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Thu-Mo-Po4.14-02 [109]: Research on Electromagnetic Feasibility of Non-contact Eddy Current Brake System for Ultra-high-speed Maglev Trains

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Recently, the national interest in transportation logistics is increasing due to the population aging and metropolization. And, it is a big issue for ultra-high-speed rail technology to meet a lot of demand in a short period of time. Germany has commercialized a 501 km/h train in Shanghai, China (2004), and the TGV in France is operating at 570 km/h. In addition, Japan is currently operating a high-speed magnetic levitation trains (Tokyo to Osaka) of 500 km/h. Korea, on the other hand, developed the high-speed train HEMU, which runs at 430km/h, and the maglev (magnetic levitation) train at Incheon International Airport is operating at a low speed of 110km/h. Most high-speed trains except for maglev trains have speeds of 200 to 350 km/h. Therefore, the ultra-high-speed trains need to develop maglev trains rather than ordinary wheel trains. The 'Hyperloop', which is being developed by Elon Musk as a starting point, is aiming at 1,280 km/h, and a 'sub-sonic capsule train' with a speed of 1,200 km/h is under development in Korea. As interest in ultra-high-speed train increases worldwide, it is focused on speed-up technologies. However, emergency braking is important to prepare for safety problems. Braking technology applied to conventional trains is classified into contact type and non-contact type, and contact types have a great disadvantage that the friction material is worn because it uses friction force. The non-contact type is classified as rail brake and an eddy current brake. This ordinary contactless eddy current brake is advantageous in that it does not generate direct friction on the wheels by applying magnetic flux to the rail. However, since the attraction force between the electromagnet and the rail is very strong, the rail may be twisted due to high heat generation. Therefore, it is necessary to develop technology for braking on ultra-high-speed trains of maglev trains, not wheel trains. In this study, we analyze the feasibility of rail-contactless new eddy current braking system using the electromagnetic software MAXWELL.

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