A.6.1.

Super compact rubber block joint with high dielectric constant layer

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Abstract: Application of rubber block joint (RBJ or one piece joint) has been recently increasing for a 66kV or more XLPE cable from the merit of easy construction. We have investigated the more economical and super compact RBJ whose volume is reduced to about 1/3 of the conventional one, by employing the high dielectric constant (ε) thin layer between insulation and inner semi-conductive electrode layer in order to relieve electrical stress. The high ε rubber containing much amount of high ε filler is key material of this joint and the most important factor of high ε rubber is to prevent the fall of mechanical and electrical properties such as electrical breakdown strength and dielectric loss. This paper describes the characteristics of high ε rubber and super compact RBJ applying this high ε rubber.

Keywords: 66kV, XLPE cable, RBJ

Mots clés: 66kV , câble XLPE , RBJ

1. Introduction

RBJ (rubber block joint or one piece joint) is the joint for XLPE cables using the rubber block which consists of inner semi-conductive, insulating and outer semi-conductive layers, these components are formed beforehand into one piece at the factory. After expanding the inner side of rubber block, putting it on cable insulation, its electrical performance will be kept by interfacial pressure due to shrinkage force of rubber block itself. Application of RBJ to more than 66kV class has been increasing in recent years, because RBJ has the merits of less skilled and shorter construction in addition to a compact size, in comparison with conventional joint such as TJ (rubber taping joint), PJ (prefabricated joint) and MJ (molded joint).

We have investigated more compact and economical RBJ by employing the thin layer of high dielectric constant (ε) rubber around inner semi-conducting layer of RBJ to release and controll an electrical stress. The scale-down effect by applying the high ε rubber layer can attain notably for 66~110kV class with the large relative volume rate of inner semi-conductive layer. The key material of super compact RBJ is the high ε rubber containing much amount of high ε filler. This paper describes the characteristics of high ε rubber and the investigated super compact RBJ.

2. Controll for electric field

The size of 66kV class super compact RBJ investigated as first temporary design stage has been estimated to reduce approx.70% in each length on 3 dimension, that is, about 1/3 in volume dimension compared with conventional RBJ , as is shown in Fig1. Super compact RBJ has the high ε rubber (relative dielectric constant ε=15) layer around inner semi-conductive layer (inner electrode) to release the electrical stress at the small curvature edge of inner electrode, because 20mm of inner semi-conductive layer thickness for conventional RBJ is reduced to 4mm for super compact RBJ.

Fig.2 shows the example of equipotential line around inner electrode with a thin layer and sharp edge. To