



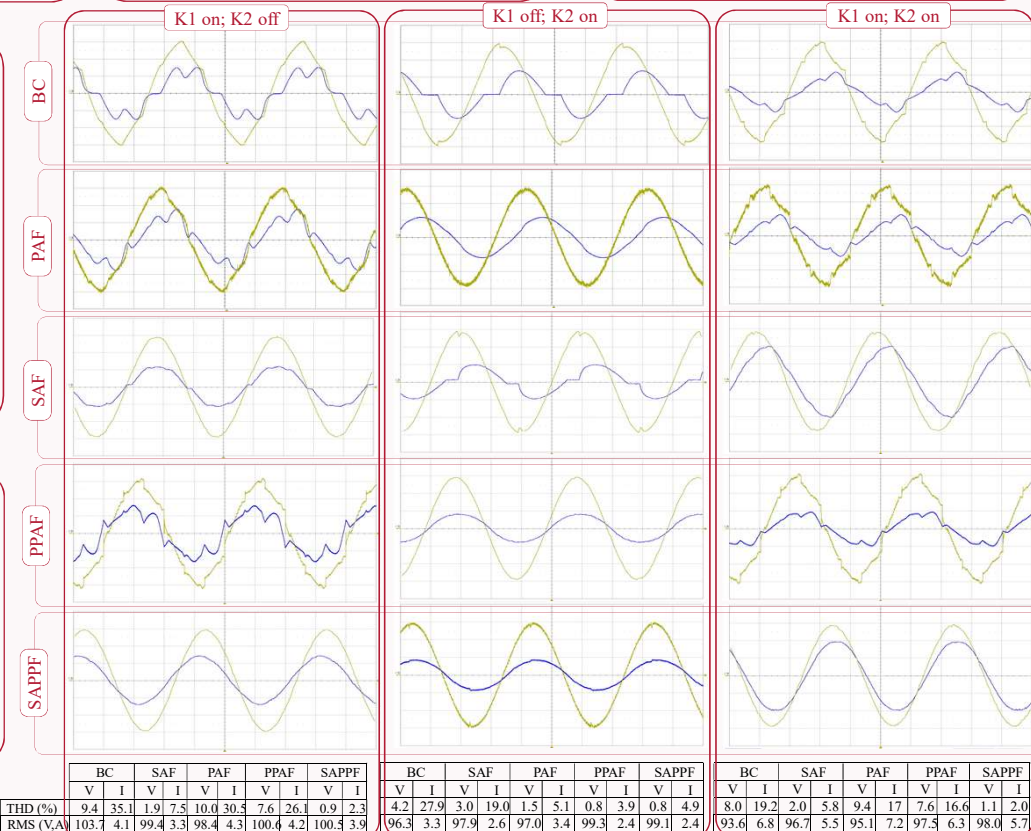
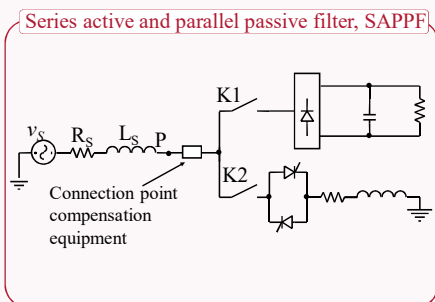
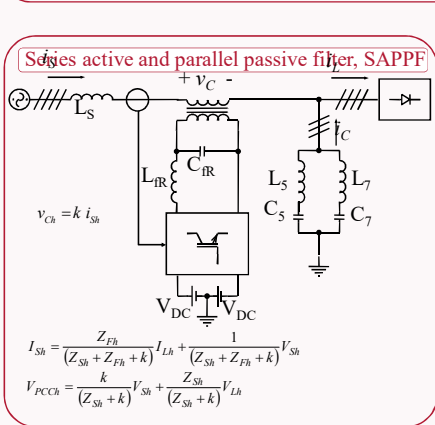
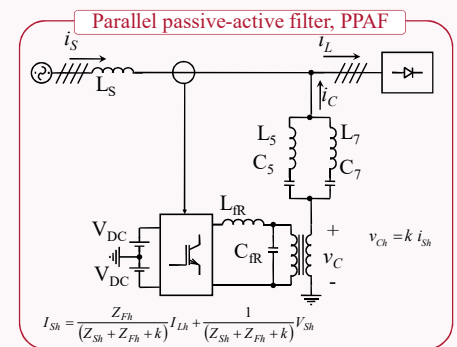
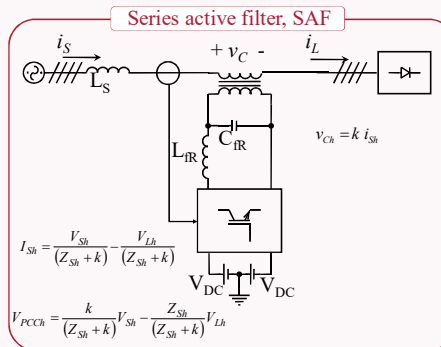
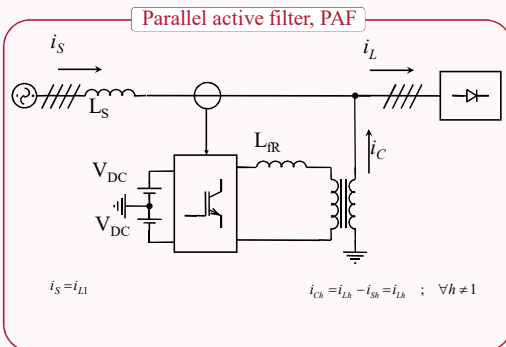
A Practical Comparative Evaluation of Different Active Harmonic Filter Topologies

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ABSTRACT. Along the last years, the practical use of active filters to mitigate harmonics has been extended in electric power systems. Different configurations of series active filters versus shunt active filters have been proposed, among them, hybrid topologies which combine active and passive filters. Nevertheless, there is not any clear accordance about the most suitable configuration for each type of harmonic sources. In this paper, four different topologies of active power filters to eliminate harmonics have been analyzed. An experimental prototype has been implemented to each configuration and have been submitted to different performance tests. With this objective, a test bank has been developed, which includes nonlinear loads kind harmonic current source, harmonic voltage source, and other whose behavior is between they both. The analysis of experimental results obtained allows the most suitable active filter power topology to be determined for each type of load.



CONCLUSIONS

Four different active filter topologies to eliminate harmonics have been analyzed. They are series active filter SAF, parallel active filter PAF, parallel passive-active filter PPAF and series active and parallel passive filter SAPPF.

A test bank has been designed composed of a harmonic voltage source (HVS) load and another harmonic current source (HCS) load, with the possibility of individual or joint connection. It allows the availability of non-linear loads with different harmonic production. Thus, an experimental analysis has been carried out about three different cases corresponding to the connection of a three-phase rectifier with smoothing DC capacitor, a three-phase regulator or a set constituted by both loads.

In each case, voltage and current waveforms were recorded and measures were made before and after harmonic compensation using each configuration. In all compensation equipments, the active filter control was designed to mitigate load harmonics.

The analysis of experimental results has allowed next conclusions to be obtained:

- VHS loads require active compensator which includes a series active power filter (SAF, SAPPF). In this case, the hybrid configuration presents better results than only series active filter.
- CHS loads require configurations which include elements parallel to load (PAF, PPAF, SAPPF). In this situation, hybrid configurations present better results than shunt active filter.
- Loads with an intermediate behavior where the percentage of HVS load is the greatest require configurations with series active filter (SAF, SAPPF)

Finally, the global analysis of results has revealed that SAPPF configuration is compensation equipment versatile which allows harmonics to be mitigated with any type of load. This configuration obtains better results than the rest of topologies in all situations.