DYNAMIC TERMINATIONS FOR HIGH VOLTAGE CABLE SYSTEM

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ABSTRACT

Comparison between dry and fluid filled terminations in term of their designs, drawbacks and benefits will be presented. Overview of available dry type terminations will be given as well as the actual status of extra high voltage dry self-supported outdoor termination development.

INTRODUCTION

Terminations for extruded high voltage cable are traditionally made with a supporting insulator (porcelain or composite), a rubber stress-cone slip on the prepared cable and a fluid (oil or SF6) filling the empty space between the cable and the insulator. This design has a very long and good experience but has also some drawbacks. The sealing of the system has to be perfectly made to avoid any leakage and ensure a good performance along the entire product lifetime. In the case of internal arc, such fluid filled terminations, especially oil filled, can produce severe damages to the surrounding equipments and human beings.

The use of fluid free or dry termination can eliminate the risk of leak and strongly reduce the risks associated with an explosion in case of internal arc. Dry sealing ends are now used since many years for GIS terminations up to the extra high voltage level (550 kV). Such design is now commonly accepted and tends to be more and more the standard for such application. Dry outdoor termination are also being used with success since many years but their voltage application has been limited up to now to the lower end of high voltage class. Actual developments of outdoor termination are oriented towards dry type terminals for extra high voltage that will increase the use of such products in the near future as figure of merit will also gives them clear advantages over traditional fluid filled designs.

TRADITIONAL FLUID FILLED TERMINATION

Traditional fluid filled terminations are composed of one supporting insulator filled with oil or SF6 as presented in figure 1. For GIS and transformer terminations the insulator is made of an epoxy based material. Insulators used for outdoor terminations are of porcelain or composite type. The electrical stress control is usually made with a rubber cone slip on the prepared extruded cable. The volume between the cable with its stress-cone and the supporting insulator is filled with some dielectric fluid such as silicon oil or SF6. This termination design is being used since many years and has very long and good experience but has also some drawbacks.

This simple design can be adapted to various cable constructions and dimensions without problems. The volume between the stress-cone and supporting insulator being filled with fluid material the variation in cable dimension is easily adapted without any special care.

One disadvantage of this design is that the presence of a fluid needs a very careful sealing of the termination to avoid any leak that could lead to an electrical breakdown.