



## DEVELOPMENT OF ONE PIECE TYPE JOINT( SELF PRESSURIZED JOINT) FOR 400KV XLPE CABLE



Koji Fudamoto, J-Power Systems Corp. (JPS), (Japan), [fudamoto.koji@jpowers.co.jp](mailto:fudamoto.koji@jpowers.co.jp)

Yoichi Watanabe, J-Power Systems Corp. (JPS), (Japan), [watanabe.yoichi@jpowers.co.jp](mailto:watanabe.yoichi@jpowers.co.jp)

Koji Kishi, J-Power Systems Corp. (JPS), (Japan), [kishi.koji@jpowers.co.jp](mailto:kishi.koji@jpowers.co.jp)

Tsuyoshi Uozumi, J-Power Systems Corp. (JPS), (Japan), [uozumi.tsuyoshi@jpowers.co.jp](mailto:uozumi.tsuyoshi@jpowers.co.jp)

Atsushi Terayama, J-Power Systems Corp. (JPS), (Japan), [terayama.atsushi@jpowers.co.jp](mailto:terayama.atsushi@jpowers.co.jp)

### ABSTRACT

*One piece type joint for 220kV class XLPE cable system has been developed and widely used all over the world. Main features of this joint are 1) Compactness, 2) High reliability, 3) Long storage period, and 4) Less jointing skill comparing with conventional joint. From the above point of view, we have determined to develop the new joint for 400kV XLPE cable system by taking over the basic technology of 220kV class joint.*

### KEYWORDS

One piece joint, EHV, XLPE, self pressurized, SPJ

### 1. INTRODUCTION

There is a growing demand of more compact and easier assembling joints than conventional joints. In recent years, the key word for extra high voltage jointing is skill reduction.

One piece type joint as we called self pressurized joint (here in after SPJ) up to 220kV class, has been developed and widely used all over the world since 1995 and supplied more than 12,000 sets totally. This SPJ consists of one pre-molded insulator (rubber unit), which contains the main insulation, insulation screen and HV electrode layer made of EP rubber molded in one piece at the factory. Main features of SPJ are as follows, 1) Compactness, 2) High reliability, 3) Long storage period. 4) Furthermore this joint can be assembled by less jointing skill comparing with conventional straight through joints, such as Extrusion Molded Joint (here in after EMJ) and/or Prefabricated Composite Joint (here in after PJ). EMJ is compact and has excellent electrical property, but requires more assembling time and well-trained jointers. PJ, which consists of an epoxy insulator and rubber molded stress cones with spring unit, achieved shorter assembling time and less jointing skill than EMJ, but still complicated and is required to be assembled by skilled jointers.

From the above point of view, we have determined to develop the SPJ for 400kV XLPE cable system by taking over the basic technology of 220kV class SPJ. The electrical performance required on the new joints shall comply with IEC 62067 (rated voltage 400kV).

The pre-qualification and type test have been carried out and successfully completed. A view of the long-term heat cycle voltage testing is shown in Fig. 10.

This paper introduces the design, electrical performance and installation workability of SPJ in comparison with the conventional 400kV class joints.

### 2. CONSTRUCTION AND FEATURE OF SPJ

The cross sectional view of the SPJ is shown in Fig. 1. The SPJ is superior to conventional EMJ or PJ in the following points.

- (1) Ensuring reliable performance: The main insulation unit is manufactured at the factory and tested for AC withstand voltage with partial discharge measurement (routine test), prior to the shipping (see Fig. 2).
- (2) Shorter overall joint length and construction period than EMJ or PJ as shown in Table 1.
- (3) Stable quality of installation work is assured: The main insulation is a factory- tested integral unit. It does not require special skills except for controlling the interface between the unit and cable insulation. This can reduce human errors in assembling. In other words, the SPJ is less dependent on the worker's skill and can provide reliable performance.



Figure 1. Cross section for the SPJ



Figure 2. Electrical routine test of a SPJ