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Product and process development of a peroxide injection cable with enhanced resistance in wet operating conditions

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Abstract

This paper describes both, the product and the process development that have been conducted in order to adapt polymer blending technology to a cable produced by the peroxide injection process, where all components of the formulation have been dosed directly during the manufacturing of the cable.
The use of a non-polar polymer system rather than a copolymer system, as widely reported in previous publications, brings the additional benefits of:

- Compatibility with strippable screens
- Dielectric losses comparable to homopolymers.

The preliminary evaluation results of the polymer system, as well as of the cable produced by direct dosage of components appear to be consistent with the working hypothesis, and with early reported experience.

The long term evaluation of the cable is ongoing and the results will be published as they become available.

Résumé

Cette publication décrit le développement de produit, ainsi que du processus de fabrication industrielle nécessaire à sa mise en œuvre pour adapter la technologie de mélanges de polymères à la production d'un câble par la technique d'injection directe de peroxyde, où tous les ingrédients de la formulation ont été ajoutés, en ligne, pendant la fabrication du câble.
L'utilisation d'un système de polymères non-polaires, de préférence à un système de copolymère comme cela avait été rapporté précédemment, a apporté les bénéfices supplémentaires suivants :

- Compatibilité avec les écrans semi-conducteurs pelables
- Des pertes diélectriques comparables aux homopolymères

Les résultats initiaux de l'évaluation du système polymèrique, ainsi que du câble produit par injection de peroxyde, sont en ligne avec l'hypothèse de départ et avec les expériences publiées précédemment.

Les essais de longue durée du câble sont en cours et les résultats seront publiés dans une communication ultérieure.

Introduction

XLPE is nowadays the dominant insulation material for medium and high voltage transmission and distribution cables. Its technical merits and positive field experience have been extensively discussed and, as far as this communication is concerned, they are taken for granted.
The emphasis of the communication is on the improvement of the performance of XLPE when operating in wet conditions. Indeed, the observations of the degradation mechanism of polyethylene under the combined effect of water and electric field , called water treeing, go back go back to 1967 by Miyashita et al (publication in Japanese) [1]. Since then countless publications proposing ways of explaining, suppressing or at least minimising the effect of water and water treeing have followed. [2] [3] [4]. The attention given to the effects of humidity has been such, that International activities for the standardisation of moisture impervious cables have been set up [5].
Among the routes investigated in order to improve the water treeing resistance of conventional XLPE compounds, the mechanical theories published by Filippini (France) [6] and Sletback (Norway) [7]