Effect of water filled voids on the thermo-electrical behaviour of XLPE insulated cables using FEA method.

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The presence of defects for instance water filled cavities within HV XLPE insulation constitutes a major concern for cable manufacturers and power utilities. Indeed, these defects as aging factors can contribute under the service conditions to the degradation of the XLPE insulated cable performances by several discharge mechanisms (Water trees, Partial discharges and electrical trees) causing their failure at long term.

In this paper, a two dimensional axial symmetric model geometry containing a water filled cavity within XLPE insulated cable has been developed using software based on Finite Element Analysis (FEA) method. The simulation model was performed to investigate the effect of void parameters (shape, size, location) on the thermo-electrical behaviour of the studied cable under service stress conditions.

Simulation results showing the electric field distortion profile, temperature repartition in the insulated cable with respect to cavity geometric factors (diameter, location) and operating parameters (applied currents and voltages) will be presented and discussed. The obtained results could be exploited to prevent an eventual partial discharge occurring in the cable insulation.

Key words

XLPE cables; Water filled voids; Thermo-electrical behaviour; simulation model and Finite Element Analysis (FEA).