Development of a Superconducting Magnetic Bearing Able to support Large Loads in a Flywheel Energy Storage System for Railway Applications

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We have been developing a superconducting magnetic bearing (SMB) that has high temperature superconducting coils and bulks for a flywheel energy storage system (FESS). The FESS equipped with the SMB has been demonstrated at the mega photovoltaic power plant test site in Yamanashi Prefecture. The SMB that used superconducting material for both its rotor and stator was capable of supporting the flywheel which has the weight of 4000 kg without any contact, and has been operated stably for 5000 hours so far. Further increase of the storage capacity is required in order for the FESS to be applied to railways as the system that prevents cancellation of regenerative braking. In this paper, the development of the SMB which is able to support a large load of 147 kN using a new type coil structure for the improvement of FESS storage capacity is described.