Aerodynamic Brake Study of Reducing Braking Distance for High-Speed Trains

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Abstract : This paper presents an aerodynamic brake study of reducing braking distance for high-speed trains (HST) using aerodynamic brakes as inspiration from the applications on the commercial aircraft wings. In case of emergency, both braking distance and stopping time are longer than the usual situation. Therefore, the passenger safety and the HST driving control management are definitely obtained by reducing the time and distance of train braking during emergency situation. Due to the limited study and implementation of the aerodynamic brake in HST, the possibility in use and the effectiveness of the aerodynamic brake to the train dynamic movement during braking are analyzed and considered. Regarding the aircraft's flaps that applied in the HST, the areas of the aerodynamic brake acted as an additional drag force during train braking are able to vary depending on the operating angle and the required dynamic braking force. The HST with a varying speed of 200 km/h to 350 km/h is taken as a case study of this paper. The results show that the stopping time and the brake distance are effectively reduced by the aerodynamic brakes. The mechanical brake and its maintenance are effectively getting this benefit by extending its lifetime for longer use.

Keywords : high-speed train, aerodynamic brake, brake distance, drag force
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