# Phase Coordinates System versus Orthogonal Reference Frame in Control of Shunt Active Filtering Systems

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*Abstract*— This paper is focused on the implementation of the different theories of powers and current decomposition methods in the compensating current calculation for three-phase three-wire shunt active filtering systems. They are grouped into two categories, depending on the type of coordinate system used in the processing measurements involved in calculations. The former is based on the phase coordinates system and includes the theories of Fryze, Fryze-Buchholz-Depenbrock as well as the so-called generalized theories of instantaneous reactive and non-active powers. The latter refers to the orthogonal reference frame–based approaches such as the p-q theory and $i_d$-$i_q$ method. The applicability of each theoretical approach in the control of a shunt active power filter was analyzed through a lot of simulations on a Matlab-Simulink platform purposely developed by authors. Both the operation of the active filtering system under sinusoidal and nonsinusoidal voltage conditions are taken into consideration. It is shown that all formulations based on the powers flow can lead to unity power factor after compensation when the supply voltage is not distorted. Finally, conclusions are drawn by analyzing the capability of each method to meet different compensation objectives in any conditions of the supply voltage and taking into consideration the complexity of the calculations required in implementation.