

## Suppression of impact oscillations in a railway current collection system with an additional coupled oscillatory system

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*Abstract:* The railway current collection system consists of a wire and a pantograph. The wave like wear on the surface of an overhead rigid conductor line can cause the contact loss between the conductor line and the pantograph. In order to explain the dynamical features of this problem, the essential model of the impact oscillations between the pantograph and the rigid conductor line has been proposed from the experiments on the actual pantograph system. This model consists of a single-degree-freedom system and the external exciting source that is pushed against the system. In the previous study, in order to suppress the impact oscillations, we add an oscillatory system coupled to this model. When the exciting frequency is near the second mode natural frequency, the impact oscillations between the main mass and the external excitation source is suppressed. We conducted a series of experiments in order to verify this theoretical result. The experimental results also reveal this suppression of the impact oscillations. Therefore, when the second mode natural frequency momentarily follows the excitation frequency, the suppression of the impact oscillations in a wide frequency range is expected. In this study, we propose the control method to suppress the impact oscillation of a main system. In this method, the stiffness of the main system is changed so that the second mode natural frequency is always near the excitation frequency.

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