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The condition monitoring of the passive harmonic filters in rail way DC sub stations

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Abstract:

The condition monitoring of the passive 12th and 24th harmonic filters in the DC sub station employing 12 pulse passive rectification plays the vital role of suppressing generated harmonics. The railway service of South Africa (Transnet) is confronted by the introduction of complex loads the sub stations was never designed for. In recent years the suppression of harmonics has become increasingly important due to penalties incurred from the energy supplier and the influence harmonics has on sensitive equipment supplied from the same grid.

The condition monitoring of harmonic filters can thus be used to control harmonic energy. Due to the fact that these filters are passive they have to be monitored to ensure efficiency. The efficiency of the filter is dependant on the filter components being within specification to ensure accurate attenuation of generated harmonics. The investigation of the document aims to address the condition monitoring of the passive filter components for various operating conditions to establish whether these components are still operating in an efficient manner.

In the short term the proper functioning of the harmonic filters will reduce power factor quality penalties and in the long term the life expectancy of systems supplied by the DC grid will be prolonged. The monitoring of the harmonic filters may even aid in diagnosing faulty components that have harmonics as a results that influence the operation of the harmonic filters.

The investigation in this research report involves the development of a method to practically measure the voltage harmonics (600 and 1200 Hz) generated by DC sub station components. The investigation deals with the simulation of the DC sub station during various operating conditions and the actual measurement of sub stations in order to calibrate the findings. The report aims to investigate the feasibility of monitoring the condition of the DC sub station passive harmonic filters without entering the DC sub station.