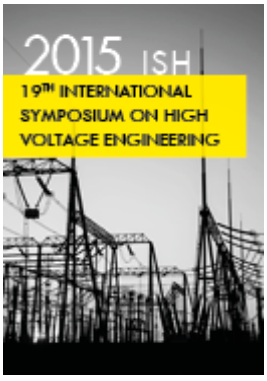
Reference: **ISH2015_162**

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Title:

**Thermal-electrical interaction of losses in three-core submarine power cables**

# Abstracts

A large number of oil-impregnated paper (OIP) cables is still in use but in the last decades the insulation material of new submarine power cables is made of XLPE. The maximal acceptable permanent insulation temperature for XLPE is 90 °C. To guarantee that this limit is not exceeded during operation, the losses and thermal conditions of the cable have to be known. In case of exceeding the critical temperature, the lifetime of the cable can decrease dramatically because of the loss of dielectric breakdown strength of the insulation material. This paper describes an investigation about a three-core submarine power cable using a commercial FEA tool to calculate the losses and temperatures in conductors, shield and armour. Heat transfer equations as well as magnetic and electric field equations are coupled. Especially, joule losses in metallic parts, electric conductivity and temperatures affect each other. The influence of the seabed and the laying depth of the submarine power cable is considered. At first, the losses in the cable are estimated. Based on those values, the heat flow from the cable surface to the seabed is simulated with a 2D model under different ambient conditions. These results then are used as boundary conditions for the more detailed and coupled thermal-electrical simulation of the submarine power cable. Thus the temperatures under varying ambient conditions applied to the insulating material are estimated. The interaction of losses with temperatures in the different components is discussed and a comparison is made with the ampacity calculated with FEA and according to IEC 60287.

More Informations :

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