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6-10 KV OVERHEAD POWER LINES

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ABSTRACT

In this article highlights 6-10 kV peak power lines provide the transmission of electricity from power stations to end users and form the basis of power distribution networks. As practice shows, in this zone, the possibility of a short circuit "to the ground" with the participation of birds remains. At the same time, the accumulation of additional insulators often prevents the free fall of the bird after an electric shock, which leads to the creation of a long-term short circuit and violates electricity supply. . Free – standing stable supports provide them with a good view, while also being a source of deadly threat. The most dangerous in this respect are widespread reinforced concrete supports with a metal (grounded) traverse and pin insulators.

KEYWORDS: *Grounded Elements, Landing, Overhead Lines, Electric Current, Voltage, Electrical Substations.*

INTRODUCTION

Overhead power lines (overhead lines) of 6-10 kV provide the transmission of electricity from electrical substations to end users (settlements, enterprises) and form the basis of electrical distribution networks (RES). Located mainly in rural areas, they cross the habitats of many species of birds and mammals, having a significant impact on them. The degree of this impact increases as the forest cover of the territory on which the plots are located decreases 6-10 kV overhead line. In conditions of open treeless spaces (fields, meadows, the poles and wires of the 6-10 kV overhead line serve as the only convenient "landing" places for a large number of bird species, replacing woody vegetation (Fig. 1).

Fig. 1 Supports of 6-10 kV overhead lines in open areas (farmland).

Many bird species not only often use overhead poles for resting, lying in wait and eating prey (predatory), but also selectively prefer them to trees. Free – standing stable supports provide them with a good view, while also being a source of deadly threat. The most dangerous in this respect are widespread reinforced concrete supports with a metal (grounded) traverse and pin insulators. The technical features of the structures of the 6-10 kV overhead line are such that in simultaneous contact with the current-carrying wire and the grounded metal part of the support head, on the where the insulators are located, most birds are electrocuted and die (Fig. 2).

Fig. 2 the small distance between the current-carrying and grounded elements in the area of the head of the support of the 6-10 kV overhead line determines the high danger of the structure for objects of the animal world.

As insulating elements on these types of supports, pin glass SHS-10 (Fig. 3), pin porcelain SHF-10 (Fig. 4) and SHF-20 (Fig. 2) insulators are most often used.

Fig. 3 Insulator SHS-10.

Fig. 4 Insulator SHF-10.

The results of special studies show that all the listed types of pin insulators (SHS-10, SHF-10, SHF-20) have approximately the same bird hazard, despite some differences in linear dimensions. At the same time, the replacement of smaller SHF-10 and SHS-10 with larger SHF-20 does not reduce the bird danger of the 6-10 kV overhead line structure, and cannot be used as bird protection measures, as well as the use of pin insulators made of polymer materials (SHP).

The use of additional “blank” insulators installed on the edges of the metal traverse (Fig. 5) does not provide the necessary degree of protection of objects of the animal world. As practice shows, in this zone, the possibility of a short circuit “to the ground” with the participation of birds remains. At the same time, the accumulation of additional insulators often prevents the free fall of the bird after an electric shock, which leads to the creation of a long-term short circuit and violates electricity supply. As a result of the gradual destruction of the polymer inner insert that secures the “idle” insulators on the metal rod, their accelerated loss occurs, since there is no load on the insulator from the wire side. The exposed metal rod (Fig. 6) significantly increases the overall bird danger of the structure. The same effect is caused by an increase in the number of any non-insulated metal objects connected to the grounded part of the support head (traverse).

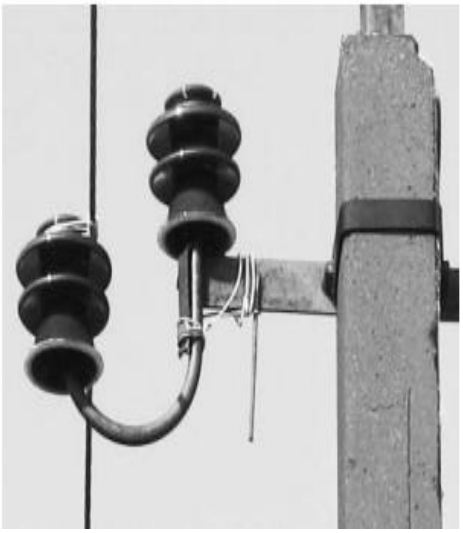

Fig. 5 Additional "idle" insulator SHF-20 at the end of the metal traverse

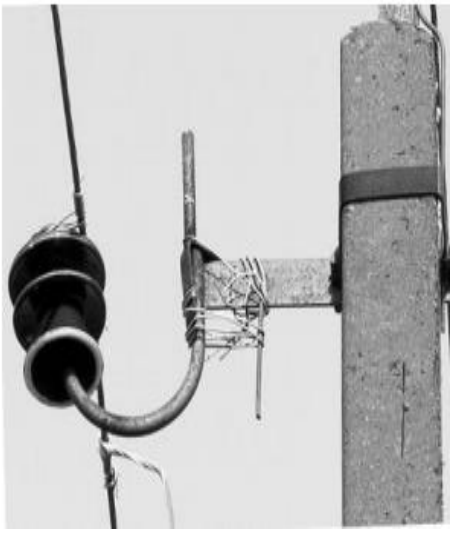

Fig. 6 The metal rod remaining after the loss of the "idle" insulator.

The main variants of electric shock to birds in contact with a 6-10 kV overhead line are as follows:

1. A short circuit involving a single bird. Occurs when one bird simultaneously touches the current-carrying wire and the grounded part of the head of the support (metal or w/w traverse, metal insulator hook, open sections of the internal reinforcement of the support, embedded parts, ground wire, metal uninsulated objects connected to the traverse, etc.). The short circuit occurs, as a rule, at the time of take-off or landing of the bird on the traverse or wire in the area of the head of the support. Or when cleaning the beak of a bird sitting on a wire on a grounded traverse.

2. A short circuit involving two or more birds. Occurs when there is physical contact between two or more birds sitting on a current-carrying wire and the grounded part of the traverse (when touching with wings, beaks when transferring food, courtship).

3. A short circuit involving many birds. Occurs at the time of takeoff or landing in the area of the head support of a flock of small or medium-sized birds (starlings, thrushes, etc.). The number of birds in such groups can number up to several hundred individuals. In wet and rainy weather, there is an increased danger to birds.

4. The death of birds at the inputs of high-voltage wires in transformers also occurs quite often (the transformer housing is usually a metal grounded cabinet).

5. The death of birds when two wires are simultaneously touched is observed much less often, due to the large distance between them.

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