

The study on the transient electric field distribution of HVDC cable

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The conductivity is the main factor deciding the electrical field distribution in HVDC cable insulation, and the conductivity is sensitive the electric field and temperature. So the electrical field distribution in HVDC cable must dependence on the structure, applied voltage and temperature. Taking the typical structure of 320kV HVDC cable as an example, the steady state and transient electric field distributions under the different temperature gradients with different nonlinear properties of insulation were studied at 1.4 U₀ and polarity reversal voltage with the software of COMSOL Multi-physics. The results showed that the insulation utilization coefficient is getting lower when the temperature gradient is getting higher and that the transient insulation utilization coefficient at the process of polarity reversal voltage is significantly lower than the steady-state insulation utilization coefficient, here the insulation utilization coefficient is defined as the ratio of the average electric field and the maximum electric field. It is strongly recommended that the problem of transient electric field distribution must be considered seriously at HVDC cable insulation materials research and insulation structure design.

Key words: HVDC cable, Transient electric field, Temperature gradient, Insulation utilization coefficient