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The analysis of the partial discharge pattern to the artificial defects introduced at the interface in an *XLPE cable joint using laboratory model*

LEE J.S., KIM J.T., LG Cable. Ltd., Korea
KOO J.Y., Hanyang University, Korea
KIM J.T., Daejin Univ., Korea

Abstract: In order to realize the possible defects at the cable joint interface, four different types of artificial defects are provided: conducting, insulating substances, void and scratches. The analysis related to the PD patterns has been performed by means of conventional Phase Resolved Partial Discharge Analysis (PRPDA) and Chaotic Analysis of Partial Discharge (CAPD) as well which was proposed by our previous communication. As a result, it could be pointed out that each defect has shown particular characteristics in its pattern respectively and that the nature of defect causing partial discharge could be identified more distinctively when the CAPD is combined with the conventional statistic method, PRPDA

Keywords: PRPDA, CAPD, partial discharge

Résumé: Pour comprendre les défauts éventuels à l'interface de la jonction du câble, quatre types différents des défauts artificiels ont été considérés : particules conductrices, substances isolantes, vide et rayures. Pour analyser les modèles concernant les DP, nous avons fait deux analyses: l'analyse traditionnelle, Analyse sur la Phase Résolue des Décharges Partielles (PRPDA) et l'analyse chaotique, Analyse Chaotique des Décharges Partielles (CAPD) qui avait été proposée par notre laboratoire. En conséquence, nous avons remarqué deux points: Chaque défaut a montré respectivement des caractéristiques particulières de son modèle. La nature du défaut qui cause la décharge partielle pouvait être identifiée plus distinctement lorsque nous avons utilisé les deux analyses ensemble, l'analyse CAPD et la traditionnelle méthode statistique, PRPDA.

Mots-clés : PRPDA, CAPD, décharge partielle

1. Introduction

Even though the cable joint splicing is performed very carefully by skillful technicians usually in manholes, various types of contaminants could be easily introduced at the interfaces, and thus, interfaces in the cable joint have been considered to be the weakest part of the extruded transmission power cable system [1]. According to the paper of CIGRE SC 15, when the electric stresses due to these interfacial defects are excessive, the partial discharges are known to be produced resulting in the interfacial electrical tree giving rise to eventually sudden breakdown [2]. On that account, partial discharge detection is suggested as one of the most effective means to the diagnosis of interfacial aging of joints.

Other precedent works have been carried out for the investigation on the nature of defects and the degree of degradation based on the PD measurement [3]. However, they might have faced some technical inconveniences related to the sensors associated with their measuring system. Moreover, the on-site applicability seems not to be so high since the transmission characteristics of PD pulse is affected by various parameters in connection with the cable accessories and PD signal transmission path [4]. In particular, many investigations on the PD pattern analysis have been reported by means of PRPDA using different types of defects, of which the results are consistent with each other only for the case of void.

In this respect, it is preferable not only to identify the nature of possible defects but also to obtain information about the present state of degradation of XLPE cable joints by recognizing their PD patterns. For this purpose, in order to realize the possible defects at the cable joint interface, four different types of artificial defects are introduced into our test specimen: conducting, insulating substances, void and scratches. And the analysis related to their PD patterns has been performed by means of the conventional Phase Resolved Partial discharge Resolved Partial Discharge Analysis (PRPDA) and Chaotic Analysis of Partial Discharge (CAPD).

The reason why the CAPD is proposed in this paper can be described from the two view points