Temperature and electric field dependence of XLPE MV cable joint stress control sleeves

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On-site measurements by dielectric loss tangent (tan δ) as a function of voltage and frequency is well-established for assessing the condition of water treed medium voltage XLPE cable insulation. However, if the cable section also consists of e.g. joints with a high tan δ, the interpretation of the measured tan δ could be challenging and even lead to an erroneous assessment, e.g. stating that the insulation is severely water treed. In Norway it has been observed that many XLPE cable sections installed in the 80's has one or several heat shrink joints with a very low insulation resistance. Laboratory examinations show that such joints have likely experienced excessive overheating during service due to bad metallic conductor connectors.

This paper will focus on the temperature and electric field dependence of the time domain dielectric response of a stress control sleeve commonly used as a part of the MV heat shrink joint design in Norway. The polarization and depolarization currents for an unused sleeve are measured at temperatures up to 150°C. DSC measurements will be performed to determine if the material experiences phase transitions in the measured temperature regime.

The polarization and depolarization currents for the virgin stress control sleeve have no field dependence in the low field regime below service stress. Further work will include measurements at higher fields and temperatures close to that experienced during overheating. The results from these measurements will be reported and included in the paper.