Protection scheme against turn to turn fault for novel magnetic valve controllable reactor based on thyristor current distortion

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Abstract

Turn to turn short circuit is a common fault of the Magnetic Valve Controllable Reactor(MVCR), but the current research on the characteristics of turn to turn faults is not clear. What’s more, the corresponding protection also has certain limitations. In this paper, a novel type of MVCR that has been put into operation in engineering is studied. Firstly, the topology structure of the novel MVCR is introduced, and the electrical characteristics of its steady-state operation are analyzed. Based on this, the fault characteristics of the excitation winding and working winding of the novel MVCR when turn to turn faults occur are studied. The study shows that when turn to turn faults occur, the amplitude of DC and AC component in the thyristor current both increase significantly, resulting in large current distortion. Due to the fault characteristics, this paper introduces the current distortion coefficient to quantitatively analyze the different characteristics of the two components before and after the faults. Furthermore, a protection scheme against turn to turn fault based on the thyristor current distortion is proposed. Finally, the feasibility and effectiveness of the proposed turn to turn protection scheme are verified by Matlab/Simulink simulation experiments.

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