

Automated Insulator Cleaning System

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Abstract— A system that is able to clean the insulators without any human presence that means the system will be totally automated. It will take care of the insulator cleaning on its own. We will use a microcontroller based circuit that will automatically turn on the cleaning pressure pump every morning to clean the insulators. For confirmation the system will send a SMS to the main power station so that we can know the system is working properly. The system will also send SMS whenever the water level is low in the water tank.

Keywords: Ac (Accuracy), Insulator ASO (Transmission System Operator), TLIN (Transmission Line), Se (Sensitivity)

I. INTRODUCTION

In recent years, the demand of electric power has enlarged considerably. To satisfy this demand, electrical companies have to improve the efficiency of their transmission lines. The efficiency of the system is based mainly on the continuity of the service, avoiding faults that suppose economical losses or for companies and users. To maintain this continuity, one of the main problems that have been found is the effect produced by pollution in the insulators of electric lines. This pollution is one of the main causes of flashover in the insulators. Therefore, it is necessary to clean the insulator regularly. In our country, there are some kinds of dry hot-line cleaning equipment's, such as high voltage hot-line cleaning rod with portable soft shaft connection and high voltage hotline automatic cleaning machine with forklift supporting.

The former needs someone to hold the cleaning rod while operating, so the labour intensity is increased and falling accidents easily happen. In order to solve the problems in the latter, an automated water supply system is used. This system can work after a certain period (one week, one month) for a specific time period.

This cleaning system can not only solve the formers' problems the low efficiency of labour operation and the poor security, but also have the advantages of mobility and easy operation.

A. Factor Responsible For Insulation Failure:

Sl. S.N. NN	Voltage Levels	Factors Responsible For Insulator Failure
1	0 - 4kv	Mechanical Clearance
2	4 - 34.5 kv	Corona and surge
3	69 - 220 kv	Lightning and switching surges
4	345 -765 kv	Switching surges & Contamination/Pollution
5	765 -1500 kv	Contamination

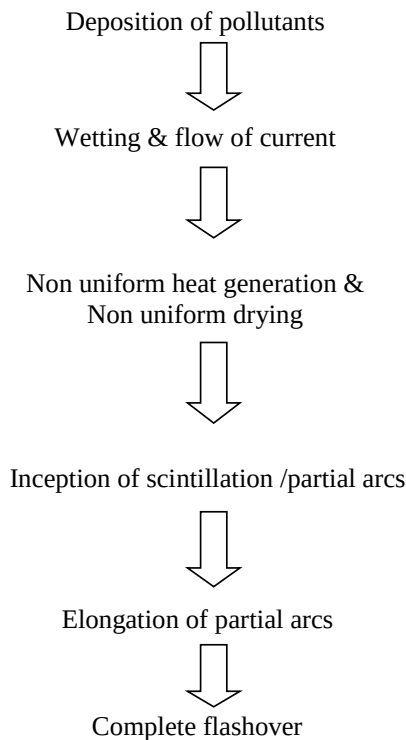
Table 1.1: Factor Responsible For Insulation Failure

Table 1.1 shows for extra high voltage or ultrahigh voltage pollution is or contamination is very important factor which is responsible for insulation failure of power line insulator.

High voltage transmission lines and insulators are exposing to outdoor so long that a impurity layer is formatted at the surface of insulators by the industrial filth and the natural filth diffusing in the air. However, the impurity layer usually contains the components of salt, acid, alkaline and so on, so under the condition of humid climates like rains and fogs, the insulator conductance increases, the insulation performance drops down, the leakage current increases sharply and the flashover voltage reduces greatly. Pollution could be several types like marine, industrial, desert, mixed, agricultural and fog/ice etc which are responsible for high voltage and ultra-high voltage insulator failure. As a result, it will easily lead to the pollution flashover accidents.

B. Pollution Flashover phenomena:

So how the phenomena of a pollution flash over happens I have briefly discuss about this, the settlement of the pollutants will be non-uniform or because the wind could carry some of the pollutant or the pollutants settle at a different uniformity on the surface because this over a period of time in case before for the monsoon starts there could be wetting because of a fog, rain, drizzle or snow which is surface and once the surface becomes wet the surface starts conducting. So the flow of leakage current happens the flow of leakage current again here depends upon the pollutants sprayed on the surface. So in case the pollutants are uniform or not uniform then the because of the wind some of the pollutants could be more at some locations and some could be very less and in some places there could be no pollutants also. So here because of this flow of leakage current there could be non-uniform heat generation because of arching there. And further non uniform drying so both here on the surface the formation of small bands which is dry and wet in nature could be observed. So the permission of this bands dry band and wet band on the surface could create non-uniform condition and the arching particularly across the dry band is observed. So semi dry band or dry band arching is seen where inception of scintillation or partial arcs what we call. So these scintillation or partial arcs which happen could elongate could depend upon the surface conditions. So and in case the entire surface becomes conducting their could be a flashover. Structure 1.1 shows Pollution flashover phenomena.



Structure 1.1 shows Pollution flashover phenomena

C. Currently Adopted Methods for Insulator Cleaning:

1 Water jets from the telescoping boom ladder which is mounted on the trucks Figure 1.1 shows a Telescopic boom ladder



Fig. 1.1: Telescopic boom ladder

2 Helicopter mounted nozzles with the special arrangements are also being used to clean the insulators during the monsoon condition. Figure 1.2 shows a arrangements of Helicopter mounted nozzle.



Fig. 1.2: Helicopter mounted nozzle.

D. Problem in Currently Adopted Methods:

This operation require skill labourers as well as the out of services electricity supply with consequent uneasiness for the customer and operator, and heavy cost of maintenance. The loss of supply time to switch off to clean insulator in an even bigger blow to profitability and a loss of credibility of the supply company. Electricity supply contracts may be broken and penalties incurred, and loss of industrial production may lead to an action for damages and the utility itself loses income and profit

“So there is a need to develop suitable technique which should be cost effective and also used better for formatting for utility. So with this in the institute at the department as tried to look into this problems seriously and there was an effort to come up a suitable method”-

E. Automated Insulator Cleaning System:

In our system we are going to use an 8051 based microcontroller that will sense the daylight and the water level in the tank and also will control the pressure pump and the GSM modem. GSM modem consisting of a SIM card into it will be used to send SMS to the power station. For detecting a new day we are here using sensor that will sense the daylight at the morning to turn on the pump. A conductivity based water level sensor is used to measure the water level in the tank. System will automatically turn off the motor if there is not enough water into the tank and will send an SMS to the power station so that they can fill the tank again. The frequency of the insulator washing can be programmed by microcontroller according to our requirement.

Figure.1.3 shows automated insulator cleaning system, which is run by solar energy, and controlled by controller.

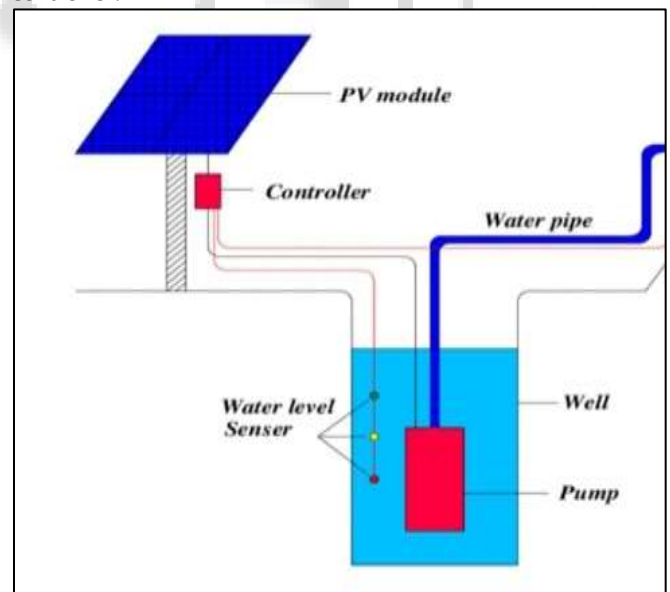


Fig. 1.3: Automated insulator cleaning system

A high pressure water with typical pressures ranging from 2700kpa to 7000 kpa (400 psi to 1000 psi) at the nozzle. This automatic system will save a lot of human manpower and money also because the High tension lines are located at very remote areas that are also very difficult to reach at regular basis. This system is totally automated and does not involve any human power so there is no risk of life during the

operation. In figure 1.4 'A & B' the Red line represents the piping of the automate insulator cleaning system,



Fig. 1.4 (A)



Fig. 1.4 (B)

II. SUMMARY

This report has described the insulation failure of insulator due to pollution flashover phenomenon problem. The report has also presented and analyzed a solution to it. we looked the problem that are occur in insulator property due to a contamination or a pollutions this contamination problem which is a very serious threat at working voltages there are point to be noted. So at working voltages above kilo volts the contamination problem plays a major role for insulation failure of insulator. Above 400 that is ultrahigh voltage range 765 KV 800 KV how the contamination flash over happens the basic phenomena of pollution flash over. What are the methods which are being used to tackle this problem? Problem in such a method which are currently used, due to some factor like cost, safety, area of working and operation period.

To avoid all such a factor that are mentioned in above, we have find out a new method that is automatic insulator cleaning system. This method is working by microcontroller and by piping system, without any human presence. This cleaning system can not only solve the formers ' problems _ the low efficiency of labour operation and the poor security, but also have the advantages of mobility and easy operation.

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