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The Maintenance of Switchgear in Substations

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Abstract

In an electric power system, switchgear is one of the most important equipment for substations used to interrupt a fault and change a network configuration. In order to minimize the fault duration and its impact on other equipment, the switchgear operating time should be extremely fast and is generally in the range of tens of milliseconds. Though this type of switchgear operates rarely, but its reliable operation is extremely important to ensure the stable and reliable electric power supply. Although over the years many new developments and improved maintenance methods have tried to enhance the reliability by reducing the failure rate of such switchgear, still its share is about 40% of overall substation failure. Seeing its important role, it is still high and thus needs a closer look to examine the causes of such failure and existing maintenance methods to improve its operation reliability and reduce failure rate. As a result, in this study some examples are introduced to analyze the factors behind the switchgear failures and suggest some maintenance methods to avoid such failures.

In most of the real world cases, the insulation failure, the overheating of conductive parts, and the non-actuation of driving mechanism have been observed to be the main common causes related to the switchgear failure. Such causes of the switchgear failures can be divided into two broad categories. The first category relates to the causes that have already existed even before starting onsite operation, and the second one is about the causes that occur after the commencement of the commercial operation. The first category of failures is generally observed due to the poor installation, the faulty design and the poor manufacturing process and it can be identified and rectified by the acceptance tests and the on-site tests. The second category of failures which occurs after the commercial operation is considered in this presentation. Hence, the factors behind such switchgear failures and the maintenance methodologies to reduce such failures are suggested and discussed. At first, the deterioration of the grease are described to avoid the non-actuation of the switchgear driving mechanism. Secondly, the preventive methods against the contact of a bird and small animals to avoid the insulation failure due to ground faults are described. Finally, the some useful notes relating to the heat measurement techniques for the conductive parts (like terminals) against the overheating are described.