



Contribution ID: 1269

Type: **Poster Presentation**

Tue-Af-Po2.23-10 [97]: Study on a Novel Electromagnetic Tripping System with Two Staeg Short Circuit Tripping Characteristic

Tuesday 24 September 2019 14:00 (2 hours)

Usually, the electromagnetic trip unit in AC circuit breaker has only one trip current value. When a current in circuit is greater than the trip current, the electromagnetic trip unit will be released, so it is suitable for instantaneous tripping in the case of short circuit. In this paper, a novel electromagnetic trip system with two trip current values is studied, which is suitable for two-stage tripping characteristic of circuit breaker, that is, short delay tripping and instantaneous tripping, when a short circuit is occurred. According to the characteristics of AC electromagnetic system with constant magnetic potential, a secondary winding is added to the iron core to change the value of main magnetic flux in the trip system by shorting and opening the secondary winding. Theoretical research shows that the two tripping current values can be achieved by this method.

In this paper, the overall plan with double winding controllable electromagnetic tripping unit is put forward in first. Then, a new type electromagnet tripping system is composed. Through the Maxwell equation theory, the main influencing factors (such as the air gap, the pole area, the length of the magnetic circuit, and number of turns of secondary winding, etc.) for the minimum tripping current with double winding controllable electromagnetic tripping unit are analyzed under the two different working conditions. The mathematical models of double winding controllable electromagnetic tripping unit are established based on the Simulink module in MATLAB software. The simulation research and theoretical analysis shows that the two trip current values by shorting and opening the secondary winding is feasible. Finally, the 3D magnetic field model with double winding electromagnetic tripping unit is established by ANSOFT. Then the structure of the double winding controllable electromagnetic tripping unit, especially the placement position of the secondary winding is optimized. The selective protection for distribution system may be provided.

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Session Classification: Tue-Af-Po2.23 - Novel and Other Applications I