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Wed-Mo-Po3.09-09 [71]: Fault Current Limiting Characteristics of a Small-Scale Bridge Type SFCL with Single HTSC Element Using Flux-Coupling

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In recent years, power devices using direct current are increasing rapidly. Especially, the development of renewable energy including photovoltaic power generation has led to the expansion of direct current (DC) power generation sources, so that interest in DC systems is increasing. However, the obstacle in the DC system is that dc circuit breaker (DCCB) is still under development. In this regard, it is necessary to appropriately apply the superconducting fault current limiter (SFCL) already developed for the alternating current (AC) system to the DC system.
Therefore, in this paper, a flux-coupling type SFCL using a single high-temperature superconducting (HTSC) element is proposed to mitigate the effect of DC short circuit. First, the operating principle and mathematical model of a flux-coupling type SFCL using a single HTSC element in a DC system are presented. After the fault occurrence, we analyze the current limiting operation and voltage characteristics of the DC fault current, the power load characteristics of each device, and the energy region characteristics of the two coils and HTSC element in the proposed SFCL. Experimental results show that applying this SFCL can help to suppress DC fault current, compensate for DC voltage drop and maintain power balance. As a result, the robustness of the low voltage direct current system for DC short circuit accidents can be greatly improved.

Primary author: KO, Seok-Cheol (Kongju National University)

Co-authors: Prof. HAN, Tae-Hee (Jungwon University); YU, Byunggyu (Kongju National University); Prof. KIM, Jihoon (Kongju National University); LIM, Sung-Hun (Soongsil University)

Presenter: KO, Seok-Cheol (Kongju National University)

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