

Composite Insulator Charged Detection Technology Research

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Keywords: synthetic insulator; internal defect; live testing; electric field method

Abstract: Due to the defects in composite insulator failure caused by more and more, it is necessary to detect defects in charged composite insulator. Composite insulator were summarized in this paper, detail defect in charged the research situation of detection technology, this paper expounds the several typical defects within the composite insulator of electric testing methods and the advantages and disadvantages of each method; Charged for composite insulator in defect inspection method is discussed and summarized.

INTRODUCTION

Synthetic organic silicone rubber insulator means the high-voltage insulator made of composite materials. Synthetic insulators with small size, light weight, high mechanical strength, and good stain resistance^[1-3]. But as the number of applications, more and more synthetic insulators, failure will gradually appear. Currently the charged detection composite insulator means the country is the only universal visual, and can not find hidden defects in silicon rubber below. In recent years, as the number of insulators and operation period, the fault has increased. Some power companies flashover accident had occurred within the synthetic insulator several times due to insulation defects and brittle fracture caused by an accident, a lot of running in the synthesis of abnormal heat insulator phenomenon^[4-7]. According to statistics, as of the beginning of 1999, the total number of national synthetic insulators failed 231 times, 5.3×10^{-4} run total for the hanging, according to statistics the annual failure rate of less than 1×10^{-4} , which accounted for within the insulation fault 6.9%^[8-12]. In order to detect early defects of composite insulator exists, due to the development in time to prevent accidents caused by the defect, synthetic insulators running live test has a great practical significance.

This paper reviews in detail in the domestic and foreign research status Charged Composite Insulator defect detection technology, describes the advantages and disadvantages of charging detection methods and various methods of synthesis insulator within several typical defects; insulator within the synthesis defect detection techniques are charged outlook and summarized.

DOMESTIC and FOREIGN RESEARCH STATUS CHARGED COMPOSITE INSULATOR DEFECT DETECTION TECHNOLOGY

Live abroad for detection of composite insulator technology research started relatively early, within Insulator defect detection method is also charged more, such as the early observation is particularly important that this method is the use of a telescope to observe the surface of the insulator remote presence of a defect, there is no corrosion, cracks, etc.^[13-15]. Later developed the ultraviolet imaging method, which is also partial discharge detection surface of the insulator, insulator internal situation can not conduct a comprehensive inspection process. With the development of insulator technology, some countries have begun to be detected by infrared imaging method, the method for the detection of more comprehensive insulator itself, for example, can be used to detect local heating joints, casing, wires and other heat detection and insulators, but not be able to conduct a comprehensive examination of internal insulator process^[16]. Later, with the passage of the insulator detection technology, electric field method increasingly popular. The method is based on the electric field distribution of synthetic insulators, namely through the analysis of different electric field distribution curve shape of the insulator, it is determined whether the internal defects of composite insulator. This method can be a good insulator on the internal situation synthesis were detected by different electric field distribution curve, you can find out the inside of composite insulator defective parts, conduct targeted analysis and testing.

Compared with other countries, in the study of the synthesis of Insulator detection technology started late, although a number of studies, but no more mature technology. In our country the means for detection of commonly used synthetic Insulator still visual, which rely on line patrol officers on the ground with a high-powered telescope view; some areas were detected by infrared imaging method, but the method is an infrared imager major equipment, expensive, not most of the area of promotion^[17]. The electric field method can be synthesized insulator electric field distribution curve shape to identify internal defects, the method is simple, practical, good value and promotional value.

METHOD SYNTHESIS CHARGED INSULATOR DEFECT DETECTION

Composite Insulator defect within charged detection technology as a core value in two ways: on the one hand, to detect synthetic insulator charged early detection of internal defects insulators, inner insulator avoid defects caused by major accidents; on the other hand, charged insulator can detect synthetic early detection of internal defects insulator, thereby increasing the safety creepage distance, so that the grid company in advance to arrange maintenance, scheduling, etc.^[18-20].

Current methods in the synthesis charged insulator defect detection can be divided into the following table 1 below:

Table 1 Charging method for detecting defects in the summary Composite Insulato

No.	kind	Overview
1	The traditional method	Observation Use binoculars to observe the synthesis of the insulator surface, there are obstacles to its internal testing.
2		Ultraviolet imaging Whether synthetic insulator partial discharge issued ultraviolet determine whether defects.
3		Infrared imaging Synthetic insulators whether local heating and determine whether the infrared light emitted by the defect.
4	Advanced methods	Electric field method Synthetic insulators electric field distribution curve shape is determined whether the abnormal presence of a defect.
5		Laser Induced Fluorescence Whether using a laser lightwave signal change determination whether the defect of composite insulator.
6		Microwave Method Whether the use of microwave reflection waveform synthesis insulator change determination whether the defect.

Table 1 shows various ways in the synthesis charged insulator defect detection summary table 2.1 below several classical methods in detail:

Charged detect defects in the synthesis of the traditional method insulator, the observation method is the use of the telescope operators and other advanced equipment to conduct a comprehensive inspection of composite insulator surface can be observed cracks in the outer cover, erosion and traces insulated sheds flashover. The advantage is that the method is simple and easy to take, the disadvantage is that the method can only be observed in the case of synthetic insulator surface, with or without internal defects can not be detected synthetic insulators. And use this method to detect must identify the different angles to see, not only from ground-based observations, must also observe a plethora of sites and many other angles; UV imaging method is to detect synthetic insulator partial discharge, due to the slow local composite insulator discharge will make it corrosion aging, and discharge phenomenon can be detected by this method out. The method uses an ultraviolet imager to observe, the principle is that when synthetic insulator at partial discharge in the air and release energy electrons continue to receive, and when electrons release energy, would emit ultraviolet rays. That is observed where ultraviolet light synthetic insulator flawed. Advantages of this method is easy to detect defects from the light-emitting area, the disadvantage of this method is the use of expensive equipment, it can not be popularized, and in some cases internal synthetic insulators undetectable; infrared imaging method is to detect local heating of composite insulator case Composite Insulator temperature rise must be flawed because the insulator, partial discharge, synthetic insulator dielectric loss current fault and the like have made the insulator temperature, the process by infrared camera and other equipment to observe the release of composite insulator infrared heat hot spots can be detected insulator defect site. Infrared camera absorb or reflect visible and ultraviolet light, and infrared filters infrared light through. The advantage of the method is able to detect local heating by an insulator defect site, using the device of the drawback of the method is limited. Currently part of the device can only be used for ground surveillance, and are vulnerable to sunlight, ambient temperature, etc., and the other part of the equipment design, lightweight, easy to

carry, can be a plethora of detection, less susceptible to the condition factors, but more expensive, can not be universal application.

Currently, the method of detecting defects live within relatively mature and advanced composite insulator electric field, microwave and laser-induced fluorescence method. Electric field method is the change in shape of the distribution curve of the presence or absence of internal defects determination insulator composite insulator according to a longitudinal electric field. The method mainly use live detector and other equipment in the synthesis of the insulator surface sweep, the insulator can be related data stored in the charging electric field distribution in the detector, and then upload the data to a computer, you can observe the detection of the internal electric field distribution of composite insulator Related squiggles, if the presence of distortion or unstable part of the curve can be determined within the detection of the presence of defects in insulators here. Advantages of this method is simple, easy to carry, can be a good insulator Defect detection in the synthesis. The disadvantage is that it is difficult for some insulator surface defect detection, need to combine with other methods better; laser-induced fluorescence detection using a laser insulator defect, after the insulator surface emitting laser induced insulator surface-emitting light waves outward, information reflecting surface of the insulator the wavelength of the signal light. The method can detect fungi and other microbial synthesis insulator surface, synthetic insulators internal test meaningless; microwave method is to use a microwave to detect presence or absence of defects in insulators. The method can detect tiny bubbles in the insulator, the reflected waves emitted when the waveform changes, indicating that the synthetic insulator flawed. This method can be used to the advantage of non-contact detection, which is superior to other methods, the disadvantage is that the process can not penetrate metal for fault detection.

CHARGED COMPOSITE INSULATOR DEFECT DETECTION TECHNOLOGY PROSPECT

With more and more applications of composite insulator, caused by defects in the synthesis insulator failure is gradually increasing, it is necessary to live within the synthetic insulator defect detection. By understanding within the domestic and foreign research status Charged Composite Insulator defect detection technology, describes a typical synthesis method for detecting defects in insulators charged analyze the advantages and disadvantages of each method and applicable conditions, research paper defect in the synthesis insulator charged detection technology the following conclusions:

(1) Synthesis Insulator testing a lot, but different applicability, currently in the insulator for the best way to detect defects in the electric field method, that is based on changes in the electric field insulator inside curve to determine whether the defects. For a more comprehensive insulator testing, field observation method can be used in combination to detect the effect is more pronounced.

(2) Synthesis of insulators in use will inevitably exist partial discharge, fever and other defects, using ultraviolet imaging, infrared imaging can detect this situation and ensure the safe operation of the charging device.

(3) The new detection technology microwave method, use change reflection waves emitted microwaves to determine the presence or absence of internal defects in insulators, which can not only detect the connection to the insulator attached small bubbles, it is also expected to be detected inside the insulator.

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