

DEVELOPMENT OF SELF-SUPPORTING DRY TYPE OUTDOOR TERMINATIONS FOR 100 KV EXTRUDED UNDERGROUND CABLE CONNECTION IN AIS SUBSTATION

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ABSTRACT

Underground HV XLPE cables are traditionally connected in Air Insulated Substations (AIS) by means of oil-filled terminations set on metallic supports.

In order to avoid oil filling, a completely dry, new type self-supporting termination has been designed, tested and qualified for its deployment in 100kV AIS substations.

Design of the termination is presented and main phases of the development program are described. Termination has been subjected to enhanced extended type tests. As a result the termination has been successfully qualified.

The authors address the assembly conditions during installation on site.

KEYWORDS

Prefabricated Terminations, Self-supporting Termination, Dry Termination, Cable Systems, Qualification Tests,

INTRODUCTION

Underground HV XLPE cables are traditionally connected in Air Insulated Substations (AIS) by means of oil-filled terminations set on metallic supports [1]. In the late 90's, an evolution has been done with the gel filling [2].

The last decade, flexible synthetic terminations such as prefabricated elastomeric sheds and stress cone outdoor terminations [3], have been developed and installed in AIS substations, hung to the HV bars. The main advantage of them is their flexibility allowing them to be installed in particular in very tricky conditions such in tower for direct connection to the Over Head Line (OHL). On the other hand, in bus bars arrangement in AIS substation, this advantage may become an inconvenient as additional post insulators shall be set to hold bars and terminations.

In order to cope with this issue, and to offer a solution to retrofit existing fluid-filled terminations without the need of installing a joint and a short section of cable, a completely new type self-supporting termination has been designed, tested and qualified for its deployment in 100kV AIS substations.

Design of the termination is presented and the authors describe the main phases of the research and development activities. Thermomechanical and electrical tests have sustained the development and are described. Terminations have been qualified after extended type tests have been performed satisfactorily.

Some site installations are shown and the assembly conditions are reviewed, pointing out the advantages of

the few components design of the termination in terms of easiness and rapidity of installation.

DEVELOPMENT PLAN

In the past years, different types of outdoor terminations such as oil-filled prefabricated terminations with composite insulator as well as dry and flexible terminations have been successfully developed and qualified.

As a result of some constraints in substation installation, a new challenge is set up for the development and qualification of new environment-friendly dry self-supporting outdoor (SSO) terminations suitable for HV extruded cable systems. Further objectives are set and in particular for the optimization of the time required to install the terminations.

The present paper is focused on terminations up to a maximum rated voltage of 52/90 (100) kV

The design of the SSO termination shall meet the requirements of standards IEC 60840 [4], IEC 60071-1 [5], IEC 60815-3 [6] and IEC 61462 [7].

CABLE SYSTEMS

Cable

Typical cables with rated voltage 52/90 (100) kV and cross-sections ranging up to 2500mm² have been considered as shown in figure 1.

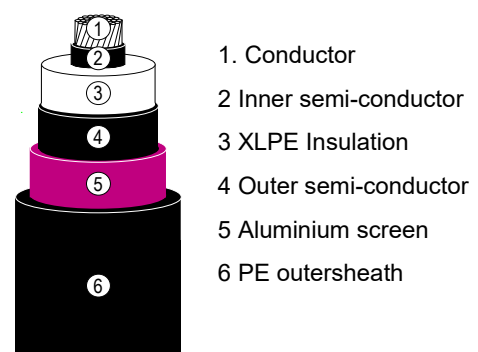


Figure 1: Structure of 100kV XLPE Cable

Outdoor Termination

Dry Self-Supporting Outdoor (SSO) Termination intended for use in pollution level d Heavy, has been designed, tested and qualified. It serves as improved type of the classical prefabricated oil-filled termination, as well as the flexible dry termination. Functional analysis has sustained the development strategy approach.