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FAST-VARYING FLICKER MITIGATION USING D-STATCOM AND ITS IDENTIFICATION

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AUTHOR'S DECLARATION

I declare that the work in this thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

The negative impact of power quality problem due to voltage flicker has gained a growing concern from utilities, especially in the areas of distribution planning. This has brought the importance for the utility, manufacturer and end user to identify who is the responsible for causing flicker before any appropriate mitigation techniques is applied. Thus, this research has proposed a new controller for 6-pulse D-STATCOM based on Phase-Locked Loop (PLL) controller with Hysteresis Current Control (HCC) switching to mitigate voltage flicker in power system. This technique has employed two different control strategies which are PLL control loop and Direct Current (DC) voltage control loop. The first control loop is based on the extraction of the three phase voltage flicker at point of common coupling (PCC) to generate a proper phase angle for source current. Meanwhile, the second control loop is used to determine the amplitude for source current. The outputs from both controllers are multiplied in order to produce reference signals for source current that will be used for Hysteresis Current Control (HCC) switching purpose. It is demonstrated that, the linearity that exists in this proposed controller not only allow the fast detection time but also has a capability to mitigate voltage flicker at different frequencies. Besides that, the extraction of voltage flicker at PCC without using any transformation are able to reduce computations complexity and hence capable to extract the flicker at PCC efficiently. In addition, the flicker source identification based on the Fast Fourier Transform (FFT) demodulation technique also has been proposed in this study. The FFT has been incorporated with Flicker Power Algorithm (FPA) to extract flicker component. It is thus allow FPA to calculate the exact flicker component and hence identify the flicker source location in both radial and non-radial power system. In this study, it is found that the proposed new control algorithm for D-STATCOM based on PLL controller together with HCC switching has been able to produce a better result as compared to the previous techniques in term of time response. Moreover, the integration of FFT with FPA techniques capable to identify the flicker source location in both radial and non-radial power system.

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