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Strippable shields with improved thermal stability and faster cable extrusion rates

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Abstract: The installation of splices and terminations for medium-voltage power cables is facilitated with cable designs which employ strippable insulation shields, which are typically based upon highly polar copolymers, like ethylene vinyl acetate (EVA). However, the temperatures of continuous vulcanization are limited by the decomposition temperature of EVA and the subsequent formation of equipment-damaging acetic acid. Such temperature limitations may pose extrusion line rate limitations. New technology has been developed to provide an opportunity for insulation shields to be based upon reduced comonomer content base resins, or alternate base resins that would otherwise result in bonded systems. The result is the potential for lower cost materials, lower adhesion values, reduced acid generation, higher temperature loperating window, and improved cable line speeds.

Keywords: strippable insulation shield, thermal stability

Les écrans semiconducteurs pelables extérieurs à l'isolation facilitent les opérations d'installation (raccordement, terminaison) des cables d'énergie moyenne tension. La composition de ces écrans est généralement basée sur des copolymères très polaires, comme par exemple l' Ethylène Vinyle Acétate (EVA). Cependant, ces derniers limitent les températures admissibles du processus de réticulation, donc les vitesses des lignes de production, par les risques de décomposition et de formation d'acide acétique, corrosif pour les équipements.
Une nouvelle technologie a permis le dévelopement d'écrans extérieurs pelables basés sur des résines à taux de comonomère réduit, ou sur d'autres type de résines conduisant normalement à des systèmes non-pelables. Les bénéfices induits sont des coûts de matières premières réduits, des forces d'adhésion plus basses, et moins de génération d'acide, ainsi que des températures de process et des vitesses de ligne augmentées.

Mots clés: écran semiconducteur pelable, stabilité thermique.

1. Introduction

Properties of Strippable Insulation Shield

The insulation shield protects the insulation from the damaging effects of ionization at the outside of the insulation surface. It must be in intimate contact with the insulation and free of defects. As an integral component of cable grounding, the insulation shield must be a resistive shield, providing a uniform ground around the insulation. There is also an important safety function. The surface potential must be sufficiently close to ground, such that where the concentric neutrals do not completely cover the cable (for example near a termination, splice or elbow) touching the extruded shield would not result in a hazardous discharge. Such hazards exist in service tunnels, ducts or other confined spaces. The insulation shield also contributes to the grounding of the cable during switching surges, short circuits, or lightning strikes.

The volume resistivity requirements for insulation shields are 500 ohm-m maximum, which is a lower volume resistivity as compared to conductor shields. This reflects a greater need for conductivity to fulfill the role of a ground. Also note that insulation shields are tested for volume resistivity at maximum 110°C, according to AEIC specifications (90°C according to IEC 60502 specifications) due to the expectation that the insulation shield will not reach the 130°C overload temperature of the conductor.

Freedom from voids at the insulation shield-insulation interface is best assured with a bonded shield, which is a requirement for high voltage cables. Most medium voltage cables are made with a strippable insulation shield, but some national codes and some utilities require a bonded insulation shield. Where used, strippable shields are for ease of cable installation.