THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

UQ Materials Performance and Investigations

Increasing the availability of locomotives and rollingstock

For the rail industry, continuous improvement of locomotive and rollingstock availability is crucial to maintaining productivity, prioritising safety and reducing operating costs. Enhancement of availability requires access to expert investigations in cases of materials defects, premature deterioration and insufficient component life.

UQ Materials Performance specialises in the investigation of materials defects, mitigation of risks associated with fatigue and advice in relation to asset life extension.

Our services

UQ Materials Performance

Founded in 1998, UQ Materials Performance provides professional consultancy, expert opinion and contract research services in materials engineering, with a focus on component failure investigations. UQ Materials Performance has grown to become one of Australia's leading consultancies in the field of materials science and engineering.

UQ Materials Performance expertise spans:

- Materials and mechanical failure investigations
- Microscopy, materials analysis, characterisation and testing
- Stress analysis and mechanical design evaluation
- Wear mitigation and durability evaluation
- Expert opinion and forensic engineering.

UQ's specialist equipment used by UQ Materials Performance includes:

- Stereo microscopy
- Scanning electron microscopy and EDS microanalysis
- Fourier transform infrared spectroscopy
- X-Ray photoelectron spectroscopy
- X-Ray diffraction
- Atomic force microscopy.

Our work with Aurizon

Over the past five years, we have carried out numerous investigations on a broad range of components for Aurizon, Australia's largest rail freight operator. These engagements focussed on greater wagon productivity, addressing coal wagon component defects, remaining life prediction and extension and recommendation for design improvements.

Substantial work has been done by UQ Materials Performance materials and mechanical engineers to investigate: Aurizon coal wagon welding for repair and modifications; mid-length axle fatigue cracking; axle journal fretting fatigue; wheel metallurgical characterisation; defects and damage in drawgear yokes, knuckles and pins; yoke weld repairs; and drawgear carrier casting quality assessment.

In spite of current challenges in the resources sector, including volatile commodity prices and global competition, Australia's freight task is expected to increase substantially over the next decade. In an environment of lower prices and increasing volumes being shipped, it is imperative that the rail industry reduce production costs and improve cost efficiency while continuing to operate safely.

Aurizon is improving productivity by an increase in the availability of locomotives and rollingstock and the implementation of innovative maintenance practices. UQ Materials Performance has been retained by Aurizon to recommend innovative coal wagon design improvements to increase wagon life and reduce maintenance costs.

UQ Materials Performance has also advised on drawgear components, the performance of which affects train unit performance and with particular relevance to longer trains being employed by Aurizon to reduce overall fuel costs and improve availability.

Aurizon runs 53 trains daily on the Central Queensland Coal Network (CQCN) servicing the Bowen Basin. With a fleet of over 200 locomotives and some 6000 wagons and one of the world's busiest coal networks, increased axle and wheel life though better understanding of the causes of defects and premature degradation has a crucial impact on Aurizon's business performance.

In the worst case, unexpected failure of wheels, axles and drawgear can cause train separations or even derailment of multiple wagons. If they occur, such events can have adverse effects on railway personnel, and can result in major loss of network capacity and productivity. Major incidents of this type can result in significant disruption and costs in terms of repairs and lost production, of the order of $9m to $15m.

UQ Materials Performance advice has significantly contributed to reducing the risk of derailments caused by wagon failures and so reduced Aurizon's potential lost production costs.

UQ Materials Performance materials science researchers and engineers have made a significant contribution to keeping Aurizon's coal operations and the supply chain efficient and safe through metallurgical inspections of wagon components, the provision of advice on the causes of failure and recommendations for changed operational, engineering maintenance, inspection and metallurgical practices.

Consulting and Research Expertise specialises in industry-university collaborations, global technology transfer, and provides access to The University of Queensland's world-class expertise, intellectual property and facilities.

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