

## Using Power Flow Analysis for Understanding UPQC's Behaviors

**Authors :** O. Abdelkhalek, A. Naimi, M. Rami, M. N. Tandjaoui, A. Kechich

**Abstract :** This paper deals with the active and reactive power flow analysis inside the unified power quality conditioner (UPQC) during several cases. The UPQC is a combination of shunt and series active power filter (APF). It is one of the best solutions towards the mitigation of voltage sags and swells problems on distribution network. This analysis can provide the helpful information to well understanding the interaction between the series filter, the shunt filter, the DC bus link and electrical network. The mathematical analysis is based on active and reactive power flow through the shunt and series active power filter. Wherein series APF can absorb or deliver the active power to mitigate a swell or sage voltage where in the both cases it absorbs a small reactive power quantity whereas the shunt active power absorbs or releases the active power for stabilizing the storage capacitor's voltage as well as the power factor correction. The voltage sag and voltage swell are usually interpreted through the DC bus voltage curves. These two phenomena are introduced in this paper with a new interpretation based on the active and reactive power flow analysis inside the UPQC. For simplifying this study, a linear load is supposed in this digital simulation. The simulation results are carried out to confirm the analysis done.

**Keywords :** UPQC, Power flow analysis, shunt filter, series filter.

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