Operational characteristics analysis of a 10 mH class HTS DC reactor for an LCC type HVDC system

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Many kinds of high temperature superconducting (HTS) devices are being developed due to its several advantages. In particular, the advantages of HTS devices are maximized in DC condition. A line commutated converter (LCC) type high voltage direct current (HVDC) transmission system requires large capacity of DC reactors to prevent firing failure of the system. However, conventional DC reactor made of copper causes a lot of electrical losses. Thus, it is being attempted to apply the HTS DC reactor to a HVDC transmission system.

The authors have developed a 10 mH class HTS DC reactor and a model-sized LCC type HVDC system. The HTS DC reactor was operated to analyze its operational characteristics in connection with the HVDC system. The voltage at both ends of the HTS DC reactor was measured to check the stability of the reactor and effect of the HVDC system. The voltage and current at the DC side of the system were measured to confirm an influence of the reactor on the system. Two 5 mH copper DC reactor were connected to the HVDC system to compare the operational characteristics.

In this paper, the operation results of the HTS DC reactor with the HVDC system are described. The comparison results between the HTS DC reactor and the copper DC reactor are also described from an operation characteristic point of view. Through the results, applicability of an HTS DC reactor in a HVDC system is confirmed.