A.3.1. Extrémités synthétiques : vers la très haute tension

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Résumé :

Les extrémités synthétiques (sans fluide) sont utilisées depuis de nombreuses années en réseaux basse et moyenne tension (BT et MT). L'extension d'application aux réseaux haute tension (HT) a nécessité la mise au point d'un nouveau bloc déflecteur pour répondre, dans une géométrie raisonnable, aux contraintes rencontrées et notamment à celles liées à une utilisation en milieu pollué.
Cette nouvelle extrémité qui combine deux principes dissociés à l'origine a d'abord été testée suivant les prescriptions du niveau 90 kV en les complétant par la détermination des niveaux de contournement à fréquence industrielle et aux chocs de foudre, caractéristiques du comportement ultérieur sous pollution. Ces premiers résultats nous ont conduits à tester une liaison dimensionnée pour le niveau 138 kV, équipée de ce même type d'extrémité selon les prescriptions de l'I.E.E.E. 48. dont une première application pour ce niveau de tension pourrait être envisagée sur liaison provisoire.

I) Introduction

The utilization of synthetic terminations (without fluid) and their advantages have already been described in many publications [1], [2], [3], [4]. Up to this date, their use has become systematic in Low Voltage and Medium Voltage cables and they have come into general use in France in 63-90 kV stand-by links and in indoor applications (indoor modular stations).
The experiences and observations acquired from stand-by links and their associated materials and more recently from terminations proposed for High Voltage (HV) networks allowed us to design a new stress cone principle.
Its essential characteristic consists in the integration inside the stress cone of a piece made up of a Linear Voltage Distribution (LVD) material. Its use allows to reduce the dielectrical constraints on the stress cone surface and subsequently to reduce breakdowns and their resulting degradations, whatever considered climatic conditions. In the following, essential characteristics of the proposed terminations for 90 kV and 138 kV networks are presented: materials properties, geometry and test results are described.

II) Dimensioning rules : choice of the materials

II-1) Materials in contact with the surroundings

Dielectric behaviour and perennity of a synthetic termination depend on the resistance of the materials to the conjoint effects of different factors of ageing like :
- U.V.
- various types of pollution (dust, salt, etc...)
- rain, fog, snow, ice.

A.3.1. Dry terminations : applicability to EHV

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Abstract :

Synthetic cable terminations (without fluid) have been used for many years on low or medium voltage networks (LV and MV). Extending the application of these terminations to high voltage (HV) networks has required development of a new stress cone to answer, with a reasonable geometry, to the encountered constraints and namely to those depending on an application in polluted area.
A new termination which combines two previous dissociated principles has been firstly tested under the prescriptions required for 90 kV level. They have been completed by the determination of the flash-over levels during lightning voltage tests and tests at power frequency. These values are determining for the future performance in a polluted area network. These results have led us to test a 138 kV link equipped with the same type of termination according to the prescriptions of the I.E.E.E 48. As a first step, this 138 kV termination could be used on stand-by links.

The materials in contact with the surroundings contribute in a large extent to the reliability of the termination, especially in their ability to tracking resistance.The used materials have complied with all the requirements of the company specification HN26E20 [5]. This behaviour has been confirmed in operating 63-90 kV networks. Indeed over a period of nearly 20 years, more than 1500 terminations (stand-by links type) have been working sometimes in very polluted areas.
The hydrophobicity of the material, widely described and guaranted in many papers for being fundamental in the long term behaviour of the termination or insulator, must be relativized. Indeed, it must be established that the design has also an important influence. And so, the use of an hydrophobic product without a suitable design does not completely guarantee the working quality of the termination [6].

II-2) Linear Voltage Distribution Material (LVD)

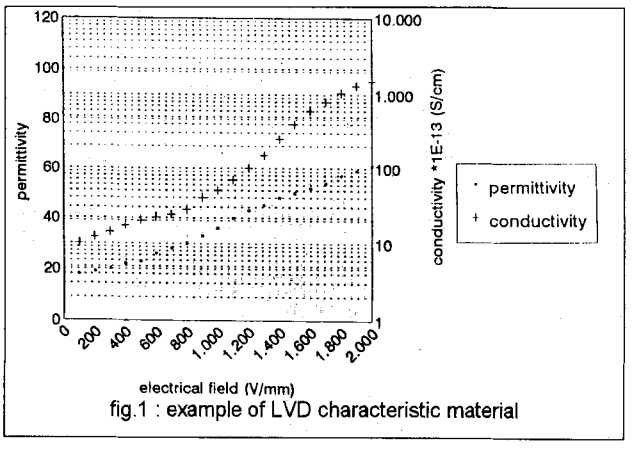

fig.1 : example of LVD characteristic material