

XLPE DEGRADATION UNDER CONSERVATIVE ELECTRICAL FIELDS OVER LONG TIME INTERVALS

Ali Harlin*, Petri Hyvönen**

* VTT, Technical Research Centre of Finland

**Helsinki University of Technology

the Faculty of Electronics, Communications and Automation

Abstract

Cross-linked low-density polyethylene is widely used in the electric insulation of medium voltage cables range 10...30kV. The degradation mechanism of polymeric materials is poorly predictable and problematic to measure in the power network over long time intervals of several decades. The basic phenomenon related to the degradation of polyolefin in electrical discharge is shortly reviewed based on earlier work, especially the reasons are reviewed why the material has such a sudden break down. Degradation of XLPE-insulation will change insulation material properties and it should be possible to detect these changes with chemical analysis. These chemical changes can lower the voltage withstand level of XLPE cables. Methods such as dielectric response measurement and FTIR-analysis were used to determine the degree of degradation. It was found that XLPE-cables used in friendly environments are still in good condition after thirty years of service. FTIR-analysis can be used to estimate cable insulation condition. Results of FTIR-analysis can be linked to the voltage withstands levels of XLPE-cables in time interval up to 30 years in use and further FTIR-analysis results can be converted to the condition classes of XLPE.