Design and Control of an Anti-Resonance Hybrid Delta-Connected Capacitor Bank for Low-Voltage Industrial Power Systems *

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ABSTRACT - This paper proposes design and control of a three-phase anti-resonance hybrid capacitor bank for power factor correction in low-voltage industrial power systems. In general, shunt capacitors connected in series with reactors should be designed carefully before installation in order to avoid series and/or parallel harmonic resonance between the capacitors and line inductances. However, the system parameters are dynamically changed according to the power system configurations and loads. Consequently, harmonic resonance might occur after the capacitors have been installed. The main objective of the proposed hybrid capacitor bank is to compensate for reactive power without any harmonic resonance. The hybrid capacitor bank is a combination of delta-connected capacitors connecting in series with three small-rating single-phase inverters without any matching transformer. The inverter is used to improve the characteristics of the capacitors. As a result, no harmonic resonance occurs under any system condition. In this paper, simulation results verify the viability and the effectiveness of the proposed anti-resonance hybrid delta-connected capacitor bank for reactive power compensation.

Keywords - anti-resonance, harmonic resonance, hybrid capacitor bank, power factor correction, power distribution systems