

Lifetime extension of Medium Voltage cables

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In many Austrian distribution grids PE-insulated medium voltage cables installed in the 80's are still in service. Failures caused by water-trees in the insulation are well known and reported. For grid operators this raises the question of whether to replace the cables to maintain the reliability of the grid. Another possibility instead replacing those cables is to extend the life time of PE-insulated cables using a treatment to refit the insulation. This treatment uses a silicon based fluid which is pressed into the insulation of the cable to inactivate existing water trees. At the beginning cables have been treated using a fluid with components of phenylmethyl-dimethyloxysilane. These components often caused accelerated corrosion of aluminium conductors because of chemical reactions. Due to this fact a couple of years ago the fluid was improved using alkoxyane to prevent corrosion. In cooperation with the Austrian Netz Burgenland Strom GmbH, the German UtilX Europe GmbH and the Institute of High Voltage Engineering and System Performance, Graz University of Technology, the effectiveness of this improved method for life time extension of medium voltage cables has been investigated. For that purpose sections of 20kV cable lines have been cut out of the grid right before the beginning of the treatment to refit the insulation. The optical investigation showed that all samples contained water trees. Cables with PVC sheath had very high moisture content and showed water droplets between copper screen and sheath. The lightning impulse tests on samples with PVC sheath showed remaining withstand voltage levels in the range between 250kV - 325kV. Samples with PE sheath showed remaining withstand voltage levels in the range between 375kV - 450kV. To evaluate the effect of the treatment 10 month later refitted samples of cables have been investigated as well. The optical investigation showed not any water trees and the increase of the withstand voltage level was significantly. The lightning impulse tests on samples with PVC sheath showed withstand voltage levels in the range between 425kV - 475kV. Samples with PE sheath showed withstand voltage levels in the range between 500kV - 525kV. Comparatively the withstand voltage level of 20kV XLPE-cables straight from the manufacturer is in the range between 600kV - 700kV.

KEYWORDS

Medium voltage cables, PE-insulated cables, life time, refitting of PE-cables, water trees