Academic Journal of Engineering and Technology Science
ISSN 2616-5767 Vol. 2, Issue 1: 1-6, DOI: 10.25236/AJETS.020008

Exploring the Influence of Animals on Transmission System and Its Prevention and Cure Methods

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ABSTRACT. *With the continuous development of China's economy, the electric power industry has reached a high level of development stage. In the power industry, the safe operation of power grid is the key problem to be paid attention to. Transmission lines are often affected by geographical, natural and biological factors, thus affecting the normal operation of power systems. In this paper, the influence of biological factors on power system and the corresponding prevention and control methods are discussed emphatically.*

KEYWORDS: *transmission route, safe operation, biological factors, prevention and treatment measures*

1. Introduction

1.1 Background

In recent years, with the acceleration of China's power construction, transmission lines continue to increase, transmission levels continue to improve. However, the hidden danger of transmission system security also continues to emerge, which has a great impact on the smooth operation of power system. At present, there are many kinds of transmission line grades in China, 35~220kv transmission lines are called High Voltage line (HV), 330~750kv transmission lines are called ultra-High Voltage line (EHV), and more than 750KV transmission lines are called UHV High Voltage (UHV). Generally, the larger the conveying power capacity, the higher the voltage level used by the line. The higher the level, the greater the harm caused by the influence of transmission lines on external factors. For example, ice-clad, birds, wind, snow and other factors often cause the collapse of the power system, the life of the residents have a great impact [1].

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1.2 Restatement of questions

In this paper, the effects of organisms such as birds and snakes on power systems are discussed. Because these factors are closely related to people's lives and extremely harmful. So how do birds and other biological factors specifically affect the normal operation of transmission lines? And what are the corresponding prevention and treatment methods?

2. Effects of biological factors

There are many biological factors affecting the normal operation of power system, this paper focuses on birds and snakes as an example to explore. According to statistics, the line failure caused by bird activity is second only to lightning and external force damage, accounting for the third total number of line failures. And in many southern regions, because of the climatic causes of many snakes, snakes will climb along the cable line, resulting in short circuits of the circuit and so on. All these have a great impact on the lives of residents.

2.1 The influence of bird factors

2.1.1 The nesting of birds

Birds often nest on the transmission line, the mouth of the object if it has electrical conductivity, across the wire will cause a short circuit of the circuit, resulting in local power system failure, thus affecting the transmission of electricity and distribution and other processes, resulting in serious hidden dangers. When the wind blows the nest away, the impact on the power system is even more serious.

In addition, the end of February of each year to the beginning of June is the main month of birds, the number of April or May reached a climax, in the tube equipment up to thousands of Bird's nest per year, to daily production brings a lot of safety risks and burdens [2-3].

2.1.2 The pecking of birds

Birds because of hunger may stand on the transmission line pecking wire insulation skin, resulting in the nudity of the wire, so that the wire by the wind, rainwater and other erosion gradually aging appear short circuit, short circuit and other phenomena, resulting in the failure of transmission lines. At the same time also to the personnel maintenance brought a certain amount of trouble.

In addition, birds often defecate at night due to life habits, high humidity at night, will greatly reduce the insulation of insulators, the same will cause the power system is not stable.

2.1.3 The excreta of birds

There will be some insulators, such as insulators, on the transmission line, mainly to enhance the creeping distance and set up. If the bird droppings are attached to the insulator in a humid environment, a conductive film will be formed

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on the surface of the insulator, resulting in a reduction in the insulation effect and a failure of the transmission line to function properly.

2.1.4 Impact of environmental factors

As the environment continues to develop, bird habitats are dwindling in the natural environment, and birds are constantly looking for their place in the city. Because the transmission tower is made up of many trusses and has many power lines, Louis is nesting, which causes a lot of electrical system failures caused by birds. And the impact of bird fighting or self-body type will also cause problems such as short circuit of transmission lines, thus undermining the normal operation of power lines.

2.2 The influence of snake factors

The influence of snakes on power system is different from that of birds, and because of many similarities, it will cause short circuit or break of power system, which can cause system failure. In the south, the climate is moist and snake-type, and snakes often climb lines to the transmission lines to cause the failure. According to statistics, in 2005, a power supply bureau under the jurisdiction of the 110KV line due to snakes caused by the line tripping Accident 2, accounting for 25% of the 110kv line failure of the year, line equipment was damaged, seriously affecting the safe operation of the grid. According to relevant information, the main cause of the power outage in Indonesia is the snake [4]. Thus, the harm of snakes to the power system is also serious.

2.2.1 The climbing of snakes

As a result of the improvement of the ecosystem, small animals such as snakes continue to breed. Since most of the transmission towers are built in the wild, there are often snakes climbing wires that cause line failures. Due to the stability in mechanics, the cement rod power line is usually fixed with the ground cable. Snakes are hovering up along the route.

When the snake's body crosses multiple transmission lines, it causes the line to be short-circuited, which not only affects the delivery of electricity, but also the snake itself is injured by excessive current.

2.2.2 The droppings of snakes

Snake droppings will also corrode insulators and gold tools, may also corrode the insulating skin of the wire, causing changes in the electric field around the line, the nudity of the wire and the destruction of insulators will lead to abnormal discharge, leakage phenomenon, will not only damage the wire, but also reduce the efficiency of the transmission of electrical energy.

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3. Prevention and treatment of biological factors

3.1 Prevention and treatment of birds

There are many ways to control birds. For example, magnetic flooding can be used, ultrasound bird repellent, photovoltaic bird repellent, the installation of bird-proof thorns, bird cover and other methods. At the same time, environmental conditions should be improved to give birds a suitable habitat, thereby reducing the nest of birds on transmission lines and regularly cleaning up related lines [5]. The relevant prevention and treatment methods are described in detail below.

3.1.1 Using magnetic methods to drive birds

The use of magnetic mesh or magnets to create a magnetic field, the bird induction of the magnetic field to cause interference, so that birds away from the transmission line, eliminate safety hazards.

3.1.2 Using ultrasound to drive birds

The use of ultrasonic generator, installed in the transmission line, issued the corresponding frequency of ultrasonic band, can not only drive away birds, but also do not interfere with human beings.

3.1.3 Using sound and light to drive birds

The use of flash lights and acoustic generators to intimidate birds, thus playing a role in dispersing birds. The flashing lights constantly adjust the color, and sound waves constantly change to prevent birds from producing adaptability.

3.1.4 Using wind to drive birds

Install windmills, and when there is wind, windmills turn to intimidate birds, leaving them away from power lines. In this way, energy environmental protection can be regenerated, and save costs, bird repellent effect is better.

3.1.5 Regular cleaning of excreta

Special personnel should regularly inspect the lines, clean up the excreta of birds, and promptly remove the bird's nest on the transmission line, etc., in order to ensure the normal operation of the power system.

3.2 Prevention and treatment of snakes

There are more snakes in the south, which can be intimidated by sound and light, and can also solve line pitfalls by stopping snakes from climbing wires. For example, on the ground line to set up obstacles and so on.

3.2.1 Using sound and light to drive snakes

The use of light and sound waves to intimidate snakes, so as to achieve the goal of snake repellent.

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3.2.2 Setting up climbing obstacles

4-5 Smooth hollow spherical shells can be set up on the ground pull line. Because the snake's body is smooth, in the climbing process need to pass the ball, if there is a ball, the snake can still find the center of gravity barely through. If it is a continuous number of balls, the snake will lose its center of gravity when climbing, thus falling, the equivalent of creating a barrier to the snake's crawling. This method has been effective in the relevant experiments, and the cost is low, the effect is good, and can be used for a long time [6].

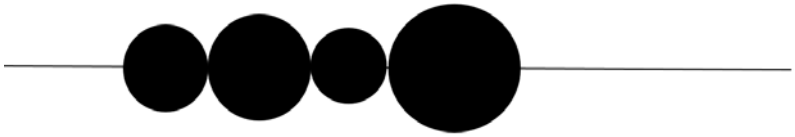

Figure. 1 Ground Pull line Obstacle settings

3.2.3 Mounting puncture structure

A prickly structure is installed on the ground line or insulator, and when the snake climbs, it will fall due to tingling and will not continue to climb the transmission line to affect the normal operation of the power system. However, this type of method requires the establishment of a longer prickly structure, due to the longer body of the snake.

4. Conclusion

To sum up, birds and snakes can be caused by the body or excreta in the way of short circuit or insulation effect, thus affecting the transmission line normal transmission of electrical energy. Birds may also nest to cause short-circuit phenomena, but also peck insulating skin caused by the nudity of conductors and thus affect the transmission of electricity.

For birds, the following prevention measures can be taken:

- The use of related equipment such as ultrasonic bird repellent, wind bird repellent, acoustic generator and flash lamp, such as bird repellent, to achieve safety purposes.
- Dispatch the corresponding personnel to carry out regular inspection and clean up the excreta of birds on the line, reduce the phenomenon of short circuit.

For snakes there can be the following prevention measures:

- Use sound and light to intimidate snakes and exorcise snakes.
- Set up obstacles such as thorns and balls on the ground pull line to prevent snakes from climbing up.

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It is also necessary to constantly improve the relevant technology, according to the seasonal and geographical reasons for the specific analysis of the use of appropriate methods to drive small animals to achieve the purpose of stable operation of the power system.

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