

ON-LINE LEAKAGE CURRENT MONITORING SYSTEMS FOR ELECTRICALLY OVER-STRESSED 33 kV INSULATORS

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Insulation is a very important subject and play a great roll in high voltage electrical engineering. For more than 80 years the glazed ceramic have been using as high voltage insulating material especially in outdoor applications such as distribution and transmission lines, substations etc. The ceramic insulation materials performed well over its competitor the toughen glass.

But in recent past, polymer (composite) materials has become more popular in the field of high voltage outdoor insulation due to many advantages over glazed ceramic and toughen glass insulations. Some of these advantages are 90% weight reduction, reduction in breakage, lower installation cost, and improved contamination performances through hydrophobicity, etc. In comparison to ceramic ones, the polymeric insulators especially silicone rubber have shown superior performance. A project was started at University of Peradeniya in 2000, to study the performance of over-stressed silicone rubber insulators under heavily polluted tropical conditions. The results of this project will help in future to manufacture the polymeric insulators with small creepage distances if the performances of over-stressed insulators are still good compared to normally stressed ones. The objective of this study is to develop an on line Leakage Current (LC) measuring system to monitor the performance of electrically over-stressed composite insulators under marine pollution and clean environment in Sri Lanka.

Two substations i.e. Koggala and Peradeniya were selected to represent polluted and clean locations respectively and 33kV LC measuring systems were developed. Twelve different types of 33 kV silicone rubber, semiconductor glaze, porcelain and glass insulators were installed in those sites.

The hardware part of the LC monitoring system consists of primary and secondary protection systems for protection from high voltage spikes; variable shunts for measuring LCs, and a data acquisition system with a personal computer (PC). The software part of the monitoring system consists of developed programs for measuring and analyzing the LC magnitudes and waveforms. The developed system was tested with the installed insulators at Koggala test station. It is concluded that the measured LCs were correlated with the pollution severity measurements during a year period. A long-term investigation of leakage current will provide better understanding of the over-stressed insulators.

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