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Modification of cable replacement criterion of isothermal relaxation current measurement system

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Abstract: We are using Isothermal Relaxation Current(IRC) measurement system for the diagnosis of our MV cables, but it's reliability has not been proved so far in KOREA. In this paper, we tried to prove the reliability of this equipment and to make new replacement criterion for this equipment through the field tests and AC breakdown tests. In order to prove the reliability of IRC measurement system, we selected three aged cables installed in the field such as the downtown area in Seoul. At first, we measured initial condition of these cables using IRC measurement equipment and AC breakdown. And then A and B phase cables were treated by silicone injection and C phase cable was not treated. These cables were operated for 1 year in the field. We carried out cable diagnosis and AC breakdown test at every 6 months. Through this study, we recommend new replacement criterion for our XLPE insulated MV cables.

Keywords: IRC, MV cables, Replacement criterion, Silicone injection, Breakdown strength

Résumé:Nous employons le système de mesure Isothermal Relaxation Current (IRC) pour le diagnostic de nos câbles de système MT mais cette fiabilité est non avérée en COREE. Dans cet article nous avons essayé de prouver la fiabilité de cet équipement et de retenir un nouveau critère de remplacement pour cet équipement par des essais sur le terrain et de coupures de courant alternatif. (C.A) Afin de prouver la fiabilité du système de mesure d' IRC nous choisissons trois câbles âgés, installés au centre-ville à Séoul. Au début, nous avons mesuré l'état initial de ces câbles en utilisant les mesures d'équipement d' IRC et des coupures de courant alternatif. (C.A) Et puis des câbles de phase A et B ont été traités par l'injection de silicone et le câble de phase C n'a pas été traité. Ces câbles ont été exploités pendant 1 année dans le réseau. Des diagnostics de câbles et des essais de coupures de courant alternatif ont été effectué tous les 6 mois. Par cette étude, nous recommandons le nouveau critère de remplacement pour nos câbles de système MT isolés au PRC.

Mots clés: format du papier, instruction aux auteurs

1. Introduction

In order to prevent the failures of underground distribution power cables we need to measure insulation condition in the field. Until now we used DC high voltage as a power source for the cable diagnosis but it was not proper method to the XLPE insulation cables because DC high voltage can affect sound insulation and can't diagnose exactly insulation degradation.

Because of these reasons we imported Isothermal Relaxation Current(IRC) measurement system but it's reliability was not proved for our URD cables. In this paper we tried to prove the reliability and to make new replacement criterion of this system through the field tests and AC breakdown(ACBD) tests.

In order to prove the reliability of this system we selected three field installed aged cables at the downtown area in Seoul.

At first, we measured initial condition of these cables using IRC measurement and ACBD test. And then phase A and B cables were treated by silicone injection and phase C cable was not treated. These cables were operated for 1 year in the field. During the field operation we carried out cable diagnosis and ACBD test at every 6 months.

This paper presents the field test results of this diagnosis system and shows the relationship between the results of condition assessment by this system and breakdown strength of cables.

Finally we found that the decision criterion of IRC measurement system have to be modified for the economical cable replacement.

2. Experiment

2.1 Introduction of IRC measurement system

Cable diagnosis by IRC measurement system is based on the relaxation time. Relaxation time of each cable component is different. This system uses 1kV DC voltage source and charging time is 30 minutes and measuring time is 15 minutes.

Figure 1 and Table 1 are showing the cable structure and the difference of relaxation time.