Holistic Asset MANAGEMENT

CASE STUDY

Superior Insights Improve Reliability, Availability and Maintainability for Light Rail Rolling Stock Assets

Holistic Asset Management (HolisticAM) partnered with a light rail operator to provide reliability engineering expertise to build Reliability, Availability and Maintainability (RAM) baseline modelling to develop Asset Class Strategies (ACS) for each rolling stock system across 10 classes of trams. The RAM model offers superior insights into lifecycle cost and asset performance. This provides a rationale for the choice of maintenance and renewal activities and determines how the assets should be managed to meet the performance objectives of the Asset Class, and the broader Asset Management Objectives. The output from the RAM model forms the key input into the development of Technical Maintenance Plans (TMP), which are a part of the Asset Planning Process.

Rail Sector

The Challenge

- Failure reduction was not progressing at an acceptable rate.
- Maintenance needs were not clear.
- A lack of understanding of the impact of TMP changes before implementation (what-if analysis and performance estimates).
- There were multiple asset classes with different classifications at system and sub-system level.

As a result, the client was spending time and resources changing maintenance regimes without knowing the impact they would have on operational availability and level of assurance of performance.

The new approach was needed to understand the current performance level of each asset class at system and sub-system level and determine the most effective way to improve system performance through design improvements or maintenance planning. It would also need to identify vulnerabilities in the system and determine the most effective way to reduce risk by balancing performance and cost.

The Solution

HolisticAM delivered a RAM model at system, sub-system and component level. The RAM study included data analysis, FMECA, Weibull analysis, and a Reliability Block Diagram (RBD) for each asset class.

Data analysis – The first step in the RAM study was to perform a purge and filtering of the obtained data to improve their quality. In this data purging process, several different aspects were considered, including the treatment of absent values, usefulness of the records and identification of erroneous data. Generally, the purging process includes detection and elimination of anomalies, errors and inconsistencies, along with integration and/or consolidation when there are several input sources. Once the data had been cleansed, Pareto Analysis was conducted for each system-subsystem-component level for 10 asset classes.

FMECA – ReliaSoft XFMEA tool was used to conduct an FMECA study of each system at component level to identify its functions, functional failure, failure effects, failure causes, current controls and Risk Priority Number (RPN). Each asset class system hierarchy was built based on the EN 15380-2 standard to standardise the asset classification hierarchy structure.

Failure Distributions – ReliaSoft Weibull++ tool was used to model failure distribution to calculate Beta, Eta and q value.

RBD – ReliaSoft BlockSim tool was used to construct system – component level RBDs to provide a comprehensive platform for system reliability, availability, maintainability and related analyses.

Modelling – RBDs were modelled with failure distribution (reliability) and maintenance characteristics (a corrective task and/or scheduled tasks) which included crew policies and spare parts policies.

Critical and Sensibility Analysis – The critical and sensibility analyses were carried out as result of simulation where possible to detect which sub-system and component had more impact on system operational availability and system reliability.

Failure Reporting, Evaluating and Display (FRED) Reports – These reports provided a graphical demonstration of the reliability and maintainability/availability characteristics of each component in the system and helped to identify the components that may require improvement.

More details about RAM model:
https://www.holisticam.com.au/services/reliability/

The Results

A baseline RAM model has been established, resulting in proper identification of bad actors, identification of areas of vulnerability which can affect operational availability and quantification of which systems/components and associated maintenance activities dominate downtime. With this knowledge, the system design can be optimised, including its configuration, level of redundancy, component selection and supporting maintenance strategy. As well as suggesting tangible improvements, a RAM programme provides confidence that the system will meet its operational targets and support wider project decision-making.

Next step - Treat these RAM models as living documents (assets) that collect more data and improve with time, and update RBDs and/or RCM (system hierarchy). Used appropriately, RAM modelling is an effective tool for assessing system reliability, availability and maintainability, and is crucial to support the Asset Life Cycle Planning Process.

Our Asset Management and Reliability Specialists offer a powerful combination of industry expertise, subject matter mastery and dedication to delivering excellence for our clients, stakeholders and each other. Combine this with the application of the ReliaSoft software, (inclusive of sales, training and direct access to ReliaSoft's global resources) will ensure any project has the resources for success.

If your organization does not have sufficient time, expertise or objectivity in-house to accomplish specific reliability goals, turning to our reliability experts can prove to be the most effective and economical solution.