STUDY OF 500kV CABLE TERMINAL INSULATION STRUCTURE

WANG WEI, **ZHAO** SEN, **WANG** XIXING , **LI** ZHONGQUN ,(China), Wangwei3@sgepri.sgcc.com.cn, zhaosen@sgepri.sgcc.com.cn, wangxixing@sgepri.sgcc.com.cn, lizhongqun@sgepri.sgcc.com.cn

ABSTRACT

This paper has researched the structure and type of 500kV cable terminal, and analyzed the structural design problem of 500kv terminal, electric-*field distribution*, and *must be paid attention to problem*, and how *simple and effective method* of *electric field* distribution in *500kV cable accessories* is *controlled. Users can learn operating* condition of *500kV cable accessories through this paper.*

KEYWORDS

500kV cable accessories, electric field distribution, structural design

INTRODUCTION

Since the 60's, the XLPE cables emerge and develop after 40 years, its voltage level has been gradually developed from 1kV to 500kV. Reason that XLPE cable can be developed rapidly is due to fully automated manufacturing processes, easily source of raw materials, easy installation and laying, and simple operation and maintenance. Therefore, since the 80's, the developed speed of XLPE cable is given impressively. 500kV cable terminal as the current international and domestic high voltage cable accessories are also being at different concern, and with the urban network development, 500kV cable accessories will become more widely used.

This paper describes the based work of detailed design of 500kV cable accessories (terminal), which is the technical data and test process, and some previous studies in this respect. From these starting, we will need to understand the situation and determine the parameters when design the 500kV cable terminal.

ELECTRIC FIELD ANALYSIS

According to the theory of electric field distribution in high voltage insulation, generally the electric field of the HV cables is divided into two categories: power frequency field strength and impulse field strength. The values of working field for the cable structure are different in different places, the general field at the conductor screen is 1.5 to 2 times higher than the field strength at insulated screen. So here we pay more attention to the electric field strength.

In the design of HV cable, we will focus on the working field strength, Fig.1 [3] is the working field scope of various voltage XLPE cables. The Max working field of 500kV cables is about 15kV/mm, under today's technology, the main reasons which decide cable working field should be considered by the capacity of production facilities, cable bend radius, cable tray size and manufacturing length, and so on. Cable diameter can not be infinitely increased, manufacturing costs should also be considered. Secondly, the design of the cable should also be considered the technical requirements of cable accessories, the Max working field of additional insulation in wrapped joint can only reach 3kV/mm, that of prefabricated joints can reach about 5kV/mm.

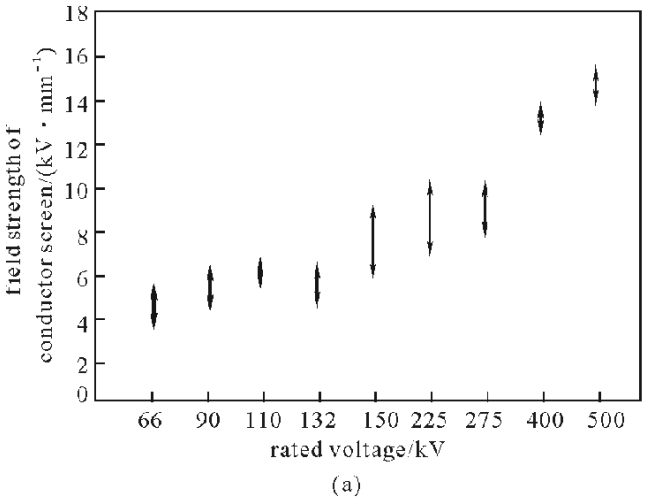

Fig.1. Field strength at the conductor screen or insulated screen under different voltage levels

In addition, the impulse level do also affect the working field of XLPE insulated cables, Fig.2 [3] shown in the working field at conductor screen on various XLPE cable. From Fig.2, the field strength at conductor screen in 500kV cable can be achieved at 70 ~ 85kV/mm, even to 110kV/mm.

Electric field strength in cable accessories is change with the structure change, shown in Fig.3 [4] is changes of field strength in HV prefabricated silicone rubber joint.