

Startup Characteristics of an Eddy Current Brake Using Capacitor Self-Excitation Phenomenon under Low-Speed and Large-Gap Conditions

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To explore the potential of electric braking in railway vehicle trailer cars, this study investigates capacitor self-excitation in eddy current brakes (ECBs) with the aim of enabling regenerative braking. While the characteristics under favorable conditions for self-excitation—such as high speeds and small air gaps—have been examined, the behavior under less favorable conditions, including low speeds and large air gaps, remains unclear. This study focuses on analyzing the behavior of the ECB under such less favorable conditions. Anomalous sustained excitation with small currents was observed, deviating from conventional behavior. From experimental and theoretical analyses, this phenomenon is presumed to be caused by the nonlinear magnetic properties of the secondary cores, including initial magnetization and magnetic saturation.