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B.4.3. Paramétres influençant la pelabilité des matériaux semi-conducteurs pour les écrans des câbles

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Résumé

L'exigence de base pour les mélanges conducteurs pelables recouvrant l'isolation est qu'ils puissent être facilement retirés de celle-ci laissant une surface propre, exempte de tout défaut.

Il existe diverses préférences en ce qui concerne la force de pelabilité, et le comportement lors du pelage.

Ces propriétés sont généralement liées à la formulation et à la qualité du mélange pelable. Cependant, le procédé de fabrication du câble a également un effet significatif.

Afin de quantifier l'effet du procédé sur la pelabilité, des expériences ont été réalisées sur des câble 20 kV fabriqués sur une ligne expérimentale.

Cet article présente les résultats des tests où les effets de la vitesse de ligne, de la température de filière, du type et des températures de réticulation ont été étudiés. La compréhension des interactions entre l'isolation et le semiconducteur pelable dans le procédé de fabrication "CCV" est développée et les aspects physico-chimiques des phénomènes d'adhérence à l'interface sont discutés.

B.4.3. Parameters influencing the strippability of conductive compounds for insulation shields

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Abstract

The basic requirement for strippable insulation shields is that they should be easy to remove from the insulation, leaving a clean surface without defects.

There are different preferences with regard to strip force level and stripping behaviour.

These properties are basically governed by composition and quality of the strippable compound. However, the cable manufacturing process also has a significant impact on these properties.

In order to quantify the effect of the process on strippability, experiments were carried out on 20 kV cables made on a pilot cable line.

This paper presents the results from tests where the effect of line speed, die temperature, curing medium and curing temperature have been studied. An understanding of the interactions between the insulation and the strippable shield in a CCV cable process is developed and the physical and chemical aspects of the interface adhesion phenomena are discussed.

Introduction

Medium voltage XLPE cable constructions consist of a conductor, semiconductive conductor shield, insulation and semiconductive insulation shield. The insulation shield is of a strippable or bonded type according to various standards. The basic requirement for a strippable construction is that the strippable shield should be easily removed by hand without leaving any black spots on the insulation surface.
There are different preferences regarding strip force and strip behaviour in different countries regulated by different standards [1,2].

The stripping properties are basically governed by the composition and quality of the strippable compound. However, the cable manufacturing, storage time and storage conditions, thickness of the strippable shield and test procedure also have a significant influence on these properties.

In this work the influence of the cable manufacturing process on the strip force was studied. The importance of the melt temperature, head pressure, line speed, and vulcanization condition was studied on a 20 kV cable produced on a CCV pilot cable line.

Materials

In this evaluation two commercial strippable compounds were used. Type A is a strippable compound intended for higher strip forces. Type B is an easy strippable compound. The insulation used in this evaluation is a conventional XLPE homopolymer.

Cable line

The investigation was performed on a 1+2 Nokia-Maillefer pilot cable line, with a 45 mm extruder for the conductor shield, a 60 mm insulation extruder and a 45 mm extruder for the strippable shield. This line has a capability to cure either with gas or steam.

In the cable manufacturing process, the strippable compound and the insulation compound are processed in two separate extruders and pressed into the extruder head. The melts are distributed in the head by a specially designed flow distributor. The strippable compound and the insulation flow together in the head 10 cm before they are applied to the shielded conductor after which they enter the vulcanization tube.

The practical melt temperatures for the insulation are in the range of 120-145°C and for the strippable compound 100-130°C. The temperature ranges are restricted by the requirement on melt homogeneity and risk for precrosslinking.

For steam vulcanization, the cable is running through saturated steam at 210°C for 14.6 meter. For gas vulcanization, the first 3.6 m consist of a splice box followed by two heating zones each 3.0 m and a neutral zone of 5 m. The water-cooling length is 8.4 m for both conditions. All cables (20 kV) used in this investigation have the same construction.

Conductor:	Round, 50 mm^2, stranded Al.
Conductor screen:	0.6 mm
Insulation thickness:	5.6 mm
Strippable shield thickness:	0.8-0.95 mm