

**B.9.1.****Accelerated long term evaluation of MV-XLPE cables**

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Abstract: Internationally it is agreed that the ageing time necessary to test the properties for XLPE cables for use in wet environment is two years to be able to reveal typical weaknesses related to water treeing in such cables. The main purpose of this work has been to develop an ageing test, which gives a reliable result after considerably shorter ageing time than the harmonized two years "Long Duration Test" in CENELEC HD 620. Even if some of the preliminary results are positive, it is too early to determine the reliability of the test.

Keywords: XLPE Cables, Ageing, Breakdown Voltage, Water Treeing

1. Introduction

This work was started viewed in the light of results from a work performed by EA Technology in England [1], in order to study the ageing phenomena in XLPE cables of different combinations of materials and production procedures.

Internationally breakdown strength is often used as the major evaluation parameter for long-term ageing. Water tree growth and other observations are used as additional information. This is due to the fact that service experience has shown very low densities of vented water trees in new cables. Disconnection of the high voltage supply when a breakdown occurs in the breakdown tests will always take some time. In most cases the cause of breakdown (the water tree) is then destroyed. Therefore, it was a request to use breakdown strength as evaluation criterion in addition to water tree growth, which was the only criterion in the EA-test [1]. However, it was still a wish to keep the short testing time of 2000 h.

The main purpose of this work is to evaluate a screening test as a quicker alternative to the harmonized 2 years test. If successful results are obtained, cable manufacturers will be able to screen material combinations and production parameters in a more efficient way than today.

Résumé: Il est reconnu de manière internationale que le temps de vieillissement requis pour tester les propriétés des câbles à isolation PR en milieu humide est de deux ans, ce afin de pouvoir discerner les faiblesses caractéristiques dues aux arborescences d'eau dans ce matériel. La tâche principale de ce travail a été de développer un test de vieillissement donnant un résultat fiable pour une durée considérablement plus courte que les deux ans harmonisés définis par le «Test Longue Durée» de CENELEC HD 620. Cependant, même si quelques résultats préliminaires sont positifs, il est encore trop tôt pour déterminer la fiabilité de ce test.

Mots-clés: câbles à isolation PR, vieillissement, arborescences d'eau

2. Description of test samples

The tests were performed on three 6/10 (12) kV XLPE-cables with an insulation thickness of 3,4 mm. The only difference between cable 8 and 9 were the insulation screen, while cable 10 was manufactured with copolymer insulation.

In order to evaluate different test temperatures close to 55°C the tests in Table 1 were started.

Table 1: Description of the tests.

Cable no.	Cable length [m]	Ageing temperature	Comments
8.1	33	60°C	1
9.1	33	60°C	1
8.2	33	60°C	2
9.2	33	60°C	2
10	50	60°C	1
8.3	33	40°C	1
9.3	33	40°C	1

1. Ageing was started directly after the pre-conditioning at 80°C.
2. The ageing was started 1000 hours after the pre-conditioning was finished and a stable temperature of 60°C was obtained.

As no differences between 1. and 2. were observed the results are merged in this report.