SURFACE TEMPERATURE DYNAMICS OF SWITCHING RMF AND AMF CONTACTS

S. Gortschakow[1], D. Gonzalez[1], R. Methling[1], St. Franke[1], D. Uhrlandt[1],
A. Lawall[2], E. D. Taylor[2], F. Graskowski[2]
[1] Leibniz Institute for Plasma Science and Technology, Greifswald, Germany
[2] Siemens AG, Berlin, Germany

ABSTRACT

Vacuum interrupters (VI) are widely used for switching in power grids. A high number of operations under standard load conditions, safe short-circuit current interruption capability and maintenance-free operation lead to increase of their popularity in various applications. The lifetime of VI contact systems is mainly controlled by a limited thermal load of the electrode surface. In order to optimize the heat management of the electrode system a self-induced magnetic field are used. Radial magnetic field (RMF) contacts induce the arc rotation, thus, reducing the arc dwell at local position. Axial magnetic filed (AMF) contacts maintain a diffuse arc causing the overall thermal load reduction.

This contribution presents the results of comparative study of typical RMF and AMF contact systems used in vacuum interrupters at similar operation conditions. An AC current pulse with a peak value up to 28 kA and frequency of 50 Hz was used. The measurements of arc current and voltage were complemented by optical diagnostics. The arc dynamics was observed by a high-speed camera. Near infrared radiation (NIR) spectroscopy determined the anode surface temperature after current zero crossing. During the active phase, a high-speed camera equipped by a narrow band filter was applied for acquisition of qualitative distribution of the anode surface temperature. In addition, the density of neutral chromium vapour close to the current zero crossing was measured by means of broadband optical absorption spectroscopy. Three Cr I resonance lines at 425.43 nm, 427.78 nm, and 428.97 nm are used for the analysis. Special attention was put on the behaviour after current interruption. The results for measured temperature evolution of anode surface temperature along with the corresponding Cr density will be presented and discussed.