



A.8.3 Phénomènes de vieillissement aux interfaces écran-isolation affectées par le développement d'arborescences d'eau

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A.8.3 Ageing phenomena at cable-shield interfaces affecting the propensity of the insulation to develop water trees.

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ABSTRACT

At the Jicable 1987 meeting, the authors presented a report on the nature, source, and effects of impurities migrating from semiconducting shields into the insulation during electrical aging under wet conditions. Specific data were presented from a laboratory test where a thin slab of insulation was sandwiched between two layers of shielding material and exposed to moderate electric stress while one of the shields was exposed to air and the other to distilled, deionized water. The 1987 data covered a test period of up to 7,000 hours.

This report is an expansion of the previous paper and covers data on specimens aged through more than 28,000 hours. It also presents long-term testing results when the same insulating and shielding materials were washed with distilled, deionized water prior to molding into test cells, and when the insulation/shield interfaces were subjected to artificial protrusions, ionic and non-ionic surfactants, and artificially enhanced ionic impurities.

The long-term test results indicate a strong correlation between the amount of water-extractable ionic impurities in the shields and the propensity of the insulation to develop vented water trees. The extent of bowtie treeing is significantly influenced by surface contamination of the insulation compound pellets and/or the deliberate addition of ionic impurities. Unless very sharp and prominent, protrusions at the interfaces play a less important role on water treeing than the impurities in the shield compounds. Non-ionic surfactants do not enhance water treeing to any significant extent, while ionic surfactants are strong enhancers of water treeing.

The data are discussed in consideration of analyses of field-aged cables, recovered after 10 - 40 years of service.