Winding Design for a Rotating Arc SF6 Circuit Breaker and Investigating its Effects on Arc Temperature and Resistance

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A winding is designed for a rotating arc circuitbreaker which is used to generate an external magnetic field in Zdirection for imposing a rotational electromagnetic force to arc. The winding location is chosen according to the structure of case study. Simulation results are obtained using a three-dimensional(3-D) transient model. The effect of winding on arc is driven by analysis of magnetic field and its interaction with external magnetic fields and their influences on arc stability in circuitbreaker. The 3-D distribution of electric current density is obtained from a current continuity equation along with the generalized Ohm’s law, while the magnetic field induced by current flowing through the arc column, is calculated by magnetic vector potential equation. In SF6 circuit breakers where gas interacts with arc column, fundamental equations such as; Ampere’s law, Ohm’s law, turbulence model, transport equations of mass, momentum, and energy of plasma flow have to be coupled for analysis the phenomenon. The coupled interactions between arc and plasma flow are described in the frame work ofmagnetohydrodynamic (MHD) equations in conjunction with a K-ε turbulence model. Simulations have been focused on designing the winding and the effects of external field on arc characteristics such as; magnetic field distribution, electromagnetic force density, pinch effect, electrical conductivity, arc resistance and temperature

Rotating Arc; Circuit Breaker; plasma; Winding Design

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