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B.8.6. Essais pratiques du câble MT gainé au plomb et isolé au papier

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Résumé

Depuis quelques années, il est possible d'effectuer le diagnostic de câbles par détection de la décharge partielle VLF (fréquence très basse). Les points faibles des systèmes câblés sont localisés et le taux de dégradation indiqué grâce à la mesure des décharges à une extrémité du câble. Cette méthode a été appliquée avec succès en Grande-Bretagne et aux Pays-Bas. La maintenance des câbles peut dès lors se limiter aux sections ou accessoires qui en ont réellement besoin, ce qui permet d'effectuer d'importantes économies. De plus, il est possible de réparer des circuits problématiques présentant de nombreuses anomalies, ce qui donne un système solide et fiable. Dans le présent article, vous trouverez une introduction générale de la détection de la décharge VLF et les expériences pratiques obtenues jusqu'à présent dans ces deux pays.

B.8.6. Diagnostic field testing of paper-insulated lead-covered MV cable

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Abstract

Since some years it is possible to diagnose mv cables with VLF partial discharge detection. Weak spots in cable systems are located and an indication of the rate of degradation is given, by measuring discharges on one end of the cable. This method has been successfully applied mainly in the UK and in The Netherlands. Maintenance of the cables can be directed to those cable sections or accessories that really do need this, which saves large amounts of money. Also is it possible to put in order problem circuits with many failures, resulting a sound and reliable system. In this paper a general introduction to VLF discharge detection is given and experiences obtained so far in both countries are emphasized.

Introduction

Since 1994, a diagnostic tool is available that is able to detect weak spots in medium-voltage cable systems with lengths upto 4 km, especially in paper-insulated lead-covered cables. This diagnostic tool is called VLF discharge detection. A first publication about this method and its results was written in 1989 [1]. A VLF generator and measuring equipment is connected to one cable end. Discharges from a specific spot will travel as voltage pulses along the cable in two directions. On the measuring end of the cable the incident and reflected pulse will be detected where the time difference between the two pulses is related to the discharge location and the pulse height is related to the discharge level. When many discharges from various locations have been measured in this, a discharge map can be created that indicates the weak parts of the cable. Some examples of weak spots found in various cable systems are:

- holes in the lead sheath and moisture under this sheath
- dried out and carbonized paper
- moisture in joints
- various types of imploded and exploded joints
- shrinking voids in mastic joints.

All these systems were still in function.

This way of diagnosing medium voltage cables have been successfully applied mainly in United Kingdom and The Netherlands. In these countries the medium-voltage paper-insulated lead-covered cables have extensive lengths. In The Netherlands, this length is about 90,000 km, mainly 10 kV cable. In the United Kingdom this cable length is about 130,000 km, mainly 11 kV.

This paper describes the advantages, the measuring principle and experiences gained in the United Kingdom and in the Netherlands.

Advantages

A general advantage of the VLF discharge detection is the possibility to characterize the condition of a cable system, independent if it is new or old. More specifically, these advantages can be described as follows:

- it is possible to adopt the policy of cable maintenance and replacement to the actual condition of the cable systems
- it is possible to put in order problem circuits with many failures, without replacing the whole system or all joints for instance, resulting a sound and reliable system
- one can locate and proof eventual cable damage after digging activities of other parties before the cable is put in service again
- one can also locate and proof eventual cable damage after cable installation (including cable laying and mounting of accessories)
- there is a possibility to evaluate eventual cable degradation as a consequency of natural ageing or specific load situations.

These advantages must be seen in the light of a growing interest in cost savings on the one hand and network reliability, quality of the delivery of energy and client satisfaction on the other hand.