95 Jicable

D.2.9. Etude de la tension de claquage du polyéthylène soumis à des transitoires rapides

GARROS B., Alcatel Alsthom Recherche, Marcoussis, France
LAND H.G., Alcatel Kabel, Hannovre, Allemagne
PEDERSEN J.R., Alcatel Kabel Norge, Halden, Norvège

Résumé

L'effet de la raideur du front de montée de choc impulsionnel sur la rigidité diélectrique a été étudié dans la gamme 0,2 - 20 $kVmm^{-1}ns^{-1}$. Le but de cette étude était de confirmer ou non l'hypothèse que de très rapides montées de chocs impulsionnels abaissaient de manière dramatique la rigidité diélectrique.

Les résultats sur du polyéthylène basse densité ne montrent aucun effet significatif. Cependant, une légère différence entre les valeurs de rigidité diélectrique obtenues à différentes températures dans la gamme 20 - 95 °C est observée. Afin de mieux comprendre l'influence de la vitesse de montée du front d'un choc et de la température, des simulations ont été effectuées avec des modèles de claquage, tels que thermique impulsionnel et électromécanique, et les modèles de conduction de Schottky et Fowler-Nordheim.

D.2.9. Investigations on break-down strength of polyethylene at very fast transients

GARROS B., Alcatel Alsthom Recherche, Marcoussis, France
LAND H.G., Alcatel Kabel, Hannover, Germany
PEDERSEN J.R., Alcatel Kabel Norge, Halden, Norway

Abstract

An investigation has been made on the effect of fast transient voltages on the breakdown strength in the range of 0,2 - 20 $kVmm^{-1}ns^{-1}$. The aim of this study was to confirm or not the assumption that very fast transient voltages decrease dramatically the impulse strength.

The results show that no significant effect was observed. However, a light difference between the breakdown strength values obtained at different temperatures in the range 20 - 95 °C was observed. To understand the behaviour in respect with fast transient voltage and temperature, simulations with models of breakdown and electrical conduction were made at various temperatures and rise times. The both Schottky and Fowler-Nordheim conduction models and impulse thermal breakdown process combined with electromechanical breakdown process were employed.

INTRODUCTION

Generated by switching for example very fast transient overvoltages can occur in a cable system. The aim of this study is to confirm or not the assumption that very fast transients decrease dramatically the impulse strength of polyethylene (PE) insulated cables. This paper deals with the influence of very fast transients with rise times between 10 and 1200 ns on the breakdown strength at different temperatures. The experiments were made on low density polyethylene (LDPE) with two kinds of test objects. The first one comes in a form of plates of insulating material with 0,3 mm wall thickness and the second one in the form of cups with 0,7 mm wall thickness.

1. DEFINITION OF TEST OBJECTS

1.1. Plates

The sample is constituted by a plate of LDPE which is 5 mm thick. In the center of the sample, over a diameter of 16 mm, the thickness is reduced to the range 0,3 - 0,4 mm with curved edges as shown on figure 1. In the curved parts, Rogowski shaped metal inserts have been incrusted during the molding process as shown on figure 2.