



## A5.4

### Development of synthetic and composite terminations for HV and EHV extruded cables.

LE PEURIAN S., EDF DRD, BP 1, 77818 Moret-sur-Loing, France

JUNG M., EDF CNIR, 34-40 Rue Henri Régnault, 92400 Courbevoie, France

#### Résumé

Des extrémités à enveloppe composite remplie d'un fluide isolant ont été développées pour les câbles 225 kV à isolation synthétique extrudée. Des extrémités synthétiques sans fluide sont de plus en plus utilisées pour les câbles 63 kV et 90 kV, notamment en Poste Intérieur Modulaire.

Pour s'assurer de la fiabilité de ces matériels, des essais de type conventionnels comportant des essais diélectriques de courte et de longue durée sont tout d'abord effectués. De plus, dans le cas des extrémités à enveloppe composite, un essai de court-circuit avec défaut interne préétabli a été défini.

Enfin, des essais spécifiques de vieillissement sous contraintes climatiques simulées sont réalisés pour vérifier le bon comportement des protections synthétiques externes vis à vis des contraintes climatiques sévères et de la pollution.

#### Abstract

Terminations with a composite insulator filled with insulating liquid or gas have been developed for 225 kV synthetic insulated cables. Synthetic terminations without fluid are more and more used for 63 kV and 90 kV cables especially in indoor modular stations.

In order to check the reliability of this equipment, conventional type tests including short term and long term electrical tests are performed. More, in the case of composite terminations, a short-circuit test with a pre-established fault has been defined.

Finally, ageing tests with simulated climatic stresses are specifically carried out to verify the satisfactory behaviour of synthetic external coverings towards climatic and pollution stresses.

#### 1-Introduction

For more than twenty years, synthetic outdoor terminations (without fluid) have been installed by EDF on the Medium Voltage system and on High Voltage temporary links. Synthetic terminations are systematically used in indoor modular compartmented 63 and 90 kV substations. The network outcome of experience of this type of equipment is very satisfactory.

These terminations being entirely dry, their main advantages compared to fluid filled porcelain terminations are :

- no risk of explosion or fire in case of internal breakdown,
- simplicity and ease of installation (weight divided at least by 2)
- lower cost,
- ability to operate in varied configurations,
- increased withstand performances under pollution conditions,
- no pressure survey and maintenance.

In the field of higher voltages (225 kV and 400 kV), the terminations include a composite insulator filled with insulating liquid (oil) or gas (SF<sub>6</sub>).

But while traditional porcelain insulated equipments do not age towards climatic and pollution stresses, this is not the case for synthetic and composite terminations.

In order to make sure of the long term reliability of this type of equipment, we had to define a series of tests which will be described in this paper.

These tests have been performed on different terminations designs made by three cables' manufacturers.

#### 2-Tests

Before being used in the network, terminations undergo a series of tests intended to check their ability to withstand service stresses for forty years.

Two French standards NF C 33-064 [1] and NF C 33-065 [2] have been written to define the tests to carry