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A.3.3. Utilisation des élastomères de synthèse dans la construction des accessoires HT et THT

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Résumé

Cet article décrit l'évolution des accessoires pour câbles HT et THT, depuis le début de l'utilisation des élastomères de synthèse il y a plus de 20 ans : extrémités, jonctions et matériel de fixation des câbles sont présentés et illustrés par différents exemples.

Nos premiers cônes déflecteurs en élastomères prémoulés datent des années 70. Vers 1980, sont apparus les isolateurs composites qui ont progressivement remplacé la porcelaine en Suisse. Une gamme complète d'extrémités faisant appel à ces techniques : déflecteurs prémoulés et isolateurs composites, est maintenant disponible jusqu'à et y compris 420 kV.

Trois types de jonctions sont décrits. La jonction prémoulée en une pièce constitue une solution simple et élégante. Plus de 500 jonctions prémoulées du niveau 123 à 170 kV sont actuellement en service.

Le dernier aspect traité est celui du matériel de fixation des câbles; l'utilisation des élastomères, dans ce domaine également, a permis d'apporter des réponses aux questions spécifiques posées par la fixation des câbles HT à isolation synthétique.

A.3.3. Use of elastomeric material for manufacturing of HV and EHV accessories

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Abstract

This paper describes the evolution of the HV and EHV cable accessories since the beginning of the use - more than 20 years ago - of elastomeric materials; terminations, joints and cable fixing material are presented and illustrated by different examples.

Our first premoulded elastomeric stress-cones date back in the early seventies. Around 1980, composite insulators appeared and progressively replaced porcelain in Switzerland. A complete range of terminations based on these techniques - premoulded stress-cones and composite insulators - is nowadays available up to 420 kV included.

Three types of joints are described. The one-piece prefabricated joint is a simple and elegant solution. More than 500 HV premoulded joints - 123 to 170 kV level - are actually in service.

The last subject concerns the HV cable fixing material. Again in this area, the use of elastomeric materials constitutes a solution to the specific questions raised by the fixing of the synthetic insulated HV cables.

1. Introduction

When, many years ago, the state of the art reached such a level that HV cables with synthetic insulation could be envisaged, the corresponding accessories had to be developed. In the early stage, it was natural to try to find solutions adapted from those successfully used for many years in paper cables. However, it appeared very soon that they were unappropriate and new techniques were necessary.

Nowadays all terminations include premoulded stress-cones; our company introduced this technique 20 years ago. Concerning joints, several different techniques are still used, but the trend is clearly towards prefabrication.

The use of synthetic elastomers and the premoulding of accessory parts, like stress-cones and joint bodies, resulted in accessories which are simple to assemble and very reliable.

2. Cable terminations

2.1 Stress-cones

Stress-cones realized with insulating and conductive self-amalgamating tapes have extensively been used up to 72 kV included. For higher voltages - 110 to 170 kV level - this technique proved to be inadapted and premolded elastomeric stress-cones were introduced in the early seventies.

The "first generation" of stress-cones did include a metallic electrode embedded in the insulation. This electrode presented some advantages particularly for the realization of a gas or oil seal at insulator bottom, but did also limit the diameter range of each model. As shown in fig. 1, some stress-cones were composed of two pieces : an inner sleeve and an outer part to be slipped over it. The whole diameter range of cables was covered by a series of inner sleeves with different internal diameters, the outer part remaining the same. The service record of these "first generation" stress-cones, up to 245 kV included, is excellent.

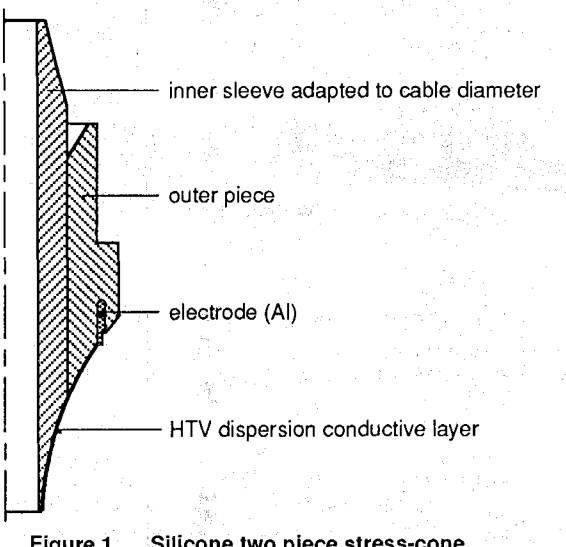

Figure 1. Silicone two piece stress-cone "First generation"