

Helping Australian Industry Improve the Reliability of Rail Welds

Overview

The integrity of rail welds is key to increasing reliability and reducing maintenance costs in the railway industry. Aluminothermic and flash-butt welding techniques are widely used by the Australian rail industry to form continuously-welded rail. These welding techniques are cheaper and provide increased flexibility (eg for emergency repairs), however they are less reliable.

Along Australia’s heavy-haul railway lines, up to 70% of all rail failures are caused by aluminothermic weld failures. This type of weld fails more often because of the inherent nature of the process (which produces a cast weld), and the operator-dependability of the process, resulting in welds of variable quality. Investigating the fatigue behaviour of aluminothermic rail welds can help the railway industry improve their integrity and reliability. Welding procedure variables such as preheating can strongly influence the joint’s performance. Detailed residual-stress measurements in the weld and heat-affected zone provide valuable data for fatigue analysis. The Institute of Railway Technology (IRT) is currently developing an experimental approach to predict fatigue behaviour in these welds. Obtaining accurate data about residual stresses can help more accurately predict the life span of these welds.

The [Bragg Institute’s](#) contribution

The [KOWARI Strain Scanner](#) was used to non-destructively measure residual stresses in a full-scale welded rail joint. Stresses were measured in several samples produced by Railtech Australia, to investigate the influence of the preheating conditions. The results showed that by optimising the welding procedure, the company could reduce detrimental residual stresses within critical parts of the weld. These measurements were provided to IRT for further assessment.

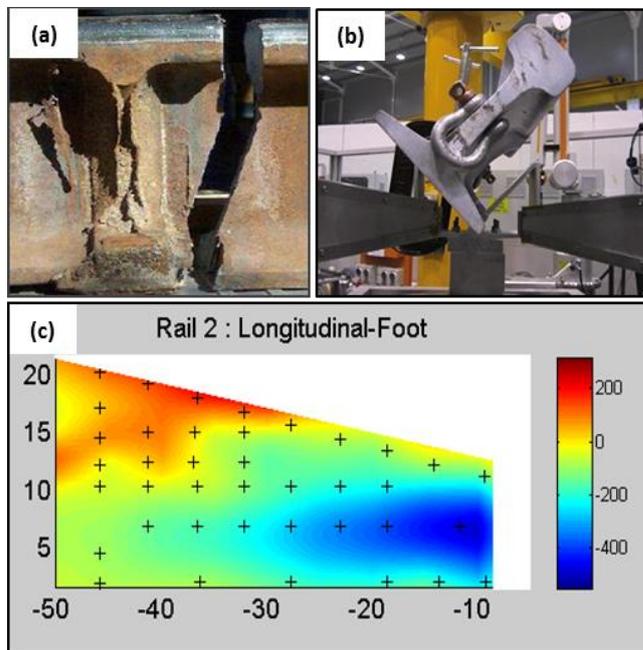
Collaborators



More information

[1] Khodabakhshi, B; [Paradowska, AM](#); Ibrahim, R and Mutton, PJ, Measurement of Residual Stresses in Aluminothermic Rail Welds Using Neutron Diffraction Technique, *Mater. Sci. Forum* 777, 237-242, 2014

If you have any further questions please contact industry_bragg@ansto.gov.au



(a) Fractured rail due to weld joint
 (b) Rail sample on the KOWARI instrument
 (c) Stress distribution in the foot of the rail