Evaluation of cross-talk in power cables by use of 3D finite element computations

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The system parameters of power cables are usually obtained by 2D finite element computations on the cable cross-section and/or measurements on the cable. The design of the cables depends on cable manufacturer and operation requirements. Conductors, screens, armor and other elements in power cables are twisted. In many cases, for example in integrated cables for offshore use, the cross-section may be asymmetric. This asymmetry may be important for the system impedances (positive-, negative- and zero-sequence), and induced currents and voltages. 2D computations are not able to reproduce this cross-talk, and measurements can be a time-consuming and costly process. A better modelling method can improve computational accuracy and prove to be a valuable tool in the cable design process.

In this paper 3D finite element computations are presented, studying the effect of cross-talk between cable elements of different lay lengths. Current flow and resulting power loss in armor and screens are obtained. Current transfer between individual armor/screen strands as well as oppositely twisted layers is evaluated.