A New Control Strategy for Three-Phase Shunt Active Power Filters Based on FIR Prediction

In this project a new discrete-time control strategy for Three-Phase Three-Wire Shunt Active Power Filters (APF) is presented, based on a mathematical model in the stationary reference frame. It involves a feedback-linearization-type approach to control the filter currents, whereby the voltage control loop is decoupled from the current control. The voltage control loop is for controlling the dc-side voltage of the PWM converter, and employs a Proportional-Integral (PI) controller to generate the reference amplitude for the compensated grid currents. An important feature of the proposed control strategy is the compensation of the one-sampling-period delay caused by microcontroller computation using a Finite Impulse Response (FIR) predictor. This predictor is designed to accomplish one-step-ahead prediction of the control variable, which is the PWM converter's switching function space vector. Furthermore, the FIR predictor is optimized so that the low order harmonics in the control variable are predicted with minimal error. The proposed control strategy is analyzed to obtain the steady state filter current error and ranges for the PI controller gains for stability. Simulation results are presented to show the effectiveness of the proposed shunt APF.

Domain: Power Systems _ Hybrid Systems
Technology: Electrical