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Water tree accelerated ageing tests for MV XLPE cables

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Résumé

Depuis déjà plusieurs années, laboratoires d'essai, instituts de recherche et fabricants essaient de trouver un test fiable de vieillissement accéléré dû aux arbres d'eau afin de démontrer si un câble de tension moyenne en polymère est susceptible ou non de créer des arbres d'eau. Jusqu'à ce jour, aucune alternative de courte durée (4 mois = 3000h) n'a été largement acceptée, tandis que de nombreux pays ont entre temps accepté les tests de 2 ans (basé sur un test UNIPEDE [7]).

Cependant, lors de la conférence Jicable de 1995, un test de 3000h prometteur basé sur un test de vieillissement d'une fréquence de 500 Hz [1] avait été présenté. Ceci a été une raison pour les compagnies de distribution d'électricité néerlandaises de mener des recherches plus poussées dans cette direction. Les résultats, rapportés dans cet article, ont en effet confirmé qu'un test 500 Hz 3000h constitue une alternative acceptable au test de vieillissement accéléré de 2 ans basé sur 50 Hz.

En outre, cet article présente une proposition en vue d'un pré-conditionnement plus rapide. Ce résultat est également basé sur un programme de recherche à l'intention des compagnies néerlandaises de distribution d'électricité.

Introduction

In the last 10 to 15 years, a lot of attention has been paid to the development of an effective water tree accelerated ageing test. Since some years there is an alternative test proposal, the so-called 500 Hz test [1]. The name 500 Hz is related to the fact that the ageing frequency in this test is 500 Hz. As a consequence of this test parameter, the duration of the ageing test can be limited to 3000 hours (which is four months), while competitive tests like the so called UNIPEDE test have an impractical duration of two years [7].

In reference [1] the first results obtained with 500 Hz testing are given. In this paper the results of a comparative laboratory test will be presented. It is shown that the UNIPEDE 50 Hz 2 years test and the

Abstract

For many years already, testing laboratories, research institutes and manufacturers try to find a reliable water tree accelerated ageing test that is able to show whether a polymer medium-voltage cable is susceptible to water treeing or not. So far, a short duration alternative (4 months = 3000 h) is not widely accepted and many countries have accepted 2 years tests meanwhile (UNIPEDE test based).

However, at the Jicable conference in 1995, a promising 3000 h test was presented based on a 500 Hz ageing test frequency. This was reason for the utilities in the Netherlands to have further research work in this direction. The results, reported in this paper, indeed confirm that a 500 Hz 3000 h test is an acceptable alternative for the 2 years accelerated ageing test based on 50 Hz.

Moreover, a proposal for a faster preconditioning regime is given in this paper. This result is also based on a research programme for the Dutch utilities.

500 Hz test 4 months test indeed give identical results.

The differences between the 500 Hz test and the UNIPEDE test are the ageing frequency (500 Hz respectively 50 Hz) and the duration of the ageing test (4 months, respectively 2 years) only. All other test parameters are similar.

The advantage of a shorter duration is clear. However, some people are afraid that the high ageing frequency will lead to non-realistic ageing effects. Therefore, some attention will be paid in this paper to the background of the choice of the test parameters.

Apart from ageing, another important aspect of any accelerated ageing test is the right choice of the