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Application of PPLP to DC MI cables

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Polypropylene laminated paper (PPLP) is a laminated paper consisting of Polypropylene (PP) film and conventional kraft paper. PPLP has excellent electrical characteristics, which are higher electrical breakdown strengths and lower dielectric loss than those of conventional kraft paper. The electrical breakdown strengths of PPLP is significantly improved in proportional to PP ratio in PPLP since most of electrical stress in PPLP is distributed in the part of PP film due to lower permittivity and higher resistivity than those of kraft paper, as shown in Figure 1.

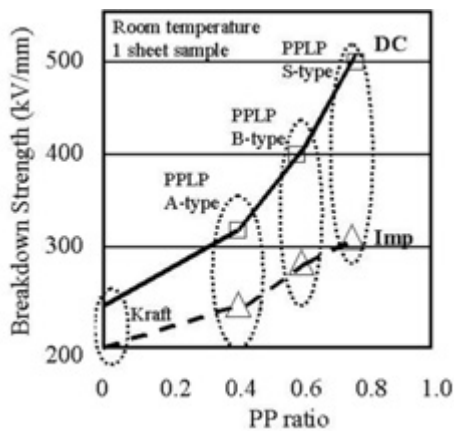


Fig. 1. Relationship between PP ratio and electrical breakdown strength

Because of its higher breakdown strength and lower dielectric loss, PPLP has been widely employed for EHV AC fluid-filled cable systems with rated voltage up to 500 kV. In addition, the pre-qualification and type tests for future 800 kV transmission systems were successfully completed in 1993.

As for the DC application, a 500 kV HVDC link of the Kansai Electric Power Co., Inc. was commissioned in the year of 2000, which is the world first application of PPLP to DC fluid-filled cable.

Through the past fundamental research and development on PPLP insulated cables, new application of PPLP has been founded and studied.

PPLP with suitable impregnation oil makes it possible to raise permissible conductor temperature and to increase transmission capacity of DC MI submarine cables, because PP film functions as the barrier against the oil migration and generation of cavity in the insulation due to temperature change in the insulation. As an example in case of MI cable with 1600mm² conductor and 19mm insulation thickness, Figure 2 shows a comparison of optimum transmission capacity between conventional kraft paper and PPLP.

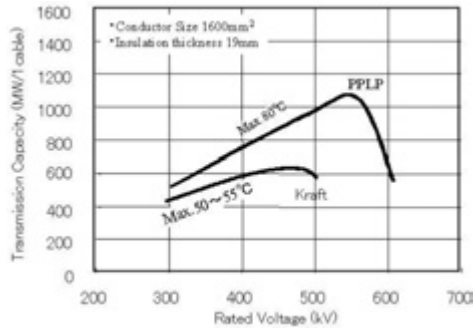


Fig. 2. Comparison of capacity between conventional MI and PPLP MI cable

This paper describes the new application of PPLP, which presents the new solution for present DC MI submarine cable technology.

Keywords: HVDC, PPLP, MI Cable, Submarine Cable