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A Novel Quench Detection Method for SMES

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The major difficulty of the quench detection of the superconducting magnetic system (SMES) is that the pulsating voltage of the converter is much larger than the local normal-zone voltage of the HTS coils. It is therefore difficult to detect the quench of the superconducting coil (SC) with the voltage measurement method. This paper presents a novel quench detection method without additional sensors. The proposed method directly utilizes the converter voltage and current to identify the resistance of SC. The steepest descent method is proposed to estimate the SC resistance on line. And the online identification method is embedded in the controller of the SMES. It is therefore able to make the SMES respond to protect the SC instantaneously upon quench detection. Simulation result verifies the efficacy of the proposed approach.

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