Contribution ID: **3** Type: **Virtual Poster**

Analysis of surface temperature dynamics of switching vacuum arc contacts

Wednesday 10 March 2021 16:45 (20 minutes)

The advantages of the vacuum technology such as environmental compatibility and emission-free solutions make the vacuum interrupters attractive for switching applications in power grids. The lifetime of the contact system is mainly limited by accumulated thermal load of the electrode surface. Therefore, various measures are applied for the reduction of this load. Two types of electrode systems are widely used for the control of arc behavior. 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. Electrodes were made of CuCr alloy. Conventional measurements of the arc current and voltage have been accompanied by various 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. Special attention was put on the cooling dynamics after current interruption. The results for measured evolution of anode surface temperature will be presented and discussed.

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Session Classification: Poster Session