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Review

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Partial Discharge Classifications: Review of Recent Progress

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ABSTRACT

It is well known that a correlation exist between the pattern of partial discharge (PD) behavior and the insulation quality. Since different sources of partial discharge have their own unique effects on the degradation of insulation material, it is vital to investigate the relationship between the defect type and the PD to determine the insulation quality. Numerous work had been done to classify partial discharge patterns with variable success. Past research work in partial discharge classification varies greatly in terms of classification techniques used, choice of feature extraction, denoising method, training process, artificial defects created for training purposes and performance assessment. Therefore it is necessary for a literature survey to access the state of the art development in partial discharge classification.

Index Terms— Partial discharge measurement, pattern recognition, feature extraction, neural networks.

1 INTRODUCTION

Electrical insulation is a significant part in all high voltage power equipment. Failure analysis reveals that insulation failure is the root cause for more than 60% of high voltage equipment damage [1]. Therefore it is crucial to ensure that the insulation is in good condition. PD measurement has received global acceptance as an effective diagnostic tool with the capability to assess and monitor insulation systems for its integrity during manufacture and while in service [2].

PD is a type of breakdown that don't fully connect the electrodes. This can lead to serious insulation damage and considerably reduce the life span of high voltage equipment [3]. PD occurs if the local electric field is greater than the threshold value causing a partial breakdown of the surrounding medium [4]. PD has a transient nature and is characterized by pulsating currents with a duration of several nanoseconds to few microseconds [5]. PD discharge magnitude is not always proportional to the damage caused since PD of a tiny magnitude may rapidly lead to electrical tree growth, especially for high voltage cables [6]. Therefore it is very cost effective if PD activity can be detected and quantified in its early stage in order for replacement to be scheduled at a suitable time [7].

The IEC has a specific limit of PD for all power equipment. When insulation failure occurs, it is replaced with no information

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