

**A1.6****Construction of long distance 500 kV XLPE cable line**

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Résumé

Au terme de 5 années d'études de développement, Tokyo Electric Power Co., (TEPCO) a appliqué des câbles isolés XLPE de 500kV ayant une épaisseur d'isolation de 27mm et des joints moulés à extrusion (EMJs) aux lignes réelles sur une longueur de 40km(2cct), dont 120 EMJs/cct, actuellement en construction par 4 fabricants de câbles. Afin d'assurer la fiabilité des câbles et des EMJs, nous utilisons une technologie récemment mise au point et d'une haute précision. Elle comporte notamment des équipements d'inspection toute résine en usine/sur site et des équipements d'inspection à rayon X et microfocus. Une fois que tous les EMJs seront installés, des essais de décharge partielle seront effectués afin de vérifier leur état et ils seront placés en utilisation commerciale en l'an 2000.

Abstract

After 5 years of developmental studies, Tokyo Electric Power Co., (TEPCO) has applied 500kV XLPE insulated cables with insulation thickness of 27 mm and extrusion molded joints (EMJs) to the actual line with the length of approx. 40km(2cct) including 120 EMJs/cct, which is presently under construction by 4 cable manufacturers. In order to assure the reliability of cable and EMJs, newly developed and highly accurate inspection technology --including in-factory / on-site all resin inspection equipment, microfocused X-ray inspection equipment and so on-- has been employed. After installation of all EMJs, partial discharge tests will be carried out to verify their soundness and to be in commercial use in 2000.

1. Introduction

While 275 kV underground transmission lines are chiefly used to supply electric power to overpopulated Tokyo, the increase of energy demand in recent years necessitated 500kV underground transmission lines to supply much more electric power directly into the central area of the metropolis. Conventionally, oil-filled cables with semi-synthetic paper insulation have been practically used for long-distance 500kV power cables. This time, the authors have developed, considering the expanding applications of cross-linked polyethylene insulated (XLPE) cables because of freedom from oil tanks and ease of maintenance, a 500kV XLPE cable and an intermediate joint, based not only on the drastic improvements in the quality control of XLPE cable manufacturing but also on the service record of 275 kV class lines.

Actual applications of 500kV XLPE cables were limited until now to the connection lines within the premises of hydroelectric power stations, having an insulation thickness of 32 mm without intermediate joints [1]. In order to realize a smaller-sized cable and an intermediate joint, 2.5 years of fundamental studies as well as 1.5 years of developmental studies were carried out, followed by about one year of long-term verification tests

aimed at verifying overall reliability including the cable installation technology [2][3][4][5][6]. The cable insulation thickness was decided to be 27 mm, the same as for conventional 275 kV XLPE cables, based on the studies on the breakdown stress and its thickness dependence in addition to the characteristics of outer semi-conductive layers treated portion at joints. Meanwhile an investigation of various intermediate joints resulted in the adoption of the extrusion molded joint (EMJ) type, which are compact and highly reliable and have much service record in 275kV lines.

With the strength of this successful development, TEPCO has applied the 500kV XLPE cable and EMJ to the Shin-Keiyo-Toyosu line, and construction is proceeding satisfactorily. This paper reports on the design, quality control, installation, and jointing work of the Shin-Keiyo-Toyosu line.

2. Construction of Shin-Keiyo Toyosu Line

The Shin-Keiyo-Toyosu line is the world's first long-distance underground line of 500kV XLPE cable with a length of approx. 40 km by 2 circuits, which supplies a large amount of electric power directly into the Shin-Toyosu substation in the central part of the metropolis from the Shin-Keiyo