



Contribution ID: 85

Type: **Poster Presentation**

Research on Transient Junction Temperature Rise of Pulse Thyristor

Thursday, 7 July 2016 14:10 (20 minutes)

Thyristor has been widely used in HVDC transmission system and pulsed power system. The thyristor will be damaged if transient temperature rise of valve plate is too high, and it will result in the system failure. The relationship between peak value of pulse current flowed the circuit and maximum transient temperature rise of thyristor in pulsed power system was investigated in this paper. Firstly, one circuit used to measure junction temperature rise of thyristor was designed, which was based on the theory that there is a linear relationship between the conducting voltage drop of thyristor and junction temperature rise of thyristor. The thyristor was kept on during the measuring process in the designed circuit. The junction temperature rise of thyristor was calculated through the thermal sensitive curve and the change of the conducting voltage drop of thyristor which can be measured in the designed circuit. The maximum junction temperature rise of thyristor was obtained after one heavy pulse current flowed. Then the equivalent thermal impedance model was built. The thermal resistance and thermal capacitance can be obtained by transient thermal impedance curve fitting, and parameter of equivalent current source can be calculated through the power curve. The temperature variation curve was calculated by the thermal impedance simulation model as the thyristor flowed pulse current. The maximum junction temperature rise of thyristor obtained from the simulation result was almost the same as maximum temperature rise obtained from experiment data. A method to evaluate the temperature rise of thyristor was obtained through the research.

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Session Classification: Poster 2-B

Track Classification: Opening, Closing, and Solid State Switches