



COMPACT TRANSITION JOINTS FOR UP TO 154KV POWER CABLE

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ABSTRACT

Transition joints are classified into the straight through joint (DJ, Differential type joint,), the Y-branch type joint (YJ) for 154kV cable, and 3 core straight through joint (3cDJ) for 77kV cable in this paper. Each joint was designed compact compared with the conventional joint, and they have an advantage applicable even in narrow existing manhole for straight through joint to connect oil-filled cables. The development tests of both types for 154 kV class cables have been completed according to JEC3408. The 6 months loading test results for 154kV joint satisfied the requirement in IEC60840 (170kV) with estimating V-t characteristics. 154kV DJs were supplied to service lines in Japan. The initial electric characteristics for 77kV 3cDJ were acceptable according to JEC3401 and also satisfied the equivalent requirement compared with specification of IEC60840 (115kV), and now the development test is being executed.

KEYWORDS

Transition joint, XLPE cable, Oil-filled cable, Interfacial pressure, Y-branch

1. INTRODUCTION

The electric power demand in the world has been increasing continuously. In order to meet the needs for replacing part of existing oil-filled cables from a certain section in the underground power transmission system by XLPE cables, the transition joint⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾ between XLPE

and oil-filled cables is indispensable because oil-filled cables were used for a long time and the environmental problems of the leakage of oil etc. are involved. However, the space in existing manholes is large enough to install only the existing straight through joint for oil-filled cables, and so the size and weight of the conventional transition joint will impede the connection work and impose restrictions on the cable offset dimensions. And Y-branch transition joint⁽⁵⁾⁽⁶⁾ permits the additional link by XLPE cables to existing oil-filled cables system.

The authors have therefore developed compact joints that are less than the size of the conventional joint using high electric field technology to cope with the increase in voltage of XLPE cables and joints in recent years. The development process and examination results are described below.

2. TYPE AND FEATURES OF 154KV JOINTS

The structures of 154kV DJ and YJ are shown in Figure-1 and Figure-2 respectively. DJ directly connects an oil-filled cable and an XLPE cable. And all three ports of the YJ are compatible with both XLPE and oil-filled cables to permit the replacement of existing oil-filled cables, pi-lead-in cables, and many other installation patterns.

The prefabricated XLPE cable side has an insulation structure in which the insulation thickness of the epoxy unit has been reduced and the rubber stress cone has been made compact through research and development of the prefabricated structure based on the electric performance confirmation data⁽⁷⁾⁽⁸⁾⁽⁹⁾ and the design electric field concerning each component element of 154-

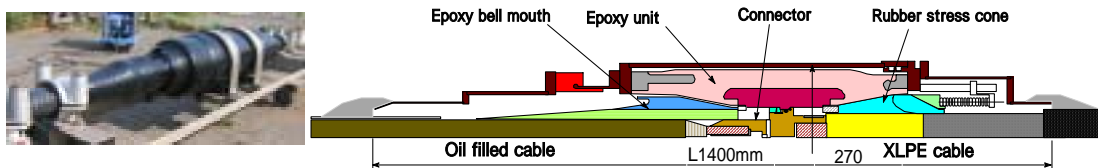


Figure-1. 154kV straight through joint

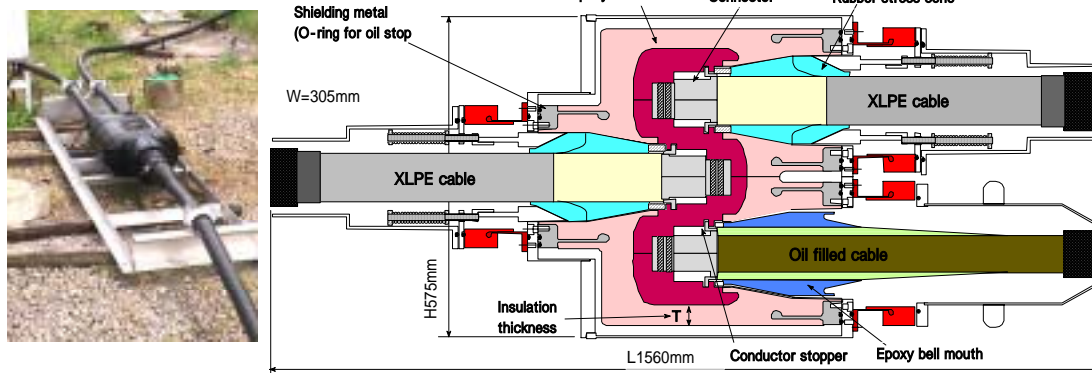


Figure-2. 154kV Y-branch type joint