

# Investigation of Space Charge Dynamics at the Interface between Oil and Impregnated Paper/Pressboard

M Hao, Y Zhou, and G Chen  
University of Southampton  
Tony Davies High Voltage Laboratory

G Wilson and P Jarman  
National Grid, UK

\*E-mail: mh2e10@soton.ac.uk

Dielectric properties of oil-paper/ pressboard insulation system play an important role in the reliability of HVDC convertor transformers [1]. It has been demonstrated that the interface between dielectrics as well as electrode/dielectric behaves as a barrier to accumulate space charge significantly [2,3]. It is, therefore, necessary to investigate space charge dynamics at the interface between oil and impregnated paper/pressboard, especially under combined AC and DC voltages and polarity reversal. In the present study, a purposely-built PEA system is established to measure space charge not only within the impregnated paper/pressboard bulk, but also at the interface between impregnated paper/pressboard and oil. A 15mm thick aluminium plate is used as ground electrode, and acts as oil container with 5mm in depth. Brass films with different thicknesses are applied to provide oil gaps between the upper electrode and the impregnated paper/pressboard sample. The output signal is enhanced by using a 40 $\mu$ m PVDF sensor and a high voltage pulse generator. The dried papers with 500 $\mu$ m in thickness are separately impregnated in fresh oil and aged oil as comparison. And the thickness of the oil gap is about 300 $\mu$ m. The results show that space charge is injected and accumulated at the interface between oil and impregnated paper under the DC voltage application of 20kV. The peak of the interfacial charges is increasing with the duration of stressing time. Moreover, more charges are injected and accumulated at the interface between aged oil and impregnated pressboard than fresh oil and impregnated pressboard in 30 minutes.

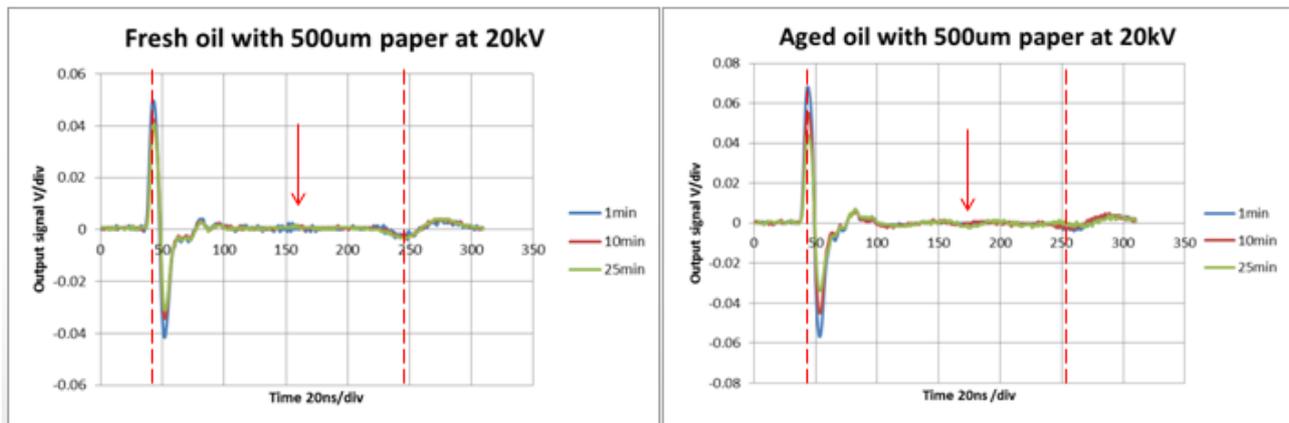


Figure 1 Oscilloscope output of space charge in fresh oil sample (left) and aged oil sample (right) under 20kV

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