

Bio P-Laser : Design of a sustainable and fully recyclable Medium Voltage cable

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ABSTRACT

Today, the need of decreasing the environmental impact of cables is getting urgent. Several studies are in progress in order to achieve the zero-carbon transition. This presentation will lead with the introduction of recycled materials in conductors and jackets of MV cables, the use of bio-origin materials in all the polymeric parts of the cable and the development of thermoplastic polymers with high melting point to replace cross-linking technology. Some comparison datas on environmental impact are detailed.

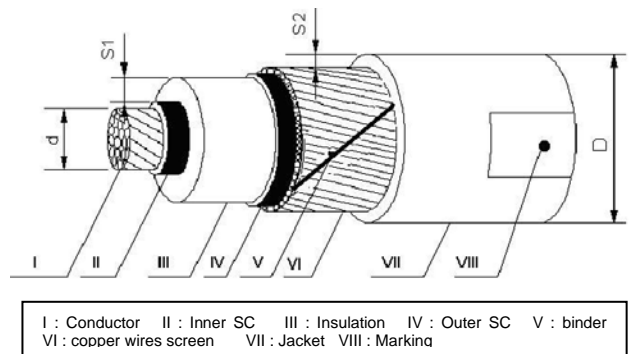
KEYWORDS

Thermoplastic insulation, recycled materials, bio-origin materials, CO₂ foot print, medium voltage

INTRODUCTION

Reduction of cables carbon foot print in electrical grids can be achieved through different improvements. For sure, the whole LCA of an electrical link has to be taken into account to design a sustainable cable (from raw materials selection to operating period and end-life of the cable). But as a first approach, the presentation will focus on the cradle-to-gate part of the cables. Some innovations are in progress on materials with bio origins, materials re-used and recycled but also on manufacturing technologies. Some examples of CO₂ eq reduction will be presented on three families of energy cables for italian grid (underground cables, aerial cables & cables for primary substation).

Designs are described on Fig.1 and 2 [1] :



I : Conductor II : Inner SC III : Insulation IV : Outer SC V : binder VI : copper wires screen VII : Jacket VIII : Marking

Fig.2 : MV cables for primary substation 12/20 kV

RECYCLED MATERIALS

The possibility to re-use thermoplastic polymers inside extruded layers of cables is one way to decrease carbon foot print of the cables. Several origins of recycled polyethylen can be considered : internal scraps and external recycled materials.

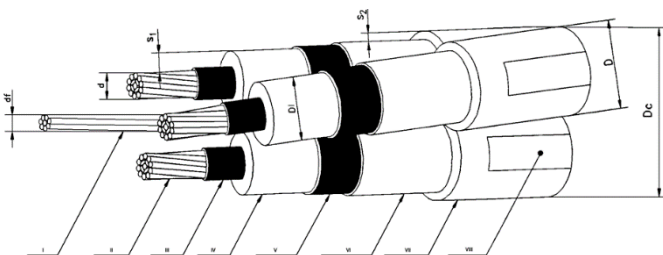
Internal extruded polymers re-use

Scraps of thermoplastic materials are generated during different steps of manufacturing process (starting of production while process parameters stabilization or at the end step). As these wastes are made of same components as the homologated ones, they are fully re-usable to be re-introduced in cables. During the collecting phase of these scraps (see photos below), a particular attention has to be paid on cleanliness to avoid any introduction of contaminants. To re-introduce this material in the current production process, some operations of grinding, filtration, pelletizing can be necessary. To optimize the sustainability of these scraps treatments, equipments have to be available close to industrial lines.



External recycled polyethylenes

More and more recycled plastics are today available in the



I : Messenger (only for aerial) II : Conductor III : Inner SC IV : Insulation V : Outer SC VI : aluminium screen VII : Jacket VIII : Marking

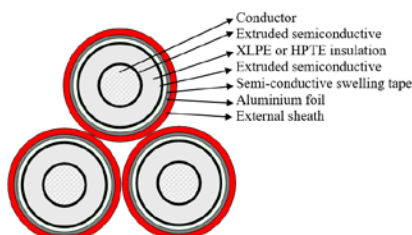


Fig.1 : MV underground or aerial 3 cores 12/20 kV