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MINIMUM-INTRUSIVE DIAGNOSIC SYSTEM FOR SF6 HIGH VOLTAGE SELFBLAST CIRCUIT BREAKER NOZZLES

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Circuit breakers are important components in the electrical power supply grid. The maintenance of high voltage gas circuit breakers requires high personal as well as monetary efforts for the asset operator. Furthermore, a faulty reassembly of the circuit breaker during maintenance can lead to a circuit breaker failure during operation. For this reason the maintenance strategy changed from a periodic schedule to a condition-based strategy. One possibility to realize condition-based maintenance strategies as well as to reduce the failure risk is the use of minimum-intrusive diagnostic techniques. This research work examines such techniques for assessing the wear of the insulation nozzle inside the switching chamber of a circuit breaker. The approach applied here is based on the measurement of the transient pressure signal at the main filling valve of the circuit breaker during a switching operation without electrical load. The pressure signal is investigated regarding characteristic features which yield information for the determination of the switching chamber condition. Characteristic features be identified in the pressure waveform and are used for further analysis. In this process the nozzle condition, as the most influencing factor is varied. Additionally the influence of electrode ablation and filling pressure variations are analyzed as well. In addition, the nozzle ablation on multiple poles is considered. A machine learning algorithm applying the k-nearest-neighbor-method is used for the determination of the nozzle and electrode condition, while the characteristic features are utilized as input parameters. Thus it is possible to classify new, unknown measurements with an already known data basis. The classification is successfully applied with a high reliability for different circuit breaker types. For the validation of the method field measurements from different circuit breaker types are evaluated.

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