CPC Theory Implementation for Active Filtering and its Limits

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Abstract— This paper analyzes the feasibility of decomposing the current in three-phase, three-wire systems using the Czarnecki's CPC theory. Several case studies were created to be analyzed by simulation in Matlab/Simulink environment, under non-sinusoidal voltage conditions, taking into consideration linear and non-linear loads. The considered case studies will emphasize that the active current component defined by Czarnecki is valid in all the imposed situations. After interpreting the results obtained by simulation, the Simulink models, designed for the reference current calculation method, were compiled for the DS1103 control board. It will be noticed that the large number of calculations necessary to implement the active and reactive current expressions, for a large number of harmonics, implies a high computation time. This circumstance leads to a high sampling time, for the DS1103 processor, leading to a program impossible to be executed in real time. Therefore, to avoid this inconvenient, only the active current was computed and only for the 1^{st}, 5^{th} and 7^{th} harmonics. For the same case studies analyzed by simulation, but this time using an experimental system, it was investigated the filtration efficiency considering the number of harmonics mentioned above. As it will be seen, the Czarnecki's CPC theory implementation needs a very powerful DSP.