

## Long-term effect of water tree aged cables injected by silicone liquid under continuous electrical and thermal stress

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Water trees are regarded as the main reason for insulation degradation of XLPE cables in a moist environment. A silicone rejuvenation technology is used to rejuvenate the water tree aged XLPE cables for many years. However, these rejuvenated cables likely initiate water trees again under in-service condition. To investigate the long-term effect of water tree aged cables injected by the silicone liquid, water-tree cable samples treated by the silicone fluid were subjected to aging experiment under electrical and thermal stress for a long time, and characteristics of water tree and electrical performance of the samples were compared during the process.

A water tree accelerated aging system with a needle electrode was employed to obtain water tree aged cable samples. After four weeks aging experiment, water trees in slices can be clearly observed by a microscope. A half samples of these water tree aged samples were injected with silicone liquid, the other half samples were kept untreated. All samples were subjected to the electrical and thermal aging for six weeks again. During the process of re-aging, dielectric loss factors of the samples were measured every week, and the sizes of water trees in samples were counted. Microscopic examination and dielectric loss factor tests show that water trees in treated samples are significantly shorter than untreated samples during the process of re-aging. Electrical performances of the treated samples are also much better than untreated samples. Based on the results, it's further confirmed that the rejuvenation fluid have long-term effect on inhibiting water tree propagation and extending the lifetime of water tree aged cables.

Key words

Water tree; XLPE cables; rejuvenation; long-term effect; electrical performance