
Substations

Condition Assessment of Power Transformer On-Load Tap-Changers Using Wavelet Analysis and Self-Organizing Map: Field Evaluation

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Abstract: An on-load tap-changer (OLTC) is the most maintenance-intensive subassembly on a power transformer. Vibration monitoring is an effective technique that can be used to assess the condition of an OLTC effectively and nonintrusively. The authors have developed a condition monitoring system for common types of OLTCs that enables the condition of tap changer contacts and associated drive system to be inferred from vibration signals. A number of prototype systems have been installed onto OLTCs in distribution zone substations for field trials. Particular emphasis has been given to the detection of faults in a particular type of older tap-changer that had been prone to a range of faults associated with the switching contacts and drive mechanism. For this type of tap-changer, it is possible to determine not only that the tap-changer is aging but also to identify the particular part that is degrading.

Keywords: On-load tap-changer (OLTC), wavelet transform, self-organizing map (SOM), condition assessment, and fault detection.

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Surge Protective Devices

Surge Protection for Interface Circuits of Communication System

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Abstract: Microelectronic circuits are often damaged by surges. Surge protection for microelectronic circuits has some special requirements different from those for electrical equipment. The approach that the surge invades into microelectronic circuits is studied. The surge withstand capability of some typical serial communication integrate chips, the behaviors of voltage limiting components, and the influence of the connecting capacitance of voltage clamping device on digital signals are studied. A design method of surge suppressor for communication systems is proposed.

Keywords: Surge protection, interface circuit, communication system, voltage clamping device, microelectronic circuit, digital signal, chip.

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Evaluation of Currents and Charges in Low-Voltage Surge Arresters due to Lightning Strikes

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Abstract: This paper presents an evaluation of the values of currents and charges absorbed by surge protective devices (SPD) connected in low-voltage open-wire overhead distribution networks in the case of direct lightning strikes to primary lines. Also, some information about overvoltage magnitude is included. The calculations have been performed using the Alternative Transients Program (ATP). The modeling of system components includes the insulation characteristics (voltage versus time to breakdown) of primary and secondary insula-

tors and a distribution transformer model for high frequencies, which takes into account the load conditions. Some parameters of interest are taken into consideration in the analysis, such as ground resistances of poles and consumers, lightning strike position, and crest value of the stroke current.

Keywords: Arresters, lightning, power distribution, power distribution lines, power system transients, surge protection.

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Switchgear

Design and Implementation of an SF₆ Interrupting Chamber Applied to Low-Range Generator Circuit Breakers Suitable for Interruption of Current Having a Nonzero Passage

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Abstract: New types of SF₆ interrupting chambers that implement innovative interrupting principles have been developed during the past years based on the objectives of reducing the operating energy of the circuit breakers and consequently increasing their reliability. This paper describes the rear-exhaust type self-blast double-volume thermal chamber, which was designed with the help of new chamber development software programs, of the physical imaging model of the arc. Simulations and confirmation by laboratories tests interruption of short circuit currents and especially tests short circuit currents having a nonpassage by zero on such new chamber for applications to generator circuit breakers are shown and evaluated.

Keywords: Generator circuit breakers, puffer thermal chamber, short circuit currents having a nonpassage by zero.

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Transformers

Accurate Modeling of Core-Type Distribution Transformers for Electromagnetic Transient Studies

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Abstract: This paper proposes a model of core-type distribution transformers for electromagnetic transient studies. The model accurately reproduces not only the impedance characteristics seen from each terminal of a core-type distribution transformer but also the surge-transfer characteristics between the primary and secondary sides in a wide range of frequency. Because of this capability, the proposed model enables the accurate evaluation of overvoltages on distribution lines including consumer-side overvoltages. A 10 kVA transformer is modeled, and transient-simulation results agree well with laboratory-test ones.

Keywords: Power transformers, power distribution, electromagnetic transient analysis.

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Measurement of λ -i Characteristics of Asymmetric Three-Phase Transformers and Their Applications

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