3petal spiral type vacuum interrupter에서 가동접점전극과 고정접점전극간의 마주보는 각도의 변화가 아크구동력에 미치는 영향

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Influence of twisting angle between fixed contact and movable contact on arc driving force in 3petal spiral type vacuum interrupter

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Abstract : Vacuum circuit breaker(VCB) is now emerging as an alternative of gas circuit breaker(GCB) which uses SF6 gas as insulating material whose dielectric strength is outstanding. But we have to reduce SF6 gas because SF6 gas is one of greenhouse gas and efforts to reduce greenhouse gas are now trend of the world. Therefore, we can say VCB is the optimal alternative of GCB because vacuum is environmentally friendly. The vacuum interrupter is the core part of VCB to interrupt arcing current. There are mainly two methods to extinguish arc. One is radial magnetic field (RMF) method and the other is axial magnetic field (AMF) method. We deals with RMF method in this paper. Compared with AMF, RMF arc quenching method has different principle to extinguish arc. In case of RMF method, pinch effect is much larger than AMF method. Because of pinch effect RMF type contact electrodes have the single large spot which is severly damaged and melted while AMF type contact electrodes have small and multiple spots which are slightly damaged and melted. To prevent contact electrode being damaged and melted from high temperature-arc, RMF method uses Lorentz force to move arc. In this paper we calculated and compared the arc driving force of two cases and we analyzed the force acting on each part of arc by means of commercial finite element method software Maxwell 3D. They have 3petals and we considered two cases. One is the case when fixed(upper) and movable(lower) contacts are in mirror arrangement (Case 1). The other is the case when one of two contacts (movable contact) is revolved at maximum angle as possible as it can be (Case 2). And at each case above, we analyzed arc driving force at two positions, position 1 is the closest to the center of contact and position 2 is near the edge of petal on fixed contact. As a result we could find that Case 2 generated stronger arc driving force than Case 1 at position 1. But at position 2 Case 1 generated stronger arc driving force than Case 2. This simulation method can contribute to optimizing spiral-type electrode designs in a view of arc driving force.

Key Words : Vacuum interrupter, Arc, Lorentz force, Radial magnetic field, Spiral type

ACKNOWLEDGE

This research was supported by University Electric Power Research Center Enterprise of Korea Ministry of Commerce Industry and Energy.