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Analysis of Three Types of SFCL in Ship MVDC System

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Abstract—The superconducting current limiter has the advantages of small on-state loss, fast fault response speed, and strong current flow capacity. It can quickly limit the short-circuit fault current in the power system and protect the safety of power equipment. Superconducting current limiters can be divided into resistive current limiters, inductive current limiters and hybrid current limiters based on current limiting impedance. They all have their own application occasions, and the continuous advancement of high-temperature superconducting technology has made their application prospects broader. The medium-voltage DC power distribution system is the development trend of the ship's power system in the future. At present, with the rapid increase of the access power of the ship's power supply system, limiting the short-circuit fault current to the limit on-off capability of the protection equipment has become an urgent problem to be solved. DC superconducting current limiter is worthy of consideration, but there is a lack of application comparisons of various current-limiting topologies in medium-voltage DC systems. This article introduces three types of superconducting current limiters, including resistance type, hybrid type and magnetic flux confinement type, and will verify their respective advantages and disadvantages in current limiting effects through experiments, and evaluate the best one.

Index Terms—DC superconducting fault current limiter, MVDC system, short current fault

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