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A.4.2. Accessoires préfabriqués pour les câbles à haute tension : dimensionnement et retour d'expérience

ONODI T., DÄTWYLER Ltd., Altdorf, Suisse

Résumé

Les accessoires de type préfabriqué enfilés sur le câble sont des éléments de haute qualité et fiables en exploitation pour les réseaux de câbles haute tension.

Des méthodes parfaitement au point sont disponibles pour le dimensionnement électrique de tels éléments.

L'interface entre le câble et l'accessoire préfabriqué est un facteur déterminant pour la fiabilité de la liaison en exploitation.

La tenue diélectrique de telles jonctions exigent des études minutieuses dans le choix des matériaux ainsi qu'un dimensionnement thermomécanique correct et un soin poussé lors du montage.

Les principaux facteurs d'influence sont expliqués à partir d'investigations sur maquettes.

A.4.2. Prefabricated accessories for high voltage cables design, dimensioning and field experience

ONODI T., DÄTWYLER Ltd., Altdorf, Switzerland

Abstract

Prefabricated, slip-on cable accessories are high-grade, reliable elements of high voltage cable networks.

Perfected methods are available for the electrical dimensioning of elements of this kind.

The interface between cable and prefabricated accessories remains a factor of significant influence on operating reliability.

The dielectric strength of such joints requires extensive considerations of choice of material, correct thermo-mechanical dimensioning and great care during installation.

The most important influencing factors are explained by means of model investigations.

Prefabricated, slip-on cable accessories (terminations and cable joints) are becoming increasingly widespread in high voltage cable networks up to 400 kV.

Precision, factory-produced products, pre-tested quality and rapid and simple installation are major advantages of these accessories.

The same long service life is expected from the accessories as from the cables and all operating situations should therefore be taken into account for dimensioning. Individual matching is not possible; therefore, the adaptability and functional capability of a product are expected to comply with a wide tolerance range.

The accessories must largely be dimensioned for three main stresses, electrical, thermal and mechanical.

1.1 Electrical

Large field non-homogeneities and high field strengths occur both in cable ends and cable joints. The maximum field strength in these sectors can be kept reliably below the field strength in the cable and at all points below the local dielectric strength by optimum arrangement of the electrodes (stress control electrodes). The field distribution in the accessories is also determined by the cable and specific sectors of the joints must even withstand the full voltage.

Assumptions for temperature distribution must be made owing to the temperature dependence of the dielectric strength. These assumptions must be checked and corrected after thermal calculation. There are widespread computer methods used for field calculation, e.g. the finite element method, which permit extremely accurate assessments.

1.2 Thermal

The temperature distribution both in the cable and also in the accessories can be calculated from the geometric and material data, in addition to the cable losses.

1.3 Mechanical

Correct mechanical dimensioning and corresponding application during installation are determining factors for operating reliability.

Some questions concerning mechanical dimensioning and matching should be described more fully during the course of these comments.

For the installation of slip-on cable accessories, the prefabricated parts are placed on the cable insulation with an expansion dependent on the dimensioning.

The expansion of the accessories produces the pressure which ensures matching of the accessories to the irregularities of the cable surface. The interface where the two elements (cable and accessories) come together is of decisive importance for the operating reliability of the overall system.