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Influence of HVDC Converter Operation on Partial Discharge Characteristics

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This paper presents an investigation of the influence of different operating conditions of HVDC convertors on partial discharge behavior occurring within cables on the DC side of an HVDC system. Cables at the DC side undergo different stresses due to transients and harmonics, which affect their insulation integrity and may result in an intensified level of partial discharge (PD) activity. Most DC schemes, nowadays, are bidirectional with the valve firing angles at the heart of power conversion and power flow control. Depending on the mode of converter operation and the properties of the interconnected AC systems, varying levels of harmonics, either characteristic or non-characteristic, appear on the DC side. By reproducing a down-scaled version of the DC output of conventional HVDC converters under controlled laboratory conditions, PD signals occurring under an HVDC applied voltage generated at different converter firing angles have be measured. PD was produced using a range of insulation samples containing known defects and measured using an HFCT sensor with a bandwidth of 19 MHz. Characteristics of the acquired PD signals have been analyzed using statistical methods with the aim of finding a promising condition monitoring tool to identify the influence of the generated harmonics on PD activity. The results will aid HVDC network operators in identifying incipient cable faults by contributing to diagnostic knowledge rules for interpretation of PD parameters under known operating conditions.

Primary author: AZIZIAN FARD, M. (Glasgow Caledonian University)

Co-authors: Dr J. REID, A. (Glasgow Caledonian University); Dr M. HEPBURN, D. (Glasgow Caledonian University)

Presenters: Dr J. REID, A. (Glasgow Caledonian University); AZIZIAN FARD, M. (Glasgow Caledonian University)

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