

A NOVEL APPROACH TO THE DESIGN OF A SHUNT ACTIVE FILTER FOR AN UNBALANCED THREE-PHASE FOUR-WIRE SYSTEM UNDER NONSINUSOIDAL CONDITIONS

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Abstract: A new approach is presented for the design of a shunt active filter in a three-phase, four-wire distribution system with unbalanced, distorted sources and unbalanced loads. The purpose of the shunt active filter is to provide compensation currents such that the source needs to supply balanced (positive-sequence) fundamental source current at unity power factor even though the load consumes harmonic currents as well as positive, negative, and zero-sequence currents. A major feature of the proposed approach is that it does not require symmetrical component transformation to transform the three-phase voltages and currents to $\alpha-\beta-o$ quantities. This makes practical implementation of the proposed method easier than the symmetrical component transformation approach. In addition, the power factor of the positive-sequence fundamental component is close to unity and only positive-sequence power is supplied by the source. The effectiveness of the proposed control algorithm is demonstrated by computer simulation and experimental results of a shunt active filter for a three-phase four-wire distribution system with distorted, unbalanced source voltages and unbalanced loads.