



## ALUMINIUM CONDUCTORS IN ANTI-ROBBERY CABLES



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### ABSTRACT

*This paper discusses the development and use of anti-robbery cables with aluminium conductor, a cable design with a high potential to replace both low voltage bundled copper cables and copper anti-robbery cables, used at the electrical service entrances of low voltage consumer units. The anti-robbery cable construction is described in details as well as the accessories developed for its connection to the power distribution network. The replacement of copper by aluminium demands a series of accessories adaptations in order to minimize connections deterioration due to corrosion, a phenomenon that is closely related to galvanic currents that appear in different metal junctions.*

### KEYWORDS

Anti-Robbery Cables, Aluminium Conductors, Cable Accessories.

### INTRODUCTION

The end of the state monopoly in the Brazilian electric sector introduced a competitive environment, forcing the power utility companies to look for a way of increasing their profits without modifying the value of the tariffs, since the tariffs are regulated by the State. In this context, the power utility companies aim to be more efficient, reducing the commercial and technical losses in order to maximize the available energy for commercialization.

The technical losses are those that occur in the system due to physical characteristics of the electrical conductors. The commercial losses are directly related to the energy robbery and insolvency.

The electricity robbery issue is one of the main concerns of the Brazilian electrical sector agents; according to the Electric Energy National Agency - ANEEL, the damage is estimated R\$3.5 billion (US\$ 1.7 billion). To illustrate this problem, two Brazilian power utility are given as examples: Light, in Rio de Janeiro, attending 3,8 million consumers units, has losses of R\$720 million (US\$360 million) per year, what represents around 16% of its market; in São Paulo, the commercial losses of the AES Eletropaulo reach almost 7% and it is around R\$500 million per year [1].

The most common way of energy robbery is using metallic claws, biting the phase and the neutral conductors, allowing the use of electricity without passing through the energy meter (figure 1). However, some years ago, a new cable begun to be used in order to avoid the electricity robbery. This product, called anti-robbery cable, is so constructed that the use of the claws is not possible anymore. Its neutral

conductor surrounding the phase like a wire armouring does not allow any contact with the central phase conductor without touching this concentric neutral conductor. That is the reason why, each time more, low voltage bundled copper cables used in service entrances have been replaced by anti-robbery cables.

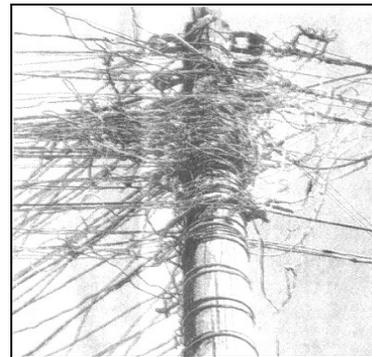


Figure 1: energy robbery

### ANTI-ROBBERY CABLE

#### Constructive aspects

The anti-robbery cables are constructed in such a way that the central conductor and its insulation are involved by a copper wire layer, helically applied around the core, forming the neutral conductor. When a metallic claw is used to reach the conductor phase, a short circuit with the neutral conductor occurs, avoiding the energy robbery.

Figure 2 shows a cross section of an anti-robbery cable used in single-phase installations. Although, there are cables with two and three conductors, all of them involved by a concentric neutral conductor, formed by copper wires helically applied.

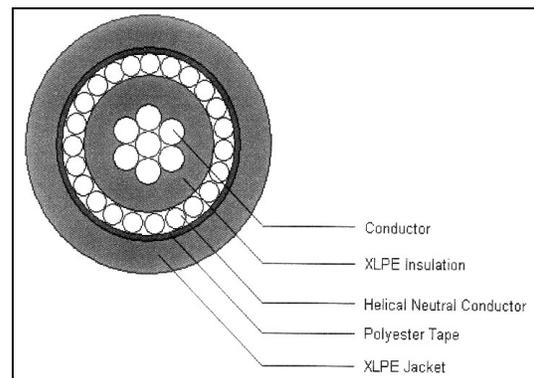


Figure 2: anti-robbery cable