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## Design and Development of Single Phase Improved Solar Energy Harvested Hybrid Active Power Filter to Maintain Power Quality in Commercial Sector

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**Abstract:** With the enhanced usage of power electronic devices, large volume of harmonic pollution has been witnessed in the electric power system. The heavy loading due to the continuous demand in the power system has led to voltage instability. This paper demonstrates the design of the hybrid active power filter along with its control scheme for linear as well as the non-linear load. The concept of Hybrid Active Power Filter helps to minimize the harmonic distortions, since it is a combination of active and passive filters. The power electronic converters are widely used to mitigate the current harmonics, reactive power compensation and to regulate the load voltage. This converter requires a DC link voltage source which is provided with the help of solar energy source. The solar energy source with the PV cell technology thus acts as a voltage source to inject the active and reactive power generated by it to the line through the voltage source inverter. Suitable control is provided to control the voltage of the converter using Fuzzy controller and the inverter signal is controlled by P-I controller, thus enabling the compensation of active and reactive power. The model is simulated using the MATLAB/SIMULINK software and thus the Total Harmonic Distortion and Power factor values before and after compensation are obtained. The values so obtained are compared with the practical model designed in the laboratory.