

MEDIUM VOLTAGE CABLE WITH OPTIMIZED SCREEN SHEATH COMPLEX

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ABSTRACT

The use of polyethylene sheath has reinforced the robustness of the medium voltage cable. Nevertheless, some properties have become more sensitive, as the mechanical stiffness, the shrinkage, and the flame resistance.

In order to minimize these drawbacks, the authors propose to use blends based on specific polymers. As result, the shock resistance and the shrinkage are 2 characteristics of the cable particularly improved with these new compositions.

KEYWORDS

Medium voltage cable sheath shrinkage shock.

INTRODUCTION

Today, most countries tend, where possible, to build underground electrical distribution networks, instead of traditional overhead lines.

They have better reliability regarding the exceptional climatic events such as storms or periods of extreme cold weather, and require less maintenance due to the surrounding vegetation, etc..

The underground networks being more costly, utilities are looking for more reliable products, so as to reduce to minimum the maintenance, and increase the service life of the links

If we consider as example the medium voltage cable used in the french distribution network, it consists of an aluminum core, surrounded by a cross-linked polyethylene insulation. On each side of the insulation, there is a conductive layer, the external one being strippable.

The insulated core is protected from the external environment by a complex formed by an aluminium foil placed in long, looks like a continuous pipe, and stuck to the external polyethylene sheath.

POLYETHYLENE SHEATHING

The definition and quality completion of the screen-sheath assembly is essential for the life time of the product. The level currently achieved, with high quality materials and processes is quite satisfactory. In particular, the replacement of the PVC by Polyethylene has reinforced the robustness of the screen-sheath complex on the following aspects:

- Better protection against corrosion of the aluminum screen
- Higher adhesion of aluminum overlapping, and with the sheath.
- Lower sensitivity to moisture absorption
- Better temperature behaviour

The grades of polyethylene used for cable sheathing show common characteristics:

- A good resistance to stress cracking
- A high resistance against thermal ageing, by adding proper anti-oxidants
- A protection against UV, obtained with carbon black or specific agents
- Protection against termites or against the flame spread, by appropriate additives.

On the other hand some parameters have become more sensitive:

- the mechanical stiffness of the cable
- the shock resistance
- the shrinkage
- the flame resistance.

These drawbacks are well known to those who routinely use polyethylene. These materials are ready to use, and the cable maker hasn't all the freedom to reach an ideal compromise between properties, which may vary from one cable standard to the other.

The polyethylene are often characterized as a first approximation by the density and melt flow rate:

- The low density, high or low pressure, is interesting for the flexibility of the cable and withdrawal. On the other hand, its limited contribution to the impact resistance of the cable leads to increase its thickness.
- HDPE is interesting for shock and abrasion, but it leads to a shrinkage that may be detrimental to the accessories, and it adds rigidity to the cable, which doesn't facilitate the installation.

Some properties can be improved by adjusting either the type of PE (mono-modal, bimodal) or the extrusion (hot water throw, speed), but the leeway is relatively narrow.

BLENDS OF POLYMERS

In order to overcome these drawbacks, we have developed sheathing materials based on alloys (blends). These alloys contain different polymers in terms of crystalline structure, polarity and viscosity. It is necessary to ensure their compatibility, so that their entropy is not increased in an exaggerated way. To improve the compatibility, specific agents can be added.