

A cumulative pollution index for the estimation of the leakage current on insulator strings

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Abstract-

The pollution performance of insulators installed in transmission and distribution lines plays a key role in maintaining the reliability, safety and cost-effectiveness of power systems. Among the different insulator monitoring techniques, leakage current stands out as one of the most meaningful pollution performance indicators as it gives a measure of how close the insulators string is to flashover. This paper presents a novel methodology for the prediction of the leakage current on insulator strings considering the environmental and weather information of the insulators location. It is based on the combination of a new developed Cumulative Pollution Index (CPI), which estimates the soluble pollution deposit on the insulator string, and a machine learning technique such as Random Forests algorithm. The method is valid for ceramic insulators, i.e. toughened glass, as well as RTV silicone-coated insulators with hydrophobic transfer properties. The research is supported by an extensive field monitoring program where three different insulator strings composed by non-coated, half-coated (bottom part) and full-silicone-coated glass insulators were monitored in a period covering twenty-two consecutive months. Finally, the performance of the proposed prediction model is evaluated using real data.

Index Terms- Condition monitoring, contamination, flashover, glass insulators, leakage current, predictive models, random forests, RTV coatings, transmission lines.

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