Dependence of Current Distribution on Pitch Length in Multi-layer HTSC Power Cable with Shield Layer

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One important issue in the design and optimization of a superconducting power cable conductor is the control of the current distribution among layers. Superconducting transmission power cable is one of interesting parts in power application using high temperature superconducting wire. Since its stacked structure makes difference between self inductances in each layer and mutual inductances between two layers, uneven current distribution in each layer happens, which results in lower current transmission capacity of HTSC power cable.

In this paper, the transport current distribution at conducting layers was investigated through the numerical analysis for the equivalent circuit of HTSC power cable with a shield layer and compared with the case of without shield layer. The transport current distribution due to the increase of the contact resistance in each layer was improved. However, its magnetization loss increased as the contact resistance increased. The shield layer was also contributed to the improvement of the current distribution in each layer without the generation of the additional ac loss in conducting if the winding direction and the pitch length were choosen properly.

keywords : High-Tc superconducting cable(HTSC), current distribution, magnetization loss. Shield layer.