

عنوان مقاله:

Aerodynamic Characteristics of High-speed Train Pantographs Based on Jet Flow Control

محل انتشار:

دوماهنامه مکانیک سیالات کاربردی، دوره 17، شماره 7 (سال: 1403)

تعداد صفحات اصل مقاله: 16

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خلاصه مقاله:

The pantograph is a critical instrument that significantly affects the aerodynamics of high-speed trains, posing a considerable challenge to the energy conservation and environmental protection of trains. This study explores the feasibility and efficiency of a jet-flow control technique in optimising the aerodynamic characteristics of the pantograph. A numerical method was adopted to investigate the effects of various jet-flow parameters, such as the jet positions, velocities and jet-slot widths, on the flow changes around the pantograph and subsequent reduction in aerodynamic drag of the pantograph. The results show that the impact of the jet position is negligible when the jet velocity is lower than the train speed. The aerodynamic drag reduction rate decreased with increasing distance from the pantograph as the jet velocity increased. When the distance between the jet slot and pantograph is less than 0.6 times the height of the pantograph, the aerodynamic drag reduction rate continuously increased with the jet velocity. As the jet slot moved away from the pantograph, the aerodynamic drag reduction rate initially increased rapidly with the jet velocity and then gradually decreased when the velocity surpassed 1.2 times the train speed. In addition, the aerodynamic drag of the pantograph decreased as the width of the jet slot decreased. However, the energy of the whole train can be only saved when the jet velocity is below 0.6 times the train speed. Findings in this study verified the effectiveness of the jet-flow method in reducing the aerodynamic drag of pantographs and provide important engineering guidance for the energy-saving of high-speed trains.

کلمات کلیدی:

pantograph, Jet flow control, Aerodynamic Drag, flow velocity, Wake vortex

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