Infrared Image-Based Condition Assessment of Lightning Surge Arresters

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Lightning surge arresters are key components for protection and reliability of power systems. During service, surge arresters are aged by deteriorating their properties. It is important to monitor conditions periodically in order to avoid failures and damages in the power apparatus. A surge arrester consisting of arrester material (ZnO) housed by insulation (silicone rubber/porcelain) is usually exposed to electro-environmental stresses. Therefore, the condition of internal arrester material cannot be assessed directly. However, with aging, leakage current inside the arrester increases resulting increasing in temperature. This study proposes an online based condition monitoring method for surge arresters by statistical analysis and thermal image processing of infrared images captured from energized 33 kV lightning surge arresters which are used in distribution network of Sri Lanka and validation by FEM based modeling. Samples of (20) 33 kV silicon rubber insulated ZnO surge arresters with service years from 0-20 years were selected for the study from Peradeniya area having high keraunic level in Sri Lanka. Recommended Thermal imager is used for capturing. Temperature profiles and statistical information (central tendency, box plot, violin plot) of the arresters were obtained by thermal image processing methods. The results of the above observations were compared with the built model from COMSOL Multiphysics software. COMSOL model is validated to obtain any defects within surge arrester. Different kind of surface defects were observed from the visual scrutiny and captured images. Relationships between age, defects and analyzed parameters including the effect of sun irradiation for measurements is determined. As the result, physical properties of surge arrester that will affect the temperature variations were identified under different conditions.

Keywords: 33 kV surge arresters, Thermal imaging, FEM, COMSOL

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