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Technique for Online Condition Monitoring of Surge Arresters

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Abstract : Overvoltage in power systems is a phenomenon that cannot be avoided. However, it can be controlled to a certain extent. Power system equipment is to be protected against overvoltage to avoid system failure. Metal Oxide Surge Arresters (MOSA) are connected to the system for the protection of the power system against overvoltages. The MOSA will behave as an insulator under normal working conditions, where it offers a conductive path under voltage conditions. MOSA consists of zinc oxide elements (ZnO Blocks), which have non-linear V-I characteristics. ZnO blocks are connected in series and fitted in ceramic or polymer housing. This degrades due to the aging effect under continuous operation. Degradation of zinc oxide elements increases the leakage current flowing from the surge arresters. This Increased leakage current results in the increased temperature of the surge arrester, which further decreases the resistance of zinc oxide elements. As a result, leakage current increases, which again increases the temperature of a MOSA. This creates thermal runaway conditions for MOSA. Once it reaches the thermal runaway condition, it cannot return to normal working conditions. This condition is a primary cause of premature failure of surge arresters, as MOSA constitutes a core protective device for electrical power systems against transients. It contributes significantly to the reliable operation of the power system network. Hence, the condition monitoring of surge arresters should be done at periodic intervals. Online and Offline condition monitoring techniques are available for surge arresters. Offline condition monitoring techniques are not very popular as they require removing surge arresters from the system, which requires system shutdown. Hence, online condition monitoring techniques are very popular. This paper presents the evaluation technique for the surge arrester condition based on the leakage current analysis. Maximum amplitude of total leakage current (IT), Maximum amplitude of fundamental resistive leakage current (IR) and maximum amplitude of third harmonic resistive leakage current (I3rd) have been analyzed as indicators for surge arrester condition monitoring.

Keywords : metal oxide surge arrester (MOSA), over voltage, total leakage current, resistive leakage current
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