

Research on MOA Online Monitoring Technology

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Abstract. Energy is one of the energy used in the form of human life. Provide electricity power system includes a number of electrical equipment, part of the equipment in case of failure, will endanger the security of the entire power system. According to the statistical analysis, the power system more than 60% of the power outage was caused by a device insulation defects. In order to timely prevent, ensure power system security, the economy, we must carry out the required work on electrical equipment testing.

Introduction

Arrester is a parallel electrical in electrical equipment. Lightning it is used to protect electrical equipment from the line conducted by the internal over-voltage operation due to damage. It is to ensure the safe operation of power system protection devices is important; its power to ensure the normal operation of the security system plays an important role.

There are four types of arrester: lightning protection gap, tube arresters, valves and metal zinc oxide arrester. When there is internal moisture and MOA aging valves and other defects, usually blackout test check it out. Due to the non-linear resistance element MOA at grid voltage and environmental factors such as long-term effects will deteriorate, and sometimes does not find any problems during power outages trials. Arrester problems under normal operating voltage after running for months, suddenly exploded, causing blackouts accident[1-3]. At present, the performance of the MOA judgment depends only on power test is not enough, the main reason is as follows:

(1) Experimental test voltage power load, and the surrounding environment and other factors to work with MOA different, then the test data can not be measured accurately and effectively reflect the device status.

(2) Outage longer test period. MOA performance changes gradually, its degradation speed after changes to a certain extent. Only MOA-line monitoring, live test, according to the data needs to determine whether the test power. It can effectively detect defects such MOA moisture and aging. Use of on line monitoring data, through (data comparison with the same device for continuous monitoring of) "Aspect Ratio" further out potential failures[4].

MOA while running, due to the aging of the valve plate and heat and impact damage may cause a malfunction, it must be timely trials. During the test equipment not normally adjacent outage, measurement methods must be charged for MOA measurement. In the measurement, external electromagnetic interference and other factors often have a great impact on the test results, so the use of reasonable test method, eliminate electromagnetic interference near the equipment is very important[5].

The basic structure of MOA

Basic components MOA is the valve. Valve zinc oxide as a main component, a small amount of Bi₂O₃, CO₂O₃, MnO₂, Sb₂O₃ and other metal oxide additives, forming granulation after mixing, is formed by high temperature calcinations. MOA has many advantages characteristics become important over-voltage protection devices. MOA fails; it will directly affect the safe operation of power system. MOA is a new development in the seventies arrester, which is mainly composed of

zinc oxide varistors. Each one has a switching voltage varistor. Under normal operating voltage (i.e., less than the varistor voltage) the varistor value is large, the equivalent insulation state. Under the action of the impulse voltage (varistor voltage greater than), varistor breakdown was low, the equivalent of a short circuit condition. After the varistor is shocked, you can restore the insulating state; when a voltage higher than the breakdown voltage revoked, it restored the high-impedance state. Therefore, after the power line installation MOA, when lightning strikes, high voltage lightning makes varistor breakdown, the lightning current into the earth through the varistor voltage power line can be controlled within a safe range, protection safety of electrical equipment.

MOA is a good protection. Zinc oxide has good nonlinear voltage characteristics, under normal operating voltage of the current flowing through the arrester minimal (micro amps or milliamps). When it is under over-voltage, resistance sharp decline, let drain voltage of energy, to protect the results. MOA is different from traditional arrester, it does not discharge gap, nonlinear characteristics of zinc oxide to achieve discharge and breaking role.

Research Methods Online Monitoring of MOA

MOA running condition monitoring for a long time, detection methods and more, basically to determine the leakage current of the foundation. The test methods currently used at home and abroad can be summarized as the following categories:

(1) The total leakage current law

MOA due to the capacitive component of the leakage current is essentially the same, you can simply think that increasing the total current to a certain extent reflects the growth of its resistive component of the current. The basic approach is to counter the arrester discharge ends of the parallel access low resistance IIA table, measuring the total leakage current changes. This method is complicated, low sensitivity, not widely used. Only non-precision instrument are for simple observation time. So the method seldom is used.

(2) Third harmonic resistive current law

The current detected by the band-pass filter third harmonic component, according to the ratio between the total MOA resistive current and third harmonic resistive component to obtain resistive current peak. Because of the different manufacturers of valves and the different characteristics, different peak as a function of the third harmonic resistive current is result in. At the same time three times as a function of peak harmonic resistive current peak is the degree of change and the aging of the valve. MOA terminal voltage harmonic content (bus voltage) is also produced a direct impact on the measurement results, the surface does not reflect MOA filthy, damp conditions. Therefore, the third harmonic method is neither universal nor objectively reflect the actual state of the MOA is running, it can only be the same product in the same vertical comparison test conditions. MOA is to just take advantage of the total leakage current, no reference voltage, more convenient. When included in a larger system voltage harmonics, capacitive currents will also contain a third harmonic so that there is a big measurement errors likely to cause false positives.

(3) Compensation resistive current measurement

Compensation method explained, because the heat generated by the valve power loss is resistive current components. Capacitive current compensation method is applied to the bus voltage minus 90 degrees out of phase capacitive current component, obtained resistive current approach. It LCD-4 type leakage current detector is representative; you can measure the total leakage current, resistive current component and power loss, better measurement results. Compensation measurement principle is simple, the measurement accuracy can meet the engineering requirements, and ease of use. Only in this way the total leakage current of resistive current and capacitive current 90 degrees out of phase when you can get the real result of the reaction valves aging. Interference in the test site, and a fixed three-phase arrangement (such as a glyph), the next phase effect of stray capacitance, the capacitive current and voltage not 90 degrees out of phase, the test instrument can not be fully compensated capacitive currents, the error great. Where A and C phases MOA affected B-phase voltage, the total leakage current phase (in truth voltage reference amount) will be after each shift and about 3 to 5 degrees before the shift, B phase at the same time by the A-phase and

MOA C-phase voltage affect the phase basically unchanged. Leading to the measured phase increases resistive current A, C phase decreases, B phase is essentially the same, and that is not the reaction MOA valve aging situation. As a longitudinal comparison is objectively reflect the actual state of the three-phase operation of the MOA. Compensation Act removed from the PT voltage signal, there may be a phase shift; when the grid voltage harmonics, but also affect the measurement accuracy.

(4) Higher harmonics calculation method

This method is a conventional method of compensation for improvements. The basic principle is: MOA total leakage current through the single-chip analysis calculation, the resistive current. Meanwhile, MOA total leakage current into the subtraction unit and logical analysis unit. Logical analysis unit to the total leakage current signal is analyzed to calculate the capacitive current and resistive current phase. Automatic signal produced capacitive current signal into a unit generates the initial value into the subtraction unit and the total leakage current for differential operation. The advantages of this approach are: testers can avoid voltage transformer wiring operation. Online monitoring of the operation easier enhances security of power system online tests. Using a single-chip system has high degree of intelligence. Its accuracy depends on the content of the system voltage higher harmonics.

Online detection technology

MOA leakage current is divided into two parts, namely the capacitive and resistive part. Under normal circumstances, the resistive current at full current component is relatively small, so the increase in resistive current to increase the full current is small; the monitoring of changes in the full current resistive current is not very sensitive. In order to monitor the non-linear resistance characteristics of the valve plate the best way is to directly monitor the resistive current. According to the development needs and the development direction of the substation, and effectively improve unmanned, fewer people on duty security level substations. In Substation Configuration MOA leakage current is online monitoring system. For real-time monitoring of the following situations:

- (1) Real-time monitoring of the whole MOA leakage current;
- (2) Real-time monitoring MOA resistive leakage current;
- (3) Real-time recording the number and time of occurrence of lightning in order to find the cause. Monitor arrester under surveillance when running times MOA full current, resistive current, lightning frequency and duration, and continue to send real-time data to the control room to achieve remote monitoring purposes.

MOA criteria

(1) MOA analysis of test results to historical trends is based on longitudinal data, not deliberately pursue absolute size of the test values.

(2) Resistive current MOA, under normal circumstances, about 10% to 20% of the full current. If the test value is within this range and can distinguish this zinc oxide arrester running well.

(3) 25% to 40% of the total current value of the resistive current MOA increases the frequency of detection. Pay close attention to trends and do the data analysis and judgment.

(4) MOA resistive current account for more than 40% of the current can be considered out of operation and further analyze the cause.

(5) If the percentage of the total current resistive current significant growth. Among them, the growth rate of the larger fundamental harmonic growth is not obvious. Such cases generally can be identified as a serious contamination MOA or internal moisture.

(6) If the percentage of the total current resistive current significant growth, in which the growth rate of the larger harmonic, the fundamental growth is not obvious. Such cases generally can be identified as MOA aging.

(7) Phase angle normal arrester above 80 degrees, when the power factor angle less than 80 degrees outage inspection.

Conclusion

Electrical testing is a strong practical ability to work, not only a wealth of theoretical knowledge, but also need to have patience and careful character. Ongoing learning at work, summarize, absorb foreign experience, applied to the actual production work, a qualified electrical test technician, their ability to play its due. In short, it should adhere to the scientific attitude, the test results must be comprehensive and historically comprehensive analysis, grasp the variation of electrical equipment performance and trends, in order to correctly judge the condition of electrical equipment, provide an important basis for the overhaul.

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