Evaluation on thermo-mechanical characteristics of outdoor termination by full scale real test in underground power cable systems

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This paper describes the real test results on thermo-mechanical characteristics of outdoor termination in underground power cable systems. Recently, the outdoor termination faults are more increasing in winter season. In South Korea, the power demands are growing with peak heating load in winter season. Therefore, the temperature difference between maximum conductor temperature and minimum conductor temperature would be bigger because the conductor temperature was decreased at night. The mechanical force is proportional to this temperature difference.

The mechanical forces have effects on interface pressure between insulation and stress-cone as well as epoxy unit and stress-cone inside outdoor termination. This interface pressure will be also changed with conductor and outdoor temperature. The outdoor termination might be faulted by less interface pressure because of insulation breakdown of termination. The minimum interface pressure is limited within 2 kgf/cm^2 in KEPCO (Korea Electric Power COrporation).

In KEPCO, the real test is performed with full scale cable and outdoor terminations. One of the outdoor terminations is installed large-scale environmental chamber. The ambient temperature in chamber can be changed from -30 deg. to 80 deg. The current source is supplied for test cable and termination at the same time. The reliable displacement sensors and load cells are installed for measurement of thermo-mechanical characteristics. The interface pressure is measured and evaluated according to the change of conductor temperature as well as ambient temperature during the test. Finally, in this paper, the relation between outdoor termination failure and less interface pressure is proved according to the change of environmental conditions in winter season through the full scale real test. The failure protection methods are also discussed in this paper.

Key words

Thermo-mechanical characteristics; Outdoor termination failure; Interface pressure; Underground power cable systems