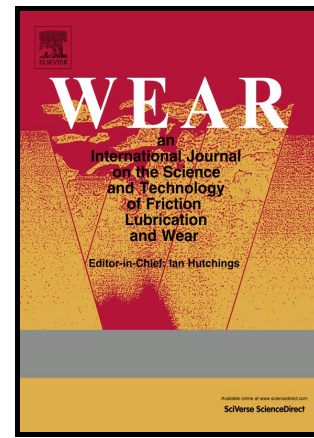


MICROSTRUCTURAL CHARACTERISATION
OF ROLLING CONTACT FATIGUE DAMAGE
IN FLASHBUTT WELDS

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Welsby



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ABSTRACT

The development of premium heat treated rail steels with hardness levels of 400HB and above, and the application of these under high axle load conditions, has provided substantial improvements in rail lives. An additional benefit is the potential to increase the intervals between consecutive grinding cycles, where rail grinding is used to control rolling contact fatigue damage. Increased grinding intervals will, however, place more emphasis on the performance of rail welds which are more sensitive to localized rolling contact fatigue damage than parent rail. The increased sensitivity to damage at welds arises from the inherent variability in material characteristics, and may vary between welding procedures, and for any particular welding process, between rail grades.

A detailed microstructural examination of the characteristics associated with flashbutt welds in the new condition and after exposure to service conditions which resulted in gauge corner cracking has been performed in order to correlate the development of rolling contact fatigue damage to the underlying microstructure. Of particular interest were the behaviour of the softened (heat affected) zones and the role of grain boundary networks of pro-eutectoid cementite which may develop during welding of hypereutectoid rail steels. Understanding the effects of these microstructures on the material response to wheel rail contact conditions, and using this information to develop improved welding

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