



B.3.2. Essai électrique de longue durée en Allemagne

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Résumé

Les paramètres d'essai de vieillissement - en Allemagne considérés comme signifiants en vue d'évaluer le comportement en longue durée de câbles à moyenne tension à isolation de polyéthylène réticulé - seront décrits en détail. Il sera essayé d'évaluer l'importance des paramètres individuels de vieillissement.

Les paramètres étudiés sont: la tension d'essai, la température, l'alimentation en eau, la qualité de l'eau, la fréquence d'essai, le type des échantillons ainsi que le genre de l'équipement d'essai. L'évaluation de l'influence exercée par les paramètres est faite sur la base de contraintes résiduelles des câbles ainsi que sur la base d'images d'arborescence.

Le rapport mettra au point que les paramètres d'essai tels que stipulés par les standards allemands représentent un compromis équilibré entre un vieillissement suffisant et une destruction non-souhaitée du système d'isolation. Les résultats obtenus et les expériences faites selon la méthode allemande prouvent que le procédé garantit une évaluation fiable du comportement en longue durée de câbles à moyenne tension à isolation de polyéthylène réticulé.

1. Introduction

Today, a long-term ageing test is an indispensable method for assessing the quality of XLPE-insulated medium voltage cable. Some of the test parameters selected in the past were so different, that demands for a standard and comparable test procedure were already being made in Germany in the mid-eighties. In order to satisfy these demands, a group of experts, consisting of representatives of the utilities and the cable industry, conceived a test procedure and tried it out in a test run. The stimuli provided by this committee of experts and the evaluation of the incomplete results made a valuable contribution to the achieving of the desired aim. The specifying of the test procedure and requirements ensured the fulfilment of the most important preconditions required for the introduction of DIN VDE 0276 part 620 and the accompanying production quality tests. DIN VDE 0276 part 620 is identical to prHD 620 parts 1, 5C and 6C.

The following investigations confirm that the test parameters selected, and in the meantime incorporated in the above-mentioned regulation, provide a balanced compromise between the sufficient ageing of the test sample and the unwanted destruction of the insulation system.

2. Long-term test according to DIN VDE 0276 part 620

Faults which occurred in the early eighties, in particular XLPE cables which had been produced in the mid-seventies, initiated many improvements in quality effectively realised in subsequent years. Examples of these are:

B.3.2. Electrical long-term test in Germany

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Abstract

The ageing parameters, which are considered in Germany to be meaningful for assessing the long-term behaviour of XLPE medium voltage cable, are described in detail. An attempt will be made to judge the significance of the individual ageing parameters.

The test parameters examined are influence of test voltage, temperature, water supply, quality of water, test frequency, kind of samples and kind of test equipment. The assessment of the influence of the parameters is made by means of examining residual strength of the cables as well as the water tree pictures.

This paper aims to clarify that the test parameters laid down in the German standard provide a balanced compromise between sufficient ageing and unwanted destruction of the insulation. The results and experience with the German test method to date have shown that the procedure provides a reliable assessment of the long-term behaviour of XLPE insulated medium voltage cable.

- Introduction of triple extrusion, of firmly bonded semi-conducting insulation screen and of dry-curing
- Continual improvement of semi-conducting and insulating materials
- Installation of magnetic separators and air sifters
- Encapsulated and automatically-operating material-charging systems
- Computer-controlled processing
- Tighter specifying of cable dimensions
- Improvement of homogeneity of semi-conducting layers and purity of insulating layers.

A second step undertaken in the mid-eighties consisted of cooperation between the German utilities and the cable manufacturers on three large tests at the Forschungsgemeinschaft für Hochspannungs- und Hochstromtechnik e.V. (FGH). There, the development of a standard test procedure was worked on. This had proved necessary because the test results for assessing ageing behaviour under the influence of moisture were difficult to compare with one another due to differing test parameters [1]. These experiments contributed considerably to the development and ultimately to the introduction of the long-term test according to DIN VDE 0276 part 620 and the accompanying production tests according to VDEW-recommendation 1991 [2]. The significant features of these two tests are:

- a) Long-term test according to DIN VDE 0276 part 620
Ageing for 2 years with water in the conductor and in the screen at a test alternating voltage of $4 U_0$ and a constant sample temperature of 50 °C.