



CORROSION KINETICS OF LV CABLE GALVANIZED STEEL SCREEN AND SOLID ALUMINIUM NEUTRAL



Yves BRUMENT,
Philippe GIFFARD,
Eric BEUCHER,

Electricité de France R&D, France, yves.brument@edf.fr
DRAKA PARICABLE, philippe.giffard@draka.com
Centre Régional d'Innovation et de Transfert de Technologie « Analyses et Surface », crittas@wanadoo.fr

ABSTRACT

After a short introduction which reminds the different existing corrosion forms, and the degradation expected in case of coupling of galvanized screen and a new solid aluminium neutral, the paper gives the results of a study carried out to evaluate in case of changing the complex screen/neutral of the LV network cable the risk of loss of durability of this new main cable.

KEYWORDS

Metallic screen, galvanization, durability, neutral, aluminium, corrosion.

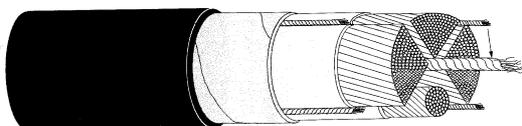
INTRODUCTION

When the engineer wants to change the design of a cable system component, he has to check and validate that the expected lifespan of the complete system will not be diminished.

This concern is shared not only by the utilities but also by the manufacturers. EDF has recently launched a study for cost reduction of LV main cable at the same time as the manufacturers have to face issues with the suppression of the use of "heavy metals" (and lead especially) in the construction of their network cables. It was a great opportunity to optimise the metallic screen and the neutral conductor of the cable.

CONSTITUTION OF FRENCH NF C 33-210 NETWORK CABLE AND NEW ONE

The main underground cable is constituted with an external PVC sheathing, a two galvanized steel tapes with twist lay, three sector shaped phases with reticulated polyethylene insulation, fillers, and a stranded aluminium wires and grease (neutral conductor) with lead sheathing for water tightness.



The new cable design should be constituted with the same elements except the neutral conductor which is constituted only with a solid aluminium conductor whose external diameter would be the one of the actual neutral measured on lead.

The major reason is to ensure the complete compatibility of the system components (accessories interoperability).



This evolution of the neutral conductor should allow to win money because:

- The lead mechanical presses used to sheath the conductor are aged and difficult to maintain,
- The suppression of lead will allow to answer to **environmental** and **health** purposes
- The lead price is summed with the aluminium price (*we can estimate that the final price of neutral would be 15% less than currently*)
- The neutral conductor would be issued from an aluminium wire without any transformation (machine wire)

Modes of degradation to be evaluated

Before changing the design of cable, we have to check its behaviour notably in terms of corrosion kinetics and lifetime. The main questions are:

- Is the lifespan of the new cable longer than the old design one ?
- Is the new aluminium neutral more sensible to the corrosion ?

We know that the penetration of water through the PVC sheathing is a reality. So, in our case, the corrosion is the predominant degradation mode because of metallic components (galvanized steel, aluminium).

THE CORROSION [1]

Corrosion is a deterioration slow or fast, progressive, of a metal related to its environment (air, water, alkaline or acid medium,...). That can affect its aspect, its surface quality or its mechanical, physical or chemical properties.

Corrosion is an electrochemical reaction between metal (or an alloy) and an aqueous phase. It is a complex