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Residual Stresses, Metallurgical and Mechanical Properties of Laser Cladded Rail

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Australia is home to the world's seventh longest railway network, over 40,000km in length, which is depended upon for passenger and freight transport. Whilst the continued surge in rail infrastructure development brings economic growth, it also results in rapid rail degradation due to the direct wheel-rail head contact under high axial loads resulting in wear and rolling contact fatigue (RCF).

Laser cladding is a promising maintenance strategy to regenerate the rail surface by using a high energy laser to metallurgically bond a metallic powder to the substrate surface, forming high-quality, hard facing layer. However, the highly localised heat input and repeated cycles solidification, thermal expansion coefficient mismatch and phase transformations all contribute to a high residual stress state which is detrimental to the rail fatigue resistance when combined with the rail-wheel contact stresses.

The aim of this project is to develop a novel cladding alloy, SS415, that has the combined advantages of excellent abrasion resistance, hardness and improved toughness which will increase the service life of hypereutectoid rails. A low residual stress state in the clad rails is imperative for rail performance and accurate evaluation of residual stresses using non-destructive neutron scattering techniques is critical in the prediction of fatigue life.

Our first residual stress measurements on a SS415 clad rail were taken on Kowari strain scanner at ANSTO. The preliminary results will be discussed and correlated with the metallurgical and mechanical properties of the laser repaired rail.

Speakers Gender

Female

Travel Funding

Yes

Level of Expertise

Student

Do yo wish to take part in the poster slam

Yes

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