A.8.5.

Experience with after laying test

PULTRUM E., VERHOEVEN S.A.M., VAN SCHAIK N., Kema High Voltage Laboratory, The Netherlands

Abstract: This paper describes the experience with series resonant testing of cable circuits after installation from 1997 to 2002. During this period of 6 years almost 200 circuits have been tested, resulting in valuable information regarding e.g. the breakdowns that occur. It also gives insight in the combinations of test voltage and duration prescribed by the utilities. The 10% of breakdowns during the tests not only show the necessity of these tests, but also the necessity to use voltages well above U_0. The results confirm the requirements given in the relevant IEC standards. The test set in use facilitates swift testing.

Keywords: Test After Installation, HV, EHV, series resonant

Résumé: Ce rapport décrit pour la période 1997 à 2002, l'expérience obtenue lors des essais de câbles après installation via système série/résonnant. Pendant ces 6 années, près de 200 circuits ont été testés, ceci conduisant à de précieuses informations concernant par exemple les claquages concernés. Il donne aussi un aperçu des combinaisons de tension et durée d'essais prescrits. Les 10% de claquages pendant les tests montrent non seulement la nécessité de ces tests, mais aussi la nécessité d'utiliser des tensions bien supérieures à U_0. Les résultats confirment les conditions données dans les normes CEI pertinentes. Le dispositif d'essai utilisé facilite la mise en œuvre d'essai rapide.

Mots clés: Essai après installation, HT, THT, série/résonnant

1. Introduction

Since its foundation in 1927, KEMA's High-Voltage Laboratory has been involved in testing cables and accessories for Dutch utilities and manufacturers and during the last 15-20 years for clients world-wide. This testing includes type testing at our laboratories and on-site test after installation or so-called TAI, see figure 1. For HV cables, these tests after installation were originally performed with DC and later on with oscillating wave voltages. Nowadays DC is recognised as being not effective and even more being harmful for XLPE cables and oscillating wave voltages have become obsolete for HV cables. The alternative, series resonant testing, is now widely accepted, which is not only reflected in recent CIGRE publications [1,2], but also in today's standards and requirements.

In this paper KEMA's experience with series resonant testing of cable circuits after installation is illustrated, based on the results of performing tests after installation from 1997 to 2002. In these 6 years we have tested almost 200 cable circuits in high and extra high voltage range. The results indicate that with 10% of all the tests a breakdown occurs. These results are an indication of the value of this test after installation and may help utilities to determine what tests might be appropriate to be confident about newly installed or renovated high voltage cable circuits.

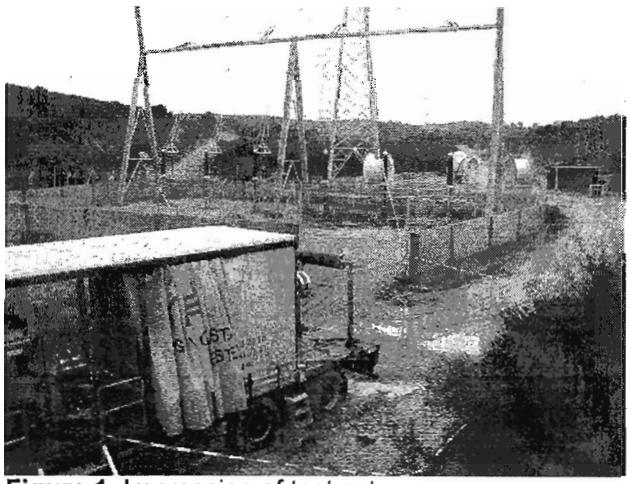

Figure 1. Impression of test set-up

2. Series Resonant Testing

Energising a HV cable requires a large amount of reactive power. To avoid the need of a transformer capable of supplying this reactive power, the cable is energised by means of a resonance circuit.