

COMPENSATION OF UTILITY CURRENT & POWER THROUGH PV-APF FOR NON-LINEAR LOADS

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ABSTRACT

For the countries like India, photovoltaic will be the most contributing electricity source in coming future. The issues related to the better quality of the power are under considerations for improvements. The researchers and technocrats are working on various aspects to be improved for assured better power quality to be achieved. The role of active filters is very important when the PV system is connected to the non linear loads. Authors have presented the system with consideration of the filter requirement for improving the performance of the PV system in this paper. MATLAB and hardware implementation of the system is presented in this paper with power tracking. Filter and other parts of the PV system. The compensation of the harmonics was the main ideology behind development of this project.

KEYWORDS: Maximum power point, boost converter, APF, PV system, etc.

INTRODUCTION

The solar energy is being very popular in India during recent years. The government policy to support the renewable energy has played a vital role in making the solar energy popular in India. Being the easily available source of the energy, solar systems are installed widely in India. Even the corporate and commercial buildings are now a day's coming up with installation of the solar roof top systems for the production of electricity.

The clean energy is attracting the industries to earn better and to have the sustainable energy generation. The solar systems in India are now modernized as far as the performance is concerned. The cost of the setup has also been reduced in recent years and hence the system is becoming popular continuously.

The flexibility and the quality power is the requirement of any electrical system. The power drawn from PV system when connected to the grid faces the issues with the harmonics distortion. Consistent performance without disturbance of the electrical supply makes any power system a reliable and trustworthy.

The boost converter connected to the PV with MTTP and controller to optimize the performance of the system. The filters will reduce the harmonic distortion. It also improves the power factor and the balances the current. The developed system is useful as it has improved the performance and provided the better control.

SIMULATION AND HARDWARE DEVELOPMENT

Following diagram shows the developed MATLAB model for the main system developed for improvement of the quality of the power supply. The developed system consists of the controller, power tracking, filters and the basic elements of the PV. The converters with control are also the part of the system.

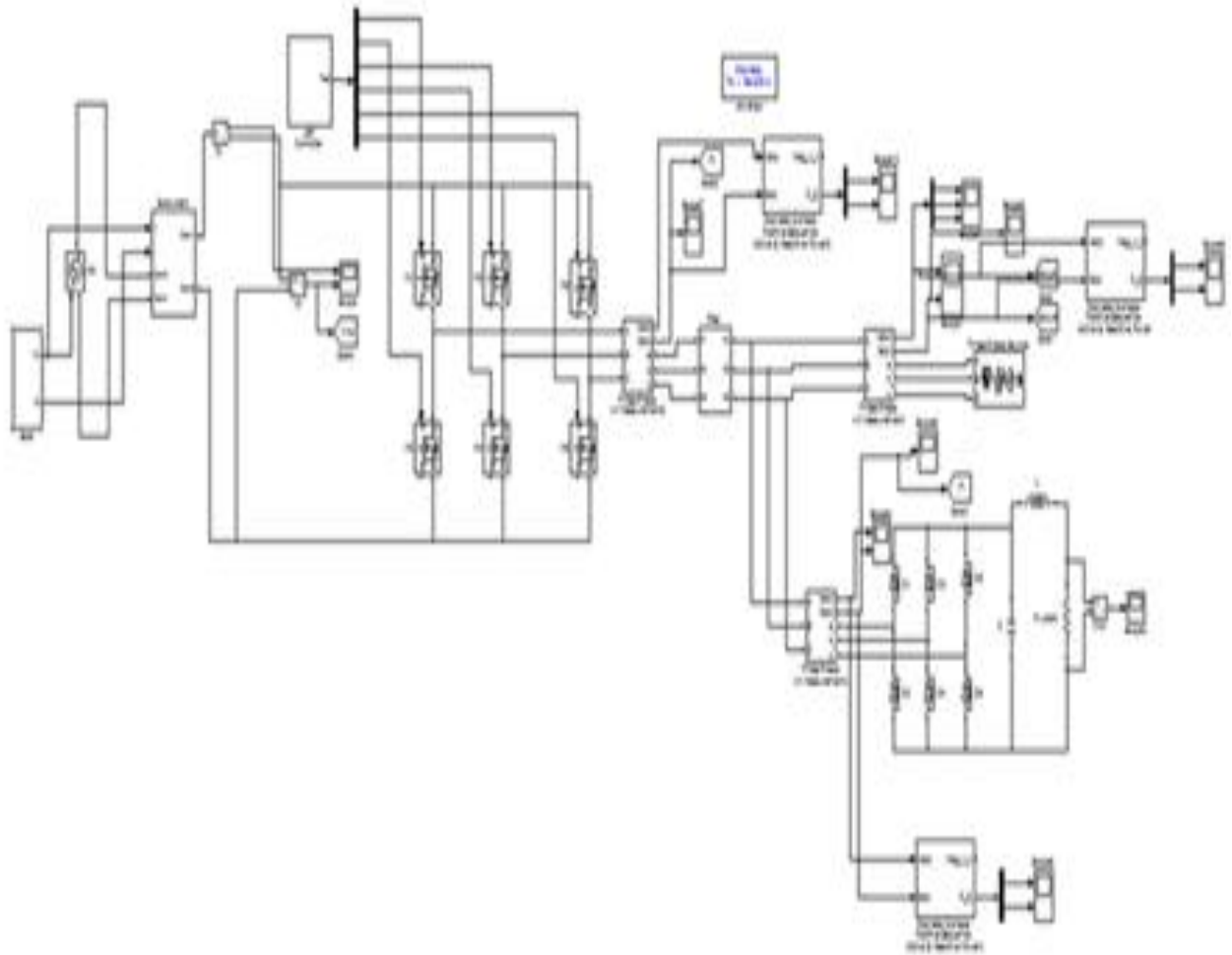


Fig: 1 Main Simulation

The model for the PV system developed in MATLAB as shown below. The grid connected systems consisting of voltage, current, and power control with the converters to control. The power electronics circuits are very important from the point of view of the controlling the power.

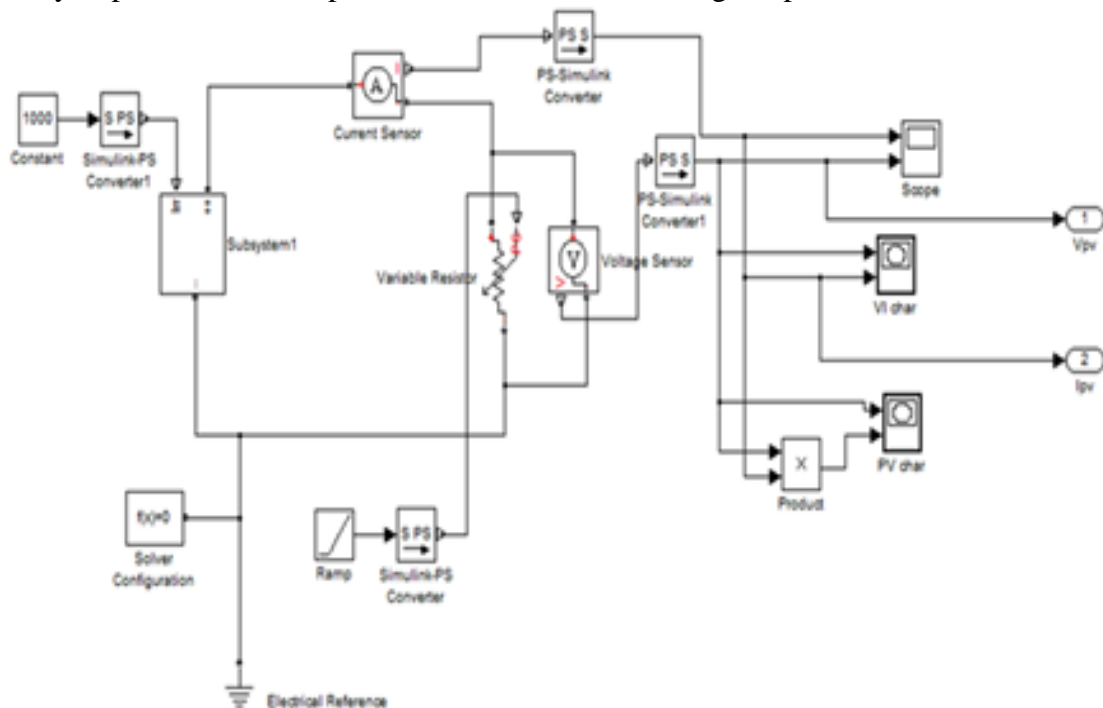


Fig 2: PV unit system

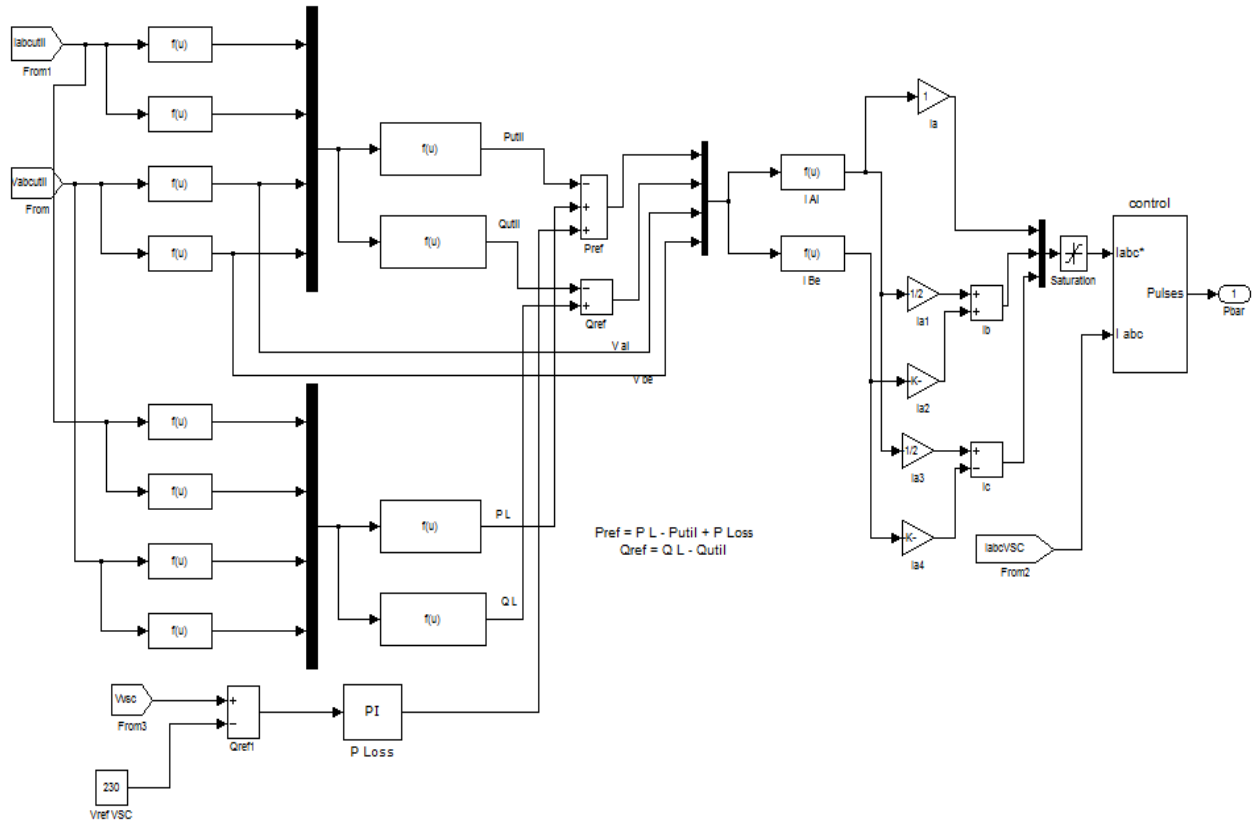


Fig 3: PV-APFcontroller

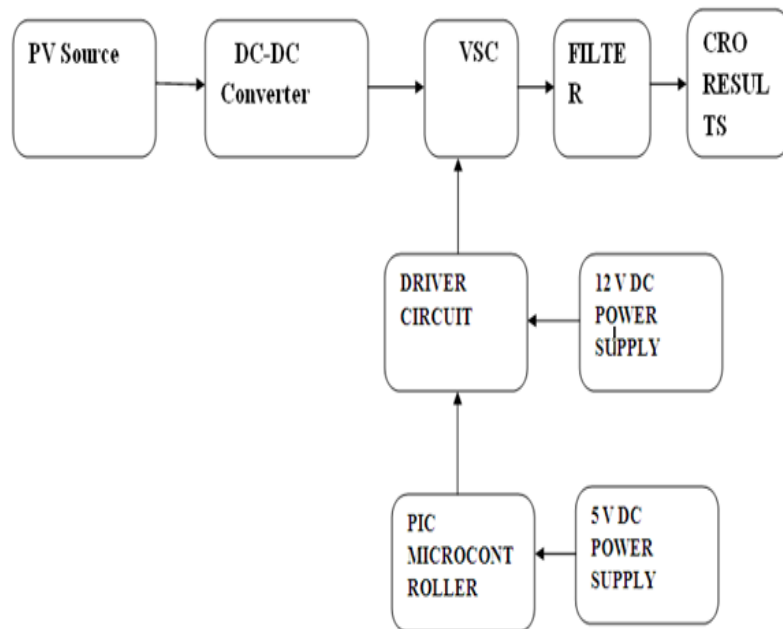


Fig 4:Block Diagram for hardware development

The PV source is connected to the converter in order to provide the controlled supply. The VSC provides the better control of voltage in comparison with the microcontroller preset values and control. The filter optimises the harmonics performance of the system and the results are displayed and observed with the help of CRO.

SIMULATION RESULTS

The results of the simulated circuit to verify the expected results have been shown below.

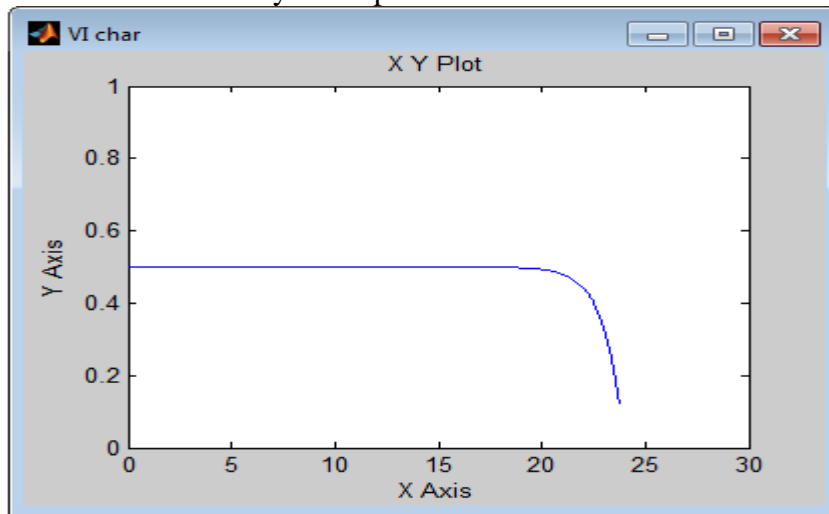


Fig 5: VI characteristics

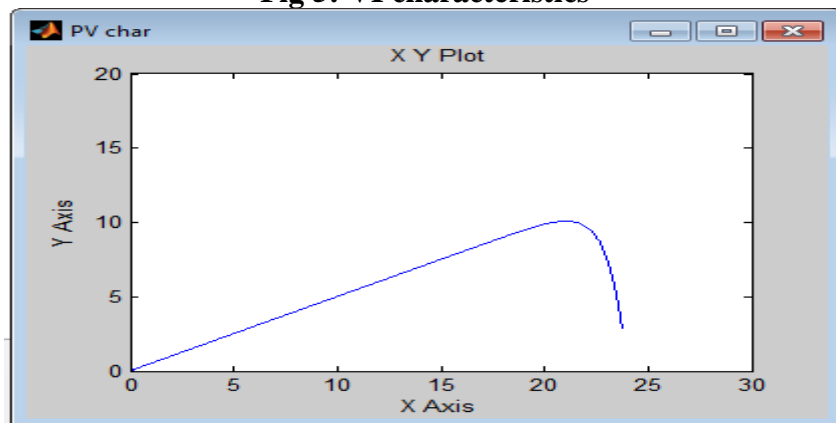


Fig 6:PV characteristics

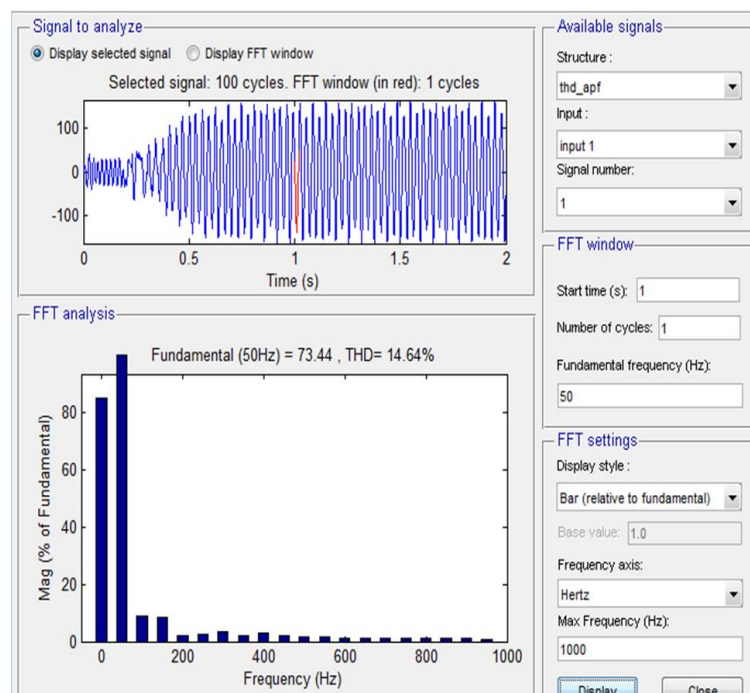


Fig 7: THD for APF

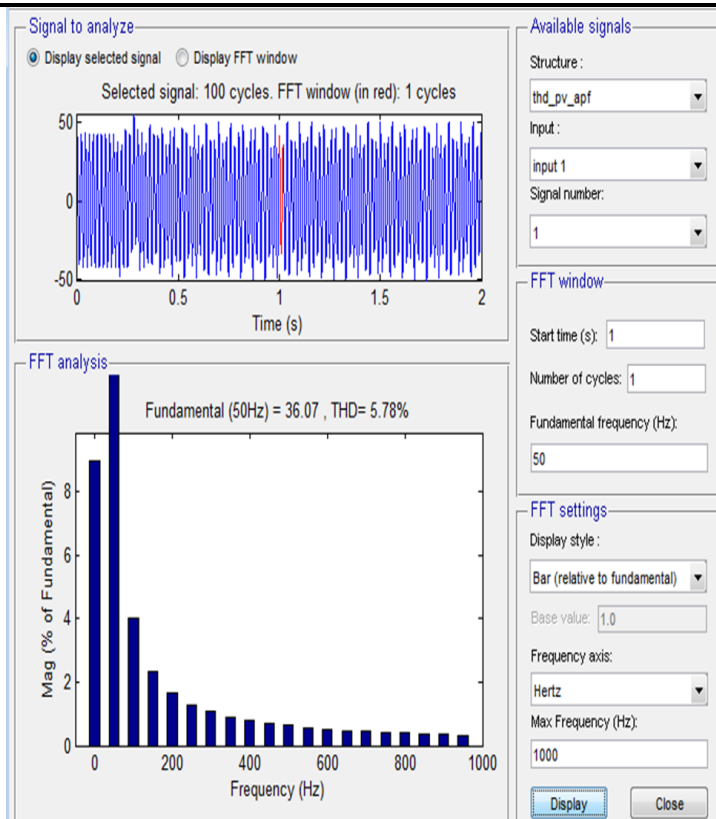


Fig 8: THD for PV-APF

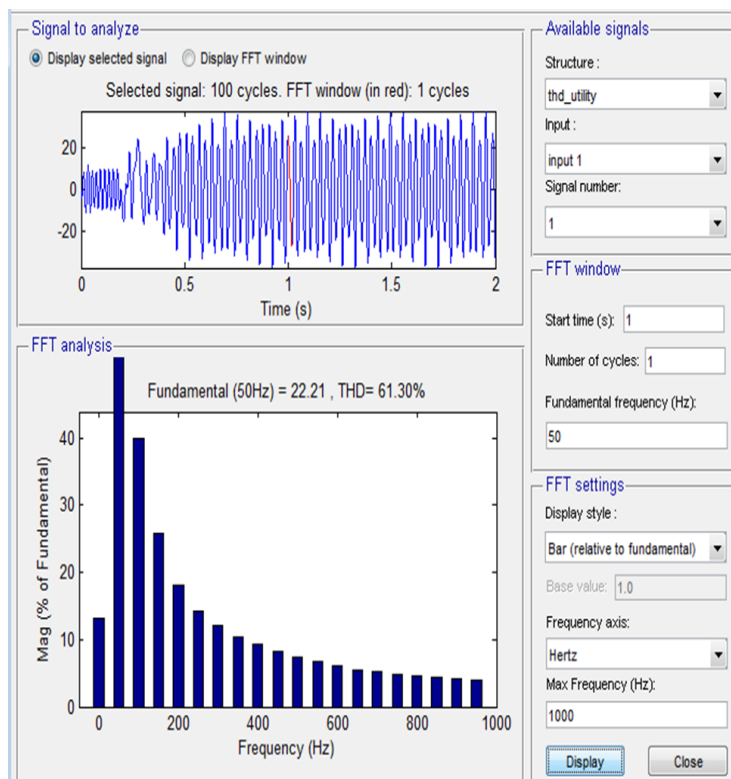


Fig 9: THD for utility

The table below shows the percent THD for various configurations and it can be easily observed that the harmonic distortion has been reduced with the implemented module of PV-APF-controller.

Table1: Comparison of THD with various controllers

Sources	THD %
Utility	61.30%
APF controller	14.64%
PV-APF controller	5.78%

The harmonics reduction being the primary target of the model development for the non-linear load has been achieved through the hardware and software results. The MATLAB/SIMULINK model shows that the PV-APF works completely to fulfill the objectives.

CONCLUSION

The non-linear loads are always connected to every electrical system. The problems with such load are the harmonic distortion and hence to improve the harmonics performance of the PV system, authors have implemented the module with filter and controller. The developed module is found suitable for performance improvement of the solar systems. The grid connection of the small systems is going to be only choice in coming future for improving the flexibility of the power. Authors have identified that implementation of the similar module for the hybrid systems may be the scope for future studies and developments.

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