NUMERICAL STUDY ON THE EFFECT OF INDONESIA–CHINA HIGH-SPEED RAILWAY (KCIC) VELOCITY ON A WALL AT ONE SIDE OF THE RAILWAY TRACK AT A DISTANCE OF S/H 1.9345

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ABSTRACT

The Indonesia–China High-Speed Railway (KCIC) is a high-speed transportation system that generates significant aerodynamic phenomena when operating near buildings or walls along the railway track. The interaction between airflow, the train body, and the wall may affect pressure distribution, drag force, and airflow patterns around the track area. This study aims to identify the effect of airflow velocity variations on the pressure coefficient, drag coefficient, and airflow characteristics between the high-speed train and the building wall at a distance ratio of $\frac{S}{H}$ 1.9345. The method used in this research is a numerical simulation based on Computational Fluid Dynamics (CFD) using ANSYS Fluent software. The train model was simplified into a two-dimensional (2D) geometry under steady flow conditions. The airflow velocity variations used in this study were 70 m/s, 83 m/s, and 97 m/s. The simulation results show that the presence of a wall on one side of the railway track affects the aerodynamic characteristics around the train. Under the wall condition, the drag coefficient values were higher than those obtained without the wall, namely 0.368 at 70 m/s, 0.366 at 83 m/s, and 0.364 at 97 m/s. Meanwhile, the drag coefficient values under the condition without the wall were 0.330, 0.329, and 0.328, respectively. These differences indicate that the wall causes flow constriction, which strengthens the aerodynamic interaction around the train. The pressure coefficient distribution shows that the maximum pressure occurs around the front or nose region of the train, while certain areas experience a pressure decrease due to airflow acceleration. The velocity

and pressure contour visualizations indicate airflow acceleration in the gap between the train and the wall, the formation of a high-pressure region at the front of the train, and wake flow behind the train. Based on the results, it can be concluded that velocity variations and the presence of a wall at a distance ratio of $\frac{S}{H}$ 1.9345 influence the drag coefficient, pressure distribution, and airflow patterns around the high-speed train. The results of this study are expected to serve as a consideration in planning safe building distances around high-speed railway tracks in order to reduce the aerodynamic impacts generated by train operation.

Keywords**:** *High-Speed Train, Aerodynamics, CFD, Drag Coefficient, Pressure Coefficient, Building Wall*.