

Harmonic Analysis In China

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Feature extraction based on the multiple harmonic analysis of 2-dimensional pattern of partial discharge

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Abstract. Partial discharge will cause deterioration of insulation of high-voltage electrical equipment, resulting in insulation breakdown and short circuit accident. In order to ensure the normal operation of the high-voltage equipment, it is necessary to detect partial discharge online. By using Ultra High Frequency (UHF) deflection method, statistical 2-dimensional (2D) patterns of partial discharge are obtained. Extracting the envelopes of the 2D patterns, we do the harmonic analysis for patterns' envelopes, and the harmonic components are used as a characteristic parameter for defect type's recognition. The results show that the harmonic components can be used as characteristic parameter for defect types' recognition. This method has the characteristics of strong real-time and simple operation.

Introduction

At present, in the research field of pattern recognition technology, feature extraction methods are as follows: statistics operator [1], pulse waveform feature [2], Matrix characteristics [3], Will Boolean parameters [4], wavelet theory [5] and principal component analysis [6]. Together with artificial neural network [5], Support Vector Machine (SVM) [7] and minimum distance separator [8], the feature extraction methods are applied to partial discharge pattern recognition, and good effects are obtained. However, those methods operate complicatedly, required large quantity of data. Especially when does the analysis of the single discharge pulse, it requires a high sampling rate of signal sampling. Moreover, the design of the circuit is also very complex and costs a lot.

This paper uses UHF method to detect partial discharge, logarithmic detector and low frequency sampling are used to process signals, the PD's 2D patterns are getting by statistical partial discharge in many sampling periods. The envelope graphs of PD's 2D pattern have the power frequency of 50 Hz (in china) period characteristics. PD's 2D pattern envelope can be regarded as a superimposed combination of 50Hz fundamental frequency and its harmonic signals. The 2D pattern harmonic characteristic and the PD's defect type characteristic have a good corresponding relation. This paper uses multiple harmonic analysis method to extract harmonic components of the 2D pattern envelope to judge the defect type. The results demonstrate the effectiveness of the above method, and this method has characteristics of strong real-time and simple operation.

The characteristics of partial discharge 2D pattern

In Partial discharge pattern recognition, the 2D pattern is the most common and the simplest characteristic of representation of partial discharge. The 2D patterns are primarily the following categories: the maximum value of the discharge amount to phase distribution pattern ($Q-\Phi$). The number of discharges to phase distribution pattern ($N-\Phi$), The discharge energy to Phase distribution pattern ($E-\Phi$).

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