Structural optimization design of three phase enclosed GIS disconnector based on MOGOA and ELM

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Abstract

Due to the compact and complex internal structure of 110kV three-phase enclosed GIS disconnector, its internal insulation design is a difficult point to be solved. To solve this problem, this paper firstly establishes a three-dimensional model of three-phase enclosed GIS disconnecting switch and conducts a research on the distribution of electric field under a specific working condition, it is found that the outer corner of the static contact, the inner corner of the static arc contact, the inner corner of the outer end of the moving contact and the inner corner of the moving contact are the internal electric field concentration of the three-phase enclosed GIS disconnector. Then, in order to further reduce the electric field strength and improve the insulation margin and performance, this paper proposes a method based on the combination of Extreme Learning Machine (ELM) and Multi-objective Grasshopper Optimization Algorithm (MOGOA) to optimize the structural design of three-phase enclosed GIS disconnector, and a ELM model is established, which takes the internal fillet radius of stationary arcing contact, the internal fillet radius of moving contact, the internal fillet radius of external end of dynamic and static contact, the radius of the outer corner of the two static side contacts and the opening distance of the grounding contact as the inputs, and takes the maximum electric field strength of the two static side contacts and the moving side contacts as outputs; Finally, the structural parameters are optimized by MOGOA algorithm.

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