

## Development of a 500kV PPLP MI cable system for HVDC applications

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This paper describes the development of the 500kV DC Polypropylene Laminated Paper (PPLP) mass-impregnated type cable system for HVDC transmission lines. As you know, mass-impregnated type cable generally has only insulating layer with the kraft paper impregnated with a high-viscosity insulating compound. But, Polypropylene Laminated Paper is made of a layer of extruded polypropylene (PP) film sandwiched between two layers of kraft paper. Thanks to PP film and its combination with kraft paper, PPLP has higher AC, impulse (Imp.) and DC breakdown (BD) strengths as well as lower dielectric loss than conventional kraft paper insulation. In addition, Kraft MI cable has a limitation for the maximum conductor temperature as 55°C. But this PPLP MI cable has higher maximum conductor temperature than that of kraft MI cable due to advantage of oil drainage characteristics. It is the most economic type of cable for HVDC transmission.

LS cable&system already developed  $\pm 250$ kV mass-impregnated type kraft cable system with cross-section of 900 mm<sup>2</sup> conductor, flexible joints and out-door terminations. This submarine cable system was successfully established between Jindo and Jeju Island in Korea. In this paper, DC 500kV PPLP MI cable system was developed including land joints, flexible joints and outdoor-terminations. In order to prove the mechanical and electrical performances, the type test was carried out according to CIGRE recommendations. A full scale cable system has been tested successfully. And additional load cycle and polarity reversal tests on the cable system showed a higher performance compared with a similar mass impregnated paper cable.

Key words

HVDC transmission; Submarine cable; DC Polypropylene laminated paper; Land joint; Outdoor termination