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Short communication

White stork risk mitigation in high voltage electric distribution networks

Luís Maricato[a], Ricardo Faria[a,*], Vitor Madeira[c], Pedro Carreira[b], Aníbal T. de Almeida[a,**]

[a] Institute of Systems and Robotics, Department of Electrical and Computer Engineering, University of Coimbra, 3030-290 Coimbra, Portugal
[b] EDP Distribuição – Energia S.A., Direcção de Tecnologia e Inovação, Rua do Túnel, Alto S. João, 3030-006 Coimbra, Portugal
[c] Department of Life Sciences – University of Coimbra, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal

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ABSTRACT

White stork (*Ciconia ciconia L.*) population increased dramatically in Portugal over the last decade, leading to an increase in nesting and roosting in the support towers for the electric distribution lines. As a consequence, there are frequent bird fatalities from electrocution and outages in distribution networks are recurrent. Consequently, this causes a poor power quality service and equipment damages, with resulting economic losses for industrial customers and electric distribution companies. To mitigate the risk of stork fatalities and to improve the quality of service, the Portuguese Distribution System Operator (DSO), Energias de Portugal – Distribuição (EDP-D) and Energy Service Regulatory Authority (ERSE) in collaboration with the Institute for Nature Conservation and Forests (ICNF) implemented programs to control white storks activities on power distribution equipment.

To control nesting activities several models of electrified structures, based on a micro electroshock discharge system, were developed and applied on the top of the line support towers. The installed structures proved to be successful, since no nesting activities were detected.

When landing on the structure, the white stork receives a small shock, which is associated with a negative experience, discouraging further attempts to roost on the support structure. Compared to other technologies tested in the past, taking into account maintenance requirements, equipment costs and power supply requirements, the micro electroshock system proved to be the most reliable and advantageous solution.

1. Introduction

The number of white stork nests in Portugal increased dramatically in the last decade, according to preliminary results of the 2014 national census of the species. Recent estimations shown an increase in the number of white stork nests, which currently account 11,694 occupied nests, more 4000 since the previous census, carried out in 2004, corresponding to an increase of 254% between 1994 and 2014 (Fig. 1) (Institute for Nature Conservation and Forests, 2014). White stork is becoming a resident non-migratory bird due to an easy access to dump sites and abundant red crayfish (*Procambarus clarkii*) in rice fields (Gilbert et al., 2014). Since 2000, the white stork population increased dramatically in the Mondego river basin, located between the cities of Coimbra and Figueira da Foz in Portugal (Iberia, 2014; Leo et al., 2002; Rosa et al., 2005; Rosa and Quintela, 2011) and is the predominant species using the electrical distribution support structures as a nesting place, both in Portugal and in some parts of Spain (Infante and Peris, 2003).

The increasingly demand for nesting and roosting in medium and in high voltage electrical distribution equipment (15–60 kV networks) has also contributed to an increase in white stork fatalities due to electrocution and recurrent outages due to the activation of the automatic safety protection devices (Santos, 2004; Janss, 2000) (Fig. 2).

The white stork is among the species of birds more seriously affected in Portugal due to electrocution, and causes a significant financial burden to electric companies and industrial clients as consequence of using the support structures for nesting (Araújo

* Corresponding author.
** Corresponding author.
E-mail addresses: luismaricato@isr.uc.pt (L. Maricato), rfaria@isr.uc.pt (R. Faria), vmcm@ci.uc.pt (V. Madeira), pedro.carreira@edp.pt (P. Carreira), adealmeida@isr.uc.pt (A.T. de Almeida).

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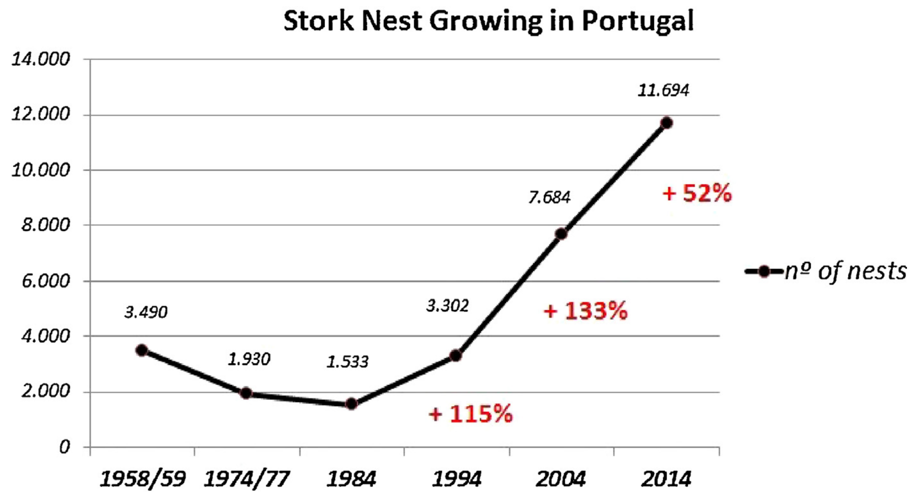

Fig. 1. White stork nest evolution in Portugal, from 1958 to 2014.

Fig. 2. White stork fatality from electrocution in a power line.

et al., 2013; Bochenski et al., 2006; Tryjanowski et al., 2006; Göcek et al., 2010; Manville et al., 2005). Electrocutions occur in areas of perching activity on poles without sufficient spacing to accommodate their wingspan and height (Avian Power Line Interaction Committee, 2006; Bevanger, 1998).

Deterrent devices may reduce considerably the impact of birds, although elimination of damage is almost impossible (Booth, 1994; Godin, 1994; Gorenzel et al., 1994). The main purpose of deterrent devices is to repel birds from breeding, roosting or feeding in areas and on structures important for economic activities, e.g. the electrical network (Avian Power Line Interaction Committee, 2006). Over the past, several techniques and types of equipment have been used or proposed to deter birds from critical locations, such as airports, aquaculture ponds and electric power lines, among others. In the early nineties, in Portugal, a program was initiated to manage the white storks on transmission towers by preventing nesting in dangerous areas and encouraging the use of dedicated pole platforms located close to the support towers (Avian Power Line Interaction Committee, 2006; Carreira et al., 2011; Santos, 2004).

EDP-D operates approximately 83,000 km of high voltage (60 kV network) and medium voltage (10–30 kV networks) lines and cables supplying about 6.1 million customers and is the main energy DSO in Portugal, is seriously committed in management of environmental aspects and to increase the quality of energy distribution, minimizing outages and associated economic losses. To provide a careful control of the main parameters of power quality (voltage level, continuity of service), EDP-D in collaboration with ICNF developed a program to clean nests and residues from network support structures and installed anti-nesting and anti-roosting devices in areas frequented by storks (Carreira et al., 2011; Santos, 2004). In addition, dedicated nesting platforms were built to replace the loss of potential nesting places. Currently, the standard dissuasion devices to prevent nesting and roosting are: passive

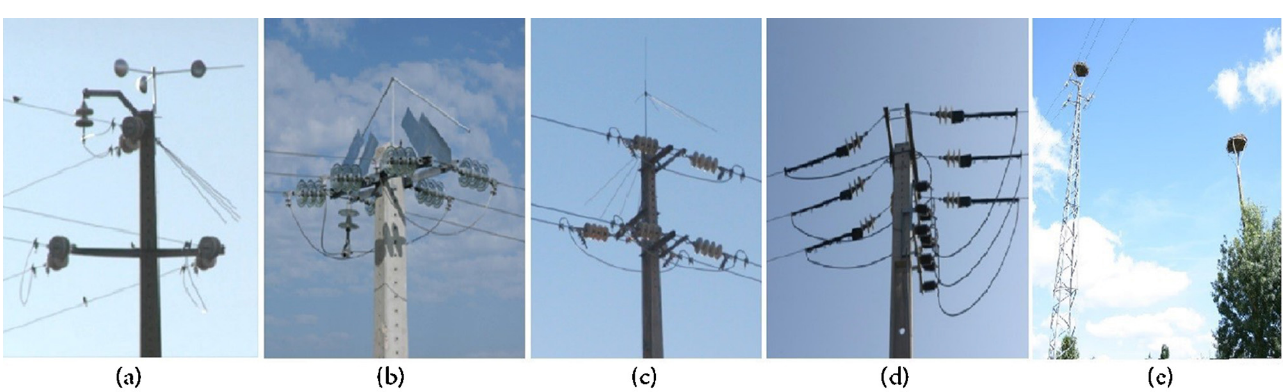

Fig. 3. Standard deterrent devices used to prevent roosting and nesting of storks. (a) Umbrella and wind turbine; (b) – Symmetric chevron and 45° plates; (c) – Double umbrella; (d) – Bare conductors with tension clamps covers and covered conductors; (e) – Platform on top of the support tower and dedicated pole with platform.