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Progress in quality of XLPE insulation for medium voltage cables

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Résumé

Cet article repasse structure de distribution systeme et part d'interet de cable dans total longeur d'systeme. Statistique d'incidents et l'experience avec moyenne tension cables sont presentees aussi. Un progress et l'avance de qualite de MT PR cables isolation est termine sur la base d'investigations de: resistance au arborescences d'electrique, resistance au arborescences d'eau, rigidite en choc 1,2/50 μs et l'analyse en spectrophotometric l'infrarouge de PR polyethylene utilise present et il y a 20 ans.

Abstract

The paper presents structure of electric distribution network and the percentage share of cable in the total length of this network. Fault statistics and some experience with medium voltage cables are presented too. The progress and quality improvement of XLPE cable insulation will be shown on base of results obtained from the tests of: resistance to electrical treeing, resistance to water treeing, volume resistivity, dielectric loss factor, impulse voltage strength and investigations based on IR spectrophotometry for crosslinked polyethylene used now and twenty years ago.

Introduction

Every year the percentage share of cables in electrical power network is increasing. This tendency is observed in medium voltage (MV) and high voltage (HV) systems. Presently, the decision to install underground cable instead of building overhead lines is made more often not only on technical or economical grounds. The more environmentally public press is influencing decision making processes leading to increased demand for underground cables [1]. The percentage share of underground cable length in the total length of electrical power network is different in various countries.

According to [2], in European countries cables in networks with voltage level from 380 kV to 420 kV represent only a very small percentage of the entire network length. The highest share is in Austria, where cables represent 4% of the total length of the transmission system and in UK where they represent 1.5%.

Higher representation of cables can be observed in systems with voltages from 100 kV to 275 kV. According to 1994 data, the most developed cable networks for this range of voltage are in United Kingdom (2900 km or 12% of the total size of network), in Holland (747 km or 8%) and in Denmark (371 km or 8%).

Figure 1 presents a comparison among the networks from a few selected European countries [2]. The main focus is on the MV system because in this voltage range the most dynamic increase in cable installations is expected.

In Poland the primary voltage in MV distribution system is 15 kV. The 20 kV voltage is used more rarely. Small networks of 6 kV, 10 kV and 30 kV also existing in many cities and towns.

In some countries MV cables with impregnated paper insulation are in use without failure for more than eighty years. Although cable designs are slightly different, the

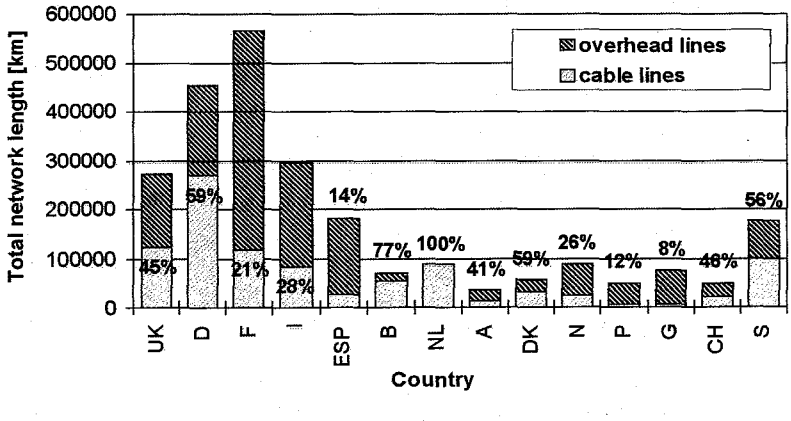

Fig.1. Comparison between >1kV- 30kV cables and overhead line lengths and percentage share of cables in the total length of MV network