant levels of corrosion had been previous been identified was the solebar structure: the two main structural members which run the length of the rail vehicle at floor level. The solebar structure is a closed section, which was being corroded from the interior of the section, and hence was not externally visible.

Our challenge was to evaluate and select an inspection technique which could be applied across the entirety of the rolling stock owner's mid-life steel bodied rolling stock fleet.

OUR SOLUTION

In collaboration with the rolling stock owner, we performed a requirements capture, identifying the requirements of the inspection technique in terms of factors such as performance, ease of use, user competency, inspection time and cost. Based on these requirements we conducted a technology review to identify candidate techniques and perform an initial down-selection of those techniques that were most likely to be successful. This review included a review of information from a wide range of industries, where similar challenges are encountered.

In collaboration with a university, we developed a series of bench top tests using corroded specimens in a variety of different states e.g. corroded plates with corrosion debris attached, corroded plates, with corrosion debris removed by grit blasting, varying paint thicknesses, presence of moisture in the corrosion debris. Each test plate was characterised using a contact measurement technique to allow a direct measurement of condition.

Using the test specimens equipment suppliers were invited to undertake blind trials of their inspection equipment on the test specimens. The results from these tests were statistically compared to the contact measured data to support the technical evaluation of the equipment. During the trials, additional information was obtained, including requirements for operator competency and training, capital cost of equipment, inspection times etc.

Using the information obtained from the blind tests, a Multi-Criteria Decision Analysis (MCDA) was performed in collaboration with the rolling stock owner to assess the overall performance and operation of each technique / equipment that was evaluated during the trial.

THE RESULTS

Based on the findings from the blind trials and Multi-Criteria Decision Analysis, an inspection technique was selected which fulfilled the requirement, while also being cost effective to deliver both in terms of capital expenditure and operating costs for the inspection.

Subsequent to the selection of the equipment, inspection procedures were developed, and the technique has been used to inspect in excess of 40km of rail vehicle structure.

To manage and aid operational decision making, a toolset was developed which allowed the easy visualisation and interrogation of the significant amounts of data captured against a series of defined limits. This tool has allowed Frazer-Nash to manage the inspection programmes on behalf of the rolling stock owner in a robust, efficient and traceable way.

The data captured in ultimately being used to provide the rolling stock owner with an understanding of the condition of their asset, and associated risk. This allows the rolling stock owner to make pro-active risk, programme and financial decision based on a reliable dataset.

Client

Confidential

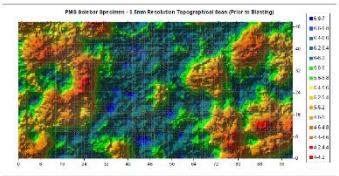
Business need

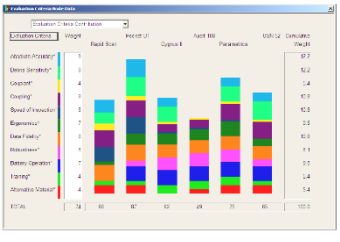
Corrosion to passenger rolling stock structures is a common issue. Traditionally, visual inspection techniques are not suitable for many structures, due to the location of the corrosion, and access constraints. A new approach was needed to select an inspection technique which managed the requirement for inspection accuracy, against the cost and time to perform the inspections across a large fleet of passenger rolling stock.

The data captured from the inspections allows the rolling stock owner to make pro-active risk, programme and financial decision based on a reliable dataset.

Why Frazer-Nash?

Frazer-Nash was able to combine our experience in non-destructive testing in a broad variety of industries, detailed knowledge of rail vehicle structures, and a structured methodology for decision making, to select an optimum technique.





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