

Analysis of Flow over Roof of Train Running in a Tunnel

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A pantograph mounted on a high speed train roof is exposed to high-speed air flow while traveling and lift is generated at the pantograph. In order to ensure high current collecting performance of the pantograph, it is important to adjust properly the lift generated at the pantograph. Velocity of a flow over a train roof has a great influence on the lift. Although the velocity of the flow at the pantograph head position in a tunnel is estimated to be approximately 1.2 times as large as the train running speed by a one-dimensional pressure fluctuation analysis, the velocity of the flow measured by an on-track test is larger than that predicted by the one-dimensional pressure fluctuation analysis. In this paper, in order to investigate the causes of this difference, we carried out a three-dimensional computational fluid analysis of the flow over train roof running in a tunnel. As the causes of the difference, we studied an effect of a boundary layer that develops on train body and tunnel surfaces and that of pantograph shields. We also proposed a simple calculation method to calculate the flow velocity over the roof of the train running in the tunnel using a personal computer.