



Harmonic Current Reduction Using Soft-Switching Active Power Filter

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Abstract

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This paper presents a design of an active power filter (APF) circuit with soft switching features. Generally, the APF circuit is used for compensating power factor and harmonic current. However, when it operates at high frequency, switching loss is increased. The switching loss can be reduced by considering soft switching technique. This proposed soft switching APF circuit includes an auxiliary circuit of resonant of DC to DC converter. By using the auxiliary resonant circuit, switching loss in the APF circuit is reduced and the voltage or current is forced to zero for some duration. The advantages of the proposed APF circuit design are efficiency improvement voltage stress reduction, harmonics current reduction and power factor improvement. The proposed soft switching APF circuit is designed to be operated at 1 kW of rated power and 40 kHz of switching frequency. Sinusoidal line current and near unity power factor are achieved. The proposed APF circuit is designed using Matlab/Simulink. The results show that the proposed APF circuit able reduces harmonic current from 6.12% to 4.12% the IEEE 1159-1995 standard referred, and the power factor is improved from 0.9423 to 0.9999.

Keywords: Active Power Filter (APF); Power Filter; Soft-Switching; Total Harmonic Distortion (THD)