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A.3.2. Extrémités de câbles synthétiques THT avec isolateurs composites

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A.3.2. Composite EHV terminations for extruded cables

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Résumé

L'isolation synthétique est utilisée depuis plus de vingt ans pour les extrémités de cables en moyenne et haute tension.Si des solutions entièrement synthétiques peuvent être proposées en HT,il n'en est pas de même en THT.Les contraintes diélectriques rencontrées ne permettent pas de mettre le bloc répartiteur de champ en contact direct avec le milieu ambiant.Aussi un fluide et une protection externe constituée par un isolateur doivent être employés.Des isolateurs composites destinés à equiper des extrémités 225 kV ont été développés.Les extrémités présentées dans ce rapport répondent aux prescriptions de la Spécification d'Entreprise HN 68 S 23 d'EDF.Leurs performances sont comparées à celles d'extrémités traditionnelles sous porcelaine.Les essais de longue durée sont en cours et confirment l'excellent comportement de ces nouveaux matériels dont on peut dès à présent envisager l'emploi sur des liaisons provisoires.

Abstract

Synthetic insulation for cable terminations has been used for more than twenty years for medium and high voltage systems.If dry HV terminations can be proposed,the dielectric stresses encountered in service are such that it is not possible to let the stress cone without protection.An insulator filled with insulated liquid or gas must be used .Composite insulators have been developed to replace porcelain in 225 kV terminations. The terminations equipped with these insulators comply with EdF Company Specification HN 68 S 23 . The report compares their performances with those of traditional equipment using porcelain. Long term tests are in progress.They confirm the excellent behaviour of these new terminations,which can already be used for temporary links.

1- INTRODUCTION

Synthetic insulation for outdoor applications of cable terminations were first developed more than 20 years ago [1] to replace traditional porcelain terminations for MV and HV levels.

The advantages of those terminations over traditional equipment are well known :

- no risk of explosion or fire in case of internal breakdown,
- simplicity and ease of installation.

In the field of higher voltages,there is a need for terminations without porcelain to reduce the risk of explosion,but at the present time,synthetic terminations are not available and the use of an insulating fluid is required (oil or SF6). Hollow core composite insulators have thus been developed in order to offer a safer behaviour of the termination in case of breakdown.
The basic specification for the development of non-ceramic EHV cable terminations described in this report was the EdF Company Technical Specification HN 68 S 23 in use for cable terminations for 36 kV and above [2] which foresees the use of oil or SF6.
As a first step,225 kV terminations using composite insulators and filled with SF6 gas were developed,referring to IEC 815 [3] for the dimensioning of the insulator,as requested in the Technical Company Specification.
The choice of composite materials,the electrical and the mechanical dimensioning have been made taking into account long term exceptional stresses encountered during the service life of the accessory.
The report briefly recalls the technical requirements for a 225 kV termination as per HN 68 S 23, describes the design criteria and the choice of process and materials used,and compares the electrical performances of the resulting non-ceramic termination with the existing one using porcelain.

2- TECHNICAL REQUIREMENTS

Technical requirements are listed in the EDF Company Technical Specification HN 68 S 23 .
HN 68 S 23 covers outdoor terminations for extruded cables rated 36 kV and above.Main points of this specification taken into account for the development of porcelain-free terminations were:

2-1 Rated voltages:Uo/U(Um)=**130/225(245)kV**

2-2Short circuit rating=**31.5kA during 0.5s**

2-3 Construction and main characteristics of components

The insulator shall be dimensioned in accordance with the rules given in IEC 815(3).Maximum internal service pressure in case of use of SF6 gas shall be 3.5 bars gauge at 20°C.The termination shall be equipped with a pressure monitoring system.

2-4Type tests:

Type tests include short-term and long-term tests.

Short-term tests:

- hot impulse test : **10 pulses at + and - 1050 kV**
- power frequency test at room temperature:**350kV 24 hours**

Long-term tests:

6000h at 225kV($\sqrt{3}$ U_o) between conductor and metallic shield.In addition **,250** thermal cycles are performed while the voltage is applied.