FUJITSU

Pacific National

Data science identifying fleet wheel wear characteristics

Pacific National captures and processes high-speed images of wheelsets to determine key measurements for condition monitoring. It engaged Versor, a Fujitsu company, to develop an AI-enabled solution to calculate wagon and locomotive wheel wear characteristics and identify optimal and poorly wearing vehicle wheelsets from these measurements.

Challenge

Pacific National wanted to enhance the value of its data from high-speed cameras that monitor the condition of its wheelsets. It needed a data analysis platform to assess the data generated and provide new insights.

Solution

Pacific National engaged Versor to create an AI-enabled solution to assess the data generated. The new solution is based on Databricks and Azure, which analyses millions of data points over 12 months, calculates wear rates and identifies wheelset wear rates for a range of key parameters.

Outcomes

- Faster fault wear rate calculations, quickly identifying the bad actors and good performers in the fleet
- Improved decision making by isolating changes in performance
- Improved safety and service through condition monitoring and action

"By identifying bad actor locomotives and wagons, we can extend wheelset service life, minimise downtime, shunting, and wheelset changes. This improves our availability and reliability while reducing unit costs."

Bruce Brymer, Manager Reliability Engineering and Train Systems, Pacific National

Monitoring wheelset conditions to avoid wear and tear

Pacific National runs nearly 12,000 active wagons delivering freight around Australia. However, over time, the wheels on these vehicles wear out, which means they must be closely monitored to avoid costly breakdowns. The challenge is that the wheels are made of steel, making fault detection difficult.

The company invested in high-speed cameras to monitor wheel condition across its fleet, however it also needed a smart data analytics solution to discern whether there were faults by drawing on the existing data hub. Its legacy system relied on time-consuming manual intervention and wanted to fast track the development of wheel wear analysis with the volume of data generated. Ideally, Pacific National wanted to create a wheel wear league table that would allow it to rank wagons and develop tactics to extend service life.

"Data flows into our condition monitoring database, FleetOne, where we manage the alerts and review the history for the wheelsets. Wheelsets that are identified to have exceeded allowable thresholds have an alert reviewed and a service request is generated in Maximo," explains Bruce Brymer, Manager Reliability Engineering and Train Systems at Pacific National. "We collect profiles and review them manually and manage the removal from a spreadsheet generated from Maximo. However, the enormity of the task meant that we needed additional resources to do the league table assessment."

Introducing a customised AI platform

As the incumbent supporter of Pacific National's transport management system (TMS), Fujitsu was invited to recommend a solution, and introduced the newly acquired Versor team that specialises in data engineering, advanced analytics, and data science services powered by AI and machine learning (AIML).

Using a series of agile sprints, over the course of just six weeks, the Versor team developed a solution which draws on data from the high-speed camera images (IEM), train management (TMS) and asset management system - Maximo. The data is collated in a Databricks data lake, hosted on Azure, and then AIML provides the ability to robustly compute and report the rate of wear across the fleet. The solution works by picking out the required wheel measurements, looking at the long-term trending of those measurements and then applying statistical analysis to them. These computations require delicate handling of statistical outliers, both from systematic errors in the pipeline as well as random noise.

"We can now review the fleet en masse, comparing between different classes, and within a class of wagon or locomotive to see which rolling stock are wearing best and worst and investigate the differences," continues Brymer. "This means we can undertake corrective actions to reduce wheel wear."

1.82mm/ 3e8m

max flange height rate of change for any wheelset

Detailed fleet condition monitoring

Pacific National can now create a wheelset league table, which can be sorted with minimal manual intervention and no need for time-consuming spreadsheets. This enables total visibility of its fleet, allowing it to identify the worst performing vehicles and investigate the cause and rate of wear.

Naturally, that reduces costs by taking poorly performing wagons out for repair or replacement before they cause network delays. Furthermore, by identifying anomalies, Pacific National can improve safety and service by proactively guarding against them. This predictive maintenance can also reduce fuel consumption and extend the lifecycle of assets.

"By identifying bad actor locomotives and wagons, we can develop strategies to extend wheelset service life which will reduce downtime, shunting, and wheelset changes," concludes Brymer. "This improves our availability and reliability while reducing unit costs for both OPEX and CAPEX items."

Fujitsu

enquire@fujitsu.com
Tel: +61 2 9776 4555