



## B2.3

### Extruded MV cables and accessories with increased electrical stress

SCHÄDLICH H., MEURER D., Alcatel, Hannover, Germany

KRÄHENBÜHL F., Alcatel, Cortaillod, Switzerland

CHANEL J., Alcatel, Bourg en Bresse, France

SCHIAFFINO P., Alcatel, Latina, Italy

DE RIDDER E., Euromold, Erembodegem, Belgium

BECKER J., Alcatel, Charleroi, Belgium

LAURENT M., Alcatel, Cossonay, Switzerland

#### Résumé

Depuis l'apparition des câbles MT à isolation extrudée, la rigidité diélectrique et la résistance au vieillissement en milieu humide ont été améliorées de façon notable. Cependant, l'épaisseur d'isolation n'a pas changé depuis des décennies.

Ce rapport présente les résultats d'une étude sur des câbles dont l'épaisseur d'isolation a été réduite à 4 mm, testés comme des câbles 20 kV en milieu sec et humide. L'utilisation de tels câbles nécessite des accessoires, y compris des jonctions de transition avec les constructions actuelles. Des essais ont été entrepris avec des jonctions de types enfilables et rétractables à froid. Enfin, on fait une proposition de nouvelles dimensions pour les câbles extrudés MT, et une première réalisation dans le réseau d'un service électrique est présentée.

#### Introduction

It has a long tradition to specify for LV and MV cable insulation specific materials and minimum wall thickness'. This principle started with the first safety regulations for cables set up in various countries at the beginning of this century. The dominant insulation for MV distribution cables until the 1970s and 1980s was mass impregnated paper. With specified wall thickness depending on the rated voltage the cable properties were well defined. Generally, their service experience and life time are very good. The evaluation of paper insulated cables is rather simple.

The established system of specified insulation thickness was applied on extruded insulations as well. Based on national specifications world-wide standards were developed and published by IEC. The insulation thickness was considered as the decisive criterion for the cable quality.

The experience with PE and XLPE insulated cables has shown that their electrical properties and long-term performance can be extremely different despite having the same thickness.

#### Abstract

Since the introduction of MV cables with extruded insulation the initial strength and the wet ageing performance could be improved substantially. The specified insulation thickness however was not modified over the past decades. This report presents the results of a study on cables with a reduced insulation thickness of 4 mm in different designs, tested as 20 kV cables under dry and wet conditions. The practical use of such cables requires accessories including transition joints to current cables. So tests with slip-on and coldshrink accessories were carried out. Finally a proposal for new dimensions of extruded MV cables is made and a first realisation in an utility network is shown.

Evaluation methods based on long-term tests under wet conditions for life time estimations were developed some years ago. They are more important than to rely on geometrical dimensions. Nowadays it is possible to produce XLPE insulated cables with reduced dimensions which have better performance than older cables and still have quite reasonable properties.

Under the pressure of fierce competition utilities ask for lower cable prices. The reduction of insulation thickness can be a possible way to reduce cost by use of less material.

However, the changes in the transmission characteristics (increased capacitance) need special attention.

#### State of the art of extruded cables

The replacement of paper insulated cables by extruded cables with PE and rubber insulations started in the USA in the 1950s and in Europe in the 1960s. After the development of XLPE in the early 1960s this material was introduced in the cable industry as well. In the 1970s extruded cables were introduced in some countries on a large scale.