

Experimental and Theoretical Studies on Impact Noise Generation on Rail Joints

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When a train passes over discontinuities on a rail, e.g. rail joints, impact noise due to the discontinuities is generated. In this paper, an attempt to understand the impact noise generation mechanism experimentally and theoretically was made. First, by performing static and running tests, vibratory properties of the track and wheel were investigated. Second, on the basis of the measurements in the tests, a theoretical model to predict impact noise was constructed. In the running tests, for both the wheel and rail vibrations, the measured A-weighted levels at three rail joints showed an increase of about 9 dB doubling a train speed. Also, by using the measured results, the respective contributions of the noise from the wheel, the rail and the sleeper to the total impact noise at one rail joint were estimated quantitatively. By using the prediction model, the overall trends of noise were well predicted. Also, the model gave an estimate of the respective contributions of the wheel, the rail and the sleeper to the total impact noise at the rail joint, and the predictions showed a good agreement with the results obtained from the measurements.