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F.3. Diffusion de l'eau à travers les gaines et son impact sur la construction des câbles

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Résumé

Dans la plupart des pays, la construction d'un câble polymère haute tension doit être étanche à l'eau, non seulement dans le sens longitudinal mais encore dans le sens radial, et ce, pour limiter le risque d'arborescence. Une gaine métallique fermée constitue une barrière telle qu'aucune vapeur d'eau ne pourra traverser une telle gaine.

Nous avons analysé la possibilité de remplacer la gaine métallique conventionnelle par une gaine plastique avec ruban sous-jacent de blocage de l'eau (gonflant). Il a été conclu que le plastique à faible perméabilité à l'eau combiné avec ledit ruban permet de répondre aux conditions requises.

F.3. Water diffusion through sheaths and its effects on cable constructions

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Abstract

In many countries the construction of a high-voltage polymer cable should be watertight, not only in the longitudinal but also in the radial direction to limit the risk of water treeing. A closed metallic sheath provides such a barrier: no water vapour will penetrate through such a sheath.

We have investigated the possibiity of replacing the conventional metallic sheath by a plastic sheath with water blocking tape (swelling tape) underneath. It was concluded that plastics with sufficiently low permeability for water in combination with standard water blocking tape fulfil the necessary requirements.

This new concept for radial watertightness offers the possibility of simple application of monitoring and diagnosing techniques, such as distributed temperature monitoring and high frequency partial discharge measurement.

Introduction

High-voltage polymer insulated cables have proven to be an interesting and well accepted alternative for oil-filled and oil-pressure cables up to certain voltage classes. In many countries the highest system voltage where polymer insulated cable is being applied is 150 kV to 220 kV and in a few countries like France and Japan polymer cables are being used for even higher system voltages.

In The Netherlands, a project is carried out a project with the object to achieve a cheaper and more reliable construction. As the result of several studies, a possible construction was found, which is described in the following paragraph. The background for this construction is given in the four last paragraphs.

New aspects concerning the construction

The cable construction that will be discussed here is rather simple. Apart from the well known combination of a (watertight) conductor and a polymer insulation system with semiconducting screens it has the following specific elements:

- swelling tapes
- a copper wire screen
- a MDPE covering
- optical fibres.

This construction is schematically shown in figure 1.

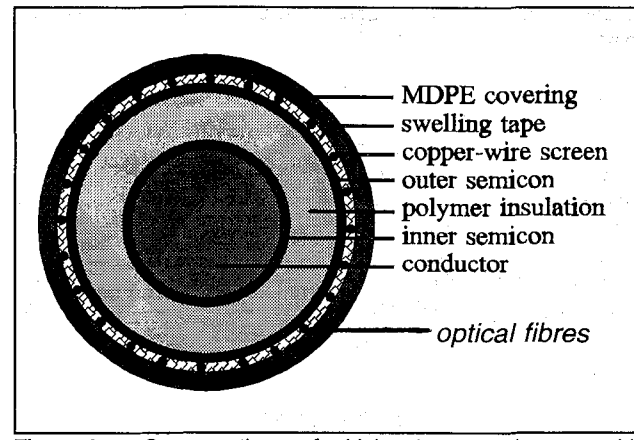

Figure 1 Cross-section of high-voltage polymer cable construction

Because of three features, this simple construction is of special interest:

- its radial watertightness
- its capability to perform partial discharge measurements on-line
- its capability to integrate optical fibres in the copper wire screen for monitoring and telecommunication.