PERFORMANCE OF MODERN CABLES IN CENTRAL EUROPE

Detlef WALD, Borealis Polymers NV, 2800 Mechelen, Belgium, detlef.wald@borealisgroup.com
Annika SMEDBERG, Borealis AB, 44486 Stenungsund, Sweden, annika.smedberg@borealisgroup.com

ABSTRACT

Based on early cable failures intensive work has been made to improve the reliability for crosslinked polyethylene (XLPE) medium voltage cables.

Several important steps have been taken to enhance the performance of medium voltage cables such as

- *Cleaner compounds*
- *Cleaner product handling*
- *Triple extrusion*
- *Extruded outer screens*
- *Use of compounds with improved resistance against water trees*
- *Change from PVC to HDPE jacketing*

After more than 30 years operation of XLPE cables the results of the efforts to enhance the reliability can now be evaluated.

This paper covers the influence of the improvements made on the reliability of selected distribution networks.

KEYWORDS

Medium voltage cables, XLPE, Polymer Modified-WTR-compounds, Copolymer, Insulation, Wet ageing

INTRODUCTION

In the beginning of the 80ies the production of XLPE cables went through several drastic changes to overcome the early failures of first generation XLPE cables. Cable makers introduced triple extrusion and extruded outer semiconductive screens instead of graphite. Additionally the jacketing was changed from polyvinylchloride (PVC) to high density polyethylene (HDPE).
The compound producers took action to improve the cleanliness of their compounds and developed the so called water tree retardant (WTR) concepts, particularly the copolymer insulation [1].
This paper discusses the performance and influence of different changes made to the production of medium voltage cables covering a range up to 36 kV.

PERFORMANCE OF CABLES IN THE NETWORK

The enhanced performance of the water tree compounds have been reported in several publications [2,3,4]. However, as most technical progress has taken place during the last 25 years there is not much published information available regarding its exact contribution to the extension of cable life and reducing failure rates under service conditions. Schädlich *& al* [5] presented some investigations on field aged cables showing the clear superiority of copolymer modified XLPE over additive and classical homo-polymer insulation.
In this publication real failure data can be presented for one German utility, E.ON Bayern, Region Ostbayern.
Figure 1 summarises statistics over the failure rates of cables during the year 2003 to 2005 related to the year of manufacturing, a clear improvement can be seen after the introduction of the second generation cables at the beginning of the 80ies.

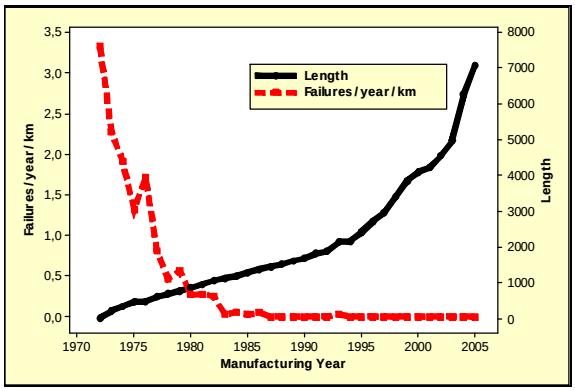

Figure 1. Failure rates of cables in installed at E.ON Bayern, Region Ostbayern

The same observation can be made from failure data from two utilities using two different ways of installation as seen in Figure 2.