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Basic study of superconducting coils in rectifier transformers for railway electrification system

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Recently, the research and development of superconducting cables have been actively advanced all over the world. Particularly in RTRI, the research of superconducting cables for the railway electrification system (DC) is advancing. If the superconducting cables are used as a feeder of the railway system, the voltage decay could be significantly reduced. Therefore, DC High Temperature Superconducting (HTS) Electrification has many effects. For example, the reduction of transmission losses, the improvement of the regeneration factor, and the reduction of substations. However, since superconducting cables has no resistance, there is a possibility that the fault current such as ground fault or short-circuit is increased. In the rectifier substation, we receive power (high voltage, about 6.6 kV - 77 kV) from AC power system. It is lowered to AC 1200V by the rectifier transformer, and power is transmitted to the train as DC 1500 V by the rectifier. On the other hand, the development of superconducting transformer with current limiting function using a phase transition of the superconductor has been also advanced. It is expected that the fault current can be restrained by applying superconducting transformers as rectifier transformers. In this study, we investigated the basic study of the superconducting coil in the rectifier transformer for railway electrification system.

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