Pillar insulator flashing phenomenon and spray cleaning device

Jingyi Zhu

North China Electric Power University (Baoding) , China.

767432446@qq.com

Abstract

The pillar insulator pollution flash accident often occurs in the substation. The pillar insulator is not cleaned thoroughly or the paint is not sprayed, which may cause the pillar insulator to cause a flashover accident under normal voltage. In order to prevent frequent flashing phenomenon, the cleaning of post insulators and the regular spraying of spray coatings are indispensable. RTV is widely used as an anti-fouling coating, and the use of RTV coatings in China is still in the traditional way. - Manual spraying, manual cleaning. Manual cleaning and spraying has a series of problems such as low efficiency, low utilization rate of paint, and environmental pollution. An RTV automatic spray cleaning device can solve these problems efficiently.

Keywords

Pillar insulator flashing phenomenon, spray cleaning device.

1. Introduction

Pillar insulators are common in substations, and contamination due to industrial pollution, dust in the air, and the like gradually accumulate and adhere to the surface of the insulator to form a fouling layer. The filth contains an acid-base and a salt component, and has poor electrical conductivity when dried, and has a high electrical conductivity after being wetted by water. When it rains, melts snow, melts fog, etc., the insulation strength of the contaminated insulator is greatly reduced, causing the insulator to flash under normal operating voltage, causing a large-scale power outage, resulting in a flashover phenomenon, causing economic losses to be caused by lightning. 10 times the accident. The traditional spraying method is manual spraying and cleaning, the degree of mechanization is low, the spraying efficiency is low, the coating utilization rate is relatively low, the cost is high, and the excessive suction of the spray coating is harmful to the human body and is easy to pollute the environment, so An equipment that can be applied to substation post insulator spray cleaning is essential to save coating and personnel costs for substations and reduce personnel damage.

Fig.1 Manual spraying site

2. Pollution flash

2.1 Cause

The main cause of the flashover of the insulator is that the particles generated by the industry adhere to the surface of the pillar insulator. The contamination is caused by the accumulation of excessive dust particles on the surface of the pillar insulator under the action of wind, rain and electric field. It produces a certain conductivity in a humid environment. Under relatively humid conditions, it is easy to greatly reduce the insulation of the post insulator, resulting in leakage and discharge on the surface of the post insulator. The surface of the charged insulator is attached to the surface due to moisture. The filthy substance is in an ionic state, and under the action of an electric field, ions with different charges move in a directional manner to form a leakage current. When the leakage current continues to rise, this partial discharge will cause flashover of the entire insulator string, and a flashover phenomenon will occur at the normal operating voltage of the substation.

2.2 Common measures

1. Strengthen manual inspections. Through manual inspections, observe the surface of the pillar insulators in a relatively humid time or place such as rainy, foggy or snowy, whether there is a large area of contamination, or the discharge sound of the insulator through the experience of the inspectors for many years. To make judgments. After the quality inspection of the post insulators, if there is a phenomenon of poor insulation, the unqualified post insulators are replaced in time to maintain the normal operation of the post insulators, prevent safety accidents caused by pollution flashes and discharges, and reduce the economy caused by substations loss.

2. Clean regularly and spray the insulation. For the protection of the post insulator, it is necessary to clean the dirt on the post insulator regularly, but in the process of cleaning, it is necessary to clean the power after the power failure, and the power failure of the substation will cause economic loss for a certain period of time. Therefore, it is necessary to strengthen the cleaning of the dirty hardware and shorten the cleaning. Time, improve cleaning results, and also save costs for substations. At the same time, the paint can be sprayed on the pillar insulator, and the commonly used paint is RTV. Regular spraying is an effective solution to prevent the phenomenon of pollution flash. By spraying RTV coatings, the life of the post insulators can be greatly extended. Therefore, most substations will be sprayed with RTV coatings, but most of them are artificially sprayed, which has a long time, low efficiency and low paint utilization. It is not high, the cost is high, the cost is high, and the artificial spraying may result in unclean cleaning and uneven spraying of the spray coating, so an automatic spray cleaning device can greatly solve these problems.

2.3 RTV coating - common anti-fouling flash coating

RTV coatings are called room temperature vulcanized silicone rubber. Its hydrophobicity and hydrophobicity are the key to significantly improve the level of flashover voltage. The coating is applied to the surface of the electro-ceramic and forms a film after curing. Its hydrophobicity greatly suppresses the generation of leakage current, which significantly increases the flashover voltage of the insulator. Even if the insulator is covered by dirt, the small molecule hydrophobic group in the film can quickly pass through the stain layer and migrate to the surface of the stain layer, so that the surface of the stain layer also has excellent water repellency. Originally, the pillar insulator is easy to produce electrical conductivity in a humid environment. After the RTV coating is sprayed, even if the soil layer is wetted for a long time, the surface of the stain layer will not form a water flow and a water film, but many Continuous small water droplets exist independently, which is very good for insulation protection.

3. Spray cleaning equipment development

An automatic spray cleaning machine can solve a series of problems caused by manual spraying. The automatic spraying can greatly improve the spraying efficiency and improve the utilization rate of the coating. It can improve the artificial spraying and cause the cleaning to be unclean and the coating to

be unevenly sprayed. At the same time, the use of machine spraying can reduce environmental pollution, reduce the paint sprayed by manual spraying, reduce the harm to the human body; reduce the incidence of accidents, and minimize the economic losses of power grid departments, substations and power transmission and transformation enterprises.

3.1 Overall design

Our overall design includes a spray washer, a robotic arm support, a moving mechanism for the sprayer, and a body for the paint. The spray cleaning machine includes the effect of cleaning and spraying. The robot arm is equipped with a spray cleaning machine. The height and distance of the spray cleaning machine can be adjusted by the robot arm, but the arm needs to be fixed on the ground, which causes inconvenience. Therefore, the robot arm is mounted on a moving mechanism, which can easily move the arm such a large and heavy body. The body is designed with a coating and cleaning fluid.

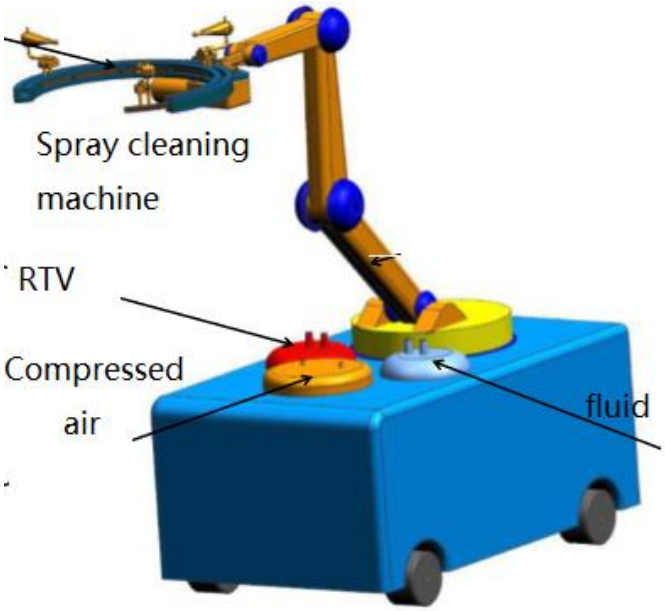

Fig.2 Spray cleaning machine model

3.2 Spray cleaning machine

The spray cleaning machine is mainly composed of two parts: automatic spraying system and spraying pressure system. The automatic spraying system consists of a radial moving mechanism, an up and down moving mechanism and a notched turntable track. At the same time, an ultrasonic sensor is installed. The ultrasonic sensor and the notched turntable track enable the spray cleaning machine to accurately align the post insulator. In combination with the control system and the hydraulic system, a full 180° rotating spray and cleaning is performed. At the same time, the hydraulic system includes the piping design, control pipeline, nozzle and hydraulic system design. The electromagnetic reversing valve can realize the conversion of the cleaning pipeline and the spray coating pipeline, and realize the integration of cleaning and spraying. The control system realizes the connection and communication with the spray cleaning machine through the single chip microcomputer and the bluetooth module, and realizes the control of the spray cleaning machine.

The spray cleaning machine can achieve the atomization effect of the pillar insulator coating spraying, and at the same time meet the national standard, solve the problem of uneven artificial spraying and different thickness. If the coating is too thick, not only the coating is wasted, but also the performance of the coating will occur. Changes, so that the insulation effect is worse, it is easy to cause problems such as drying and falling off the paint; if the spray is too thin, the surface of the post insulator will be easily exposed to the air, and the insulation effect will be lost in a short time, resulting in a change

in electrical properties. This causes the post insulator to discharge, causing the entire post insulator to be destroyed, resulting in greater economic loss.

Fig.3 Manual spraying

Fig.4 Spray cleaning machine spraying

4. Conclusion

Pillar insulators, commonly found in substations, power grid departments, power transmission and transformation enterprises, etc., play a vital role in China's power industry. They support the wires and prevent the current from returning to the ground. The supporting wires prevent the wires from sagging due to their own weight. Contact with the ground or the wire, causing discharge and conduction, and a safety accident occurs. Therefore, the protection of the post insulators should not be neglected. It is necessary to clean and spray the post insulators in time to prevent the discharge of the post insulators. RTV is widely used as the most commonly used and most effective spray coating. The common spraying method uses manual spraying. The spray cleaning machine has good effects in terms of quality effect, cost and environment. The spray cleaning machine can meet the requirements of national spraying quality, and also reduce the environment. Pollution.

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