

A Quantitative Method for Predicting Wheel-flat Dimensions Generated during Braking

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Wheel flats generated during braking cause noise, vibration, and damage to track infrastructure. However, due to measurement difficulties under severe thermomechanical conditions, their formation and growth mechanisms remain insufficiently quantified. This study proposes a practical method for predicting wheel-flat dimensions based on a one-way coupled analysis that integrates vehicle dynamics and wheel–rail frictional heat analyses. By accounting for temperature-dependent material properties and contact ellipse growth, the proposed method quantitatively predicts wheel-flat dimensions. Validation against field measurements demonstrates good agreement, confirming the method’s applicability for evaluating influential parameters governing wheel-flat development.