MAKEUP OF SINGLE STAGE GRID CONNECTED BUCK BOOST PHOTOVOLTAIC INVERTER FOR LIVING PURPOSE

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Abstract: *In this paper verified three change single deal with build cross segment releated buck booster photovoltaic inverter topology for private application. the proposed buck boost photovoltaic inverter for residental application, better use of photovioltaic, decresed size,less asking for control and higher sensibility. fuzzy control is a baaed on fuzzy logic is a logical system that is much closer in sprit a human thinking and natural language then traditional logic system during the past several year, fuzzy control has imerged as one of the most active and frutfull area for research in the appication of fuzzy set theory especially in the realmof industrial process. the effectivness of the proposed method is verified by developed simulation model in MATLAB- Simulink program. The simulation result show that the proposed the buck boost inverter produced significant improvement control performance with compare other inverter. produced significant improvement control performance with compare other inverter.*

KeyWords:* *SPWM, PV, GTI, DCM, MATLAB-Simulink

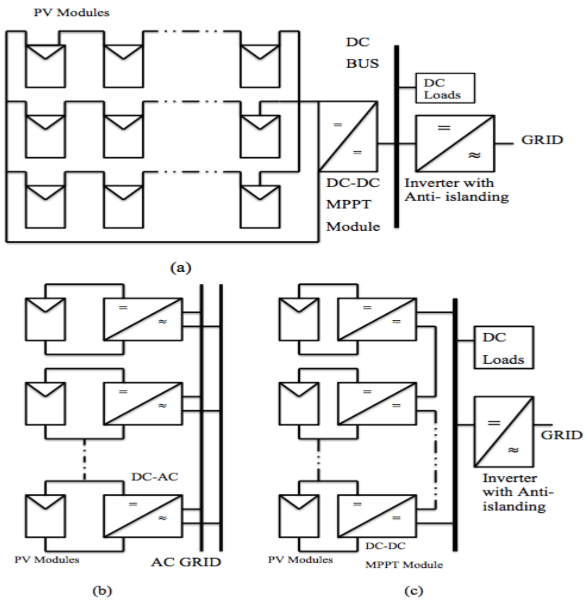

Fig 1. Grid connected PV system configurations (a) Centralized module (b) AC- Modules (c) Modular system

1. INTRODUCTION

Fuzzy control is a baaed on fuzzy logic is a logical system that is much closer in sprit a human thinking and natural language then traditional logic system during the past several year, fuzzy control has imerged as one of the most active and frutfull area for research in the appication of fuzzy set theory especially in the realmof industrial process. Photovoltaic power genration is gaining wide acceptance today as a source clean and pollution free Power. Most significantly it is showing exponential growth in grid connectrd application the power thud power electronics device is employed to interface the solar system to the grid. Due to economic causes the solar energy is not directly interfaced with the utility grid

In this type of alternatives architectures for grid connected PV system configurations are available, such as centralized module, AC module and modular configuration where the last topology perfectly fits with an intelligent PV module concept A few possible configurations of grid connected PV systems are divided in three architecture categories fig. 1(a) is defined centralized module , fig 1(b) is defined AC modules and fig1(C) shows the modular system.

Fig1(a) centralized module is define and that interfaced huge number of PV modules. But, there are some severe limitations in the design of centralized inverters, such as power loss for using a central MPPT, PV modules with mismatch losses due to the high voltage dc connecting the PV modules with the inverter, string diode loss etc.

Fig. 1(b) Ac module is defined and explain shows the AC module configuration, which is a simplified version of the centralized inverter topology. Here a single string of PV module is connected with an inverter. Each string can be applied with a separate MPPT, as there is no loss attributed to string diodes. In comparison to the centralized inverter the overall efficiency is increased.

Fig. 1(c) modular system is defined and explain shows the modular configuration. A common inverter is joined with multiple strings connected to individual DC-DC converter. The benefit of this modular configuration over centralized system is that each string can be controlled individually

The Renewable energy has become an impoitant source of energy, photovoltaic system (PV) is a an example of renewable energy. PV module convert sunlight into electrical power, so they impoitant source of energy. PV module can't be connected to the grid directly but this could be done by using power conditioning system, output voltage of PV module is not very high, so we maybe in need to connect more than module in series to get the required dc voltage. The past time photovoltaic based inverter are problem can be occur in the corban di-oxide and methane gas leaks and inter in the atmosphere and effected by the dangerous biological degradation it is affected by the all living organism they inverter not use by suitable purpose of the time based, controlling phenomena, realibility,etc In the present time renewable energy source play a crucial role now a day in electric power generation due to its environment friendly and pollution free clean energy. Photovoltaic (pv) energy is a one of the potential source of renewable energy, which get more preference due to its availability, simplicity, lower maintaince and reliability option. thus power electronics components such as an inverter.

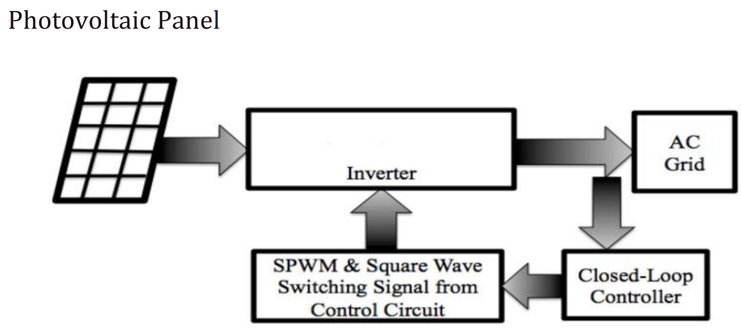

Fig. 2 Block diagram of proposed single-stage buck-boost PV inverter

Thus power electronics components such as an inverter offer the required means to convert the constant voltage output of the photovoltaic panels into a useable sinusoidal ac power in grid-connected system In addition, a closed-loop SPWM control scheme is implemented in the system to regulate the instantaneous ac output current of the inverter. Fig.1 shows the block diagram of the proposed PV power system.

2. DESIGN OF PROPOSED BUCK-BOOST GTI

2.1 Power Circuit Design

Schematic diagram of three-switch buck-boost inverter power circuit. The proposed single-stage grid-connected buck-boost inverter power circuit configuration consists of three MOSFET switches Q1, Q2, and Q3, three diodes, D1, D2, and D3, two coupled inductors L1, L2 and a capacitor C. The two coupled inductors have equal inductance L and same turns,which is used to transfer energy from the input PV array dc side to the utility grid figure shows. Since only one MOSFET switch is turned ON in each state and inductor is always connected with charging and discharging circuit. The inverter operation can be divided into: charge and discharge operation working in the (1) Negative half cycle and (2) Positive half cycle as discussed in the later section.

2.2 Negative Half Cycle

Switch Q2 is always turned off in the negative half cycle state of the inverter. The equivalent circuit of the inverter on negative half cycle is illustrated in Fig. 4. When the inverter works in negative half cycle, its function can be further divide into: (3) charging state and (4) discharging state. During charging state in the negative half cycle, the switches Q2 and Q3 are turned off, and the switch Q1 is turned ON to charge the inductor L1 through the diode D1. At that state capacitor provides continuous current to load. During discharging state, the switch Q1 and Q2 are turned off, and the switch Q3 is turned on. The stored energy in L1 will be transferred to the coupled inductor L2 which discharge to the load through switch Q3 and diode D3

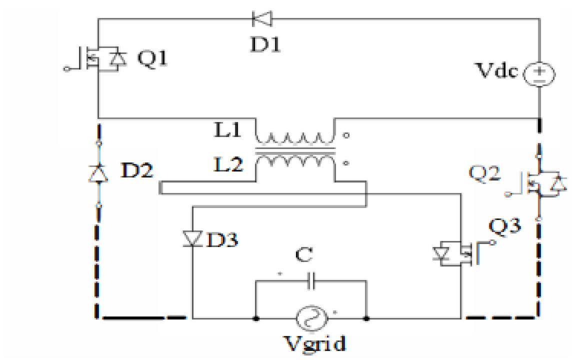

Fig. 3 Equivalent circuit of negative half cycle

2.3 Positive Half Cycle

Switch Q3 is always turned off in the positive half cycle state of the inverter. The equivalent circuit of the inverter on positive cycle is illustrated in Fig. 3. The inverter operation in the positive half cycle can be divided into: (1) charging state (2) discharging state. During charging state in positive half cycle, the switches Q2 and Q3 are turned off, and the switch Q1 is turned on to charge the inductor L1 through the diode D1. At that time the capacitor provides continuous current to the load. During discharging state, the switches Q1 and Q3 are turned off, and energy that was stored in inductor, L1 releases through the switch Q2, to the grid utility.

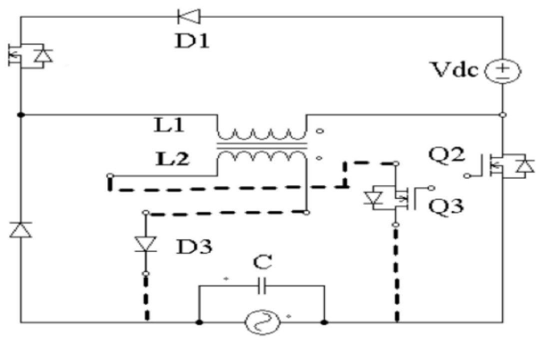

Fig. 4 Equivalent circuit of positive half cycle

3. CONTROL CIRCUIT DESIGN

In conventional inverter design, only one type switching method is used. But, in this proposed design instead of using one type of switching signal to switch the inverter, a combination of square wave and SPWM is employed. Block diagram of the proposed switching control circuit is shown in Fig.5

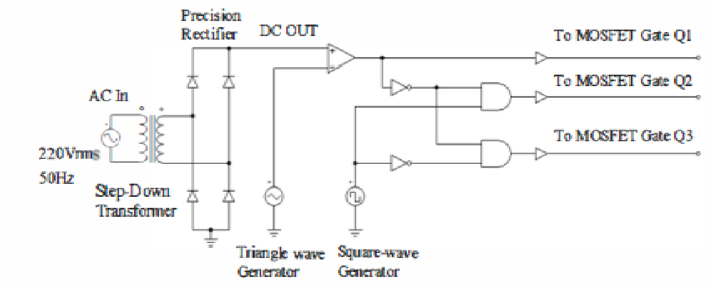

Fig. 5 Control circuit design of grid-connected inverter

After sampling, the sine wave is rectified with a precision rectifier. In addition, a high frequency triangle wave of 10KHz frequency is used. Then the two signals are passed through a comparator to generate the unipolar SPWM signal. This unipolar signal only has positive values, which changes from +5V to OV and again back to +5V. A square wave signal is used as the line frequency (50Hz for india) and is in phase with the SPWM signal. The three sets of switching signals can be categorized in three groups. The first group contains MOSFETs Q1, while the second group contains MOSFETs Q2 and the third group contains MOSFETs Q3. The resulting switching gate pulses of the inverter power circuits from control circuit are illustrated in Fig. 6, Fig. 7 and Fig. 8 respectively

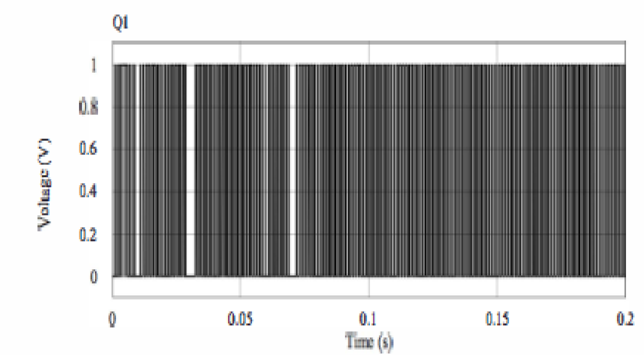

Fig.6 Switching entryway beat for MOSFET Ql

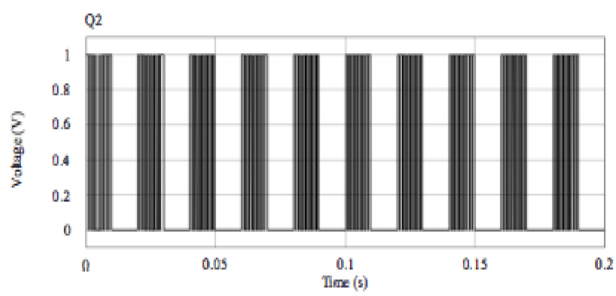

Fig.7 Switching entryway beat for MOSFET Q2

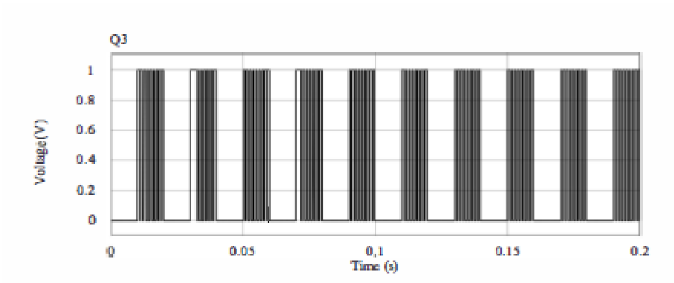

Fig.8 Switching entryway beat for MOSFET Q3

Implement in this paper fuzzy logic controller use increasing the efficiency and output power ,Where the grid signal and square wave shows the zero point at falling and rising edge. After both voltages are tied, the inverter begins to inject power into the grid. To avoid the grid to having power from the inverter when the grid is down and create undesirable accident, the free wheeling diode is employed between the grid and the inverter MOSFET power circuit that will block the reverse power flow from grid. This isolation process is to avoid the grid to become live part on the time when it should not be.

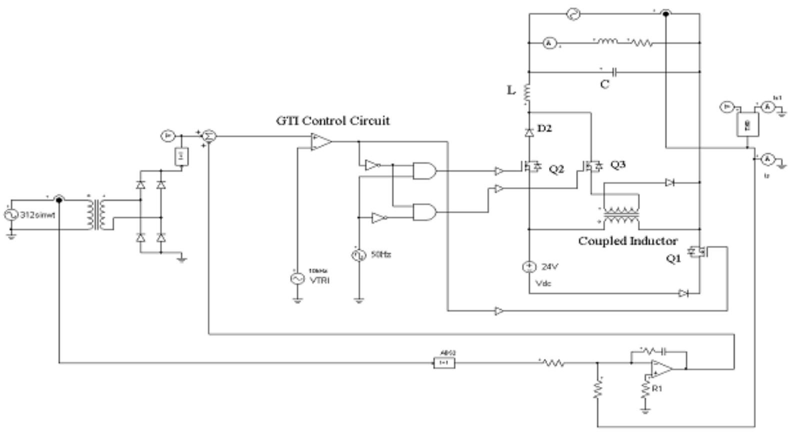

Fig.9 Circuit Diagram of new approached system

4. THE COMPARISION OF FUZZY LOGIC CONTROLLER AND NON FUZZY LOGIC CON.

S.N.	Fuzzy logic controller	Non fuzzy logic controller
1	fuzzy logic is logical system which is much closer to human thinking and natural language then traditional logical system	when applied non fuzzy control system which are nonlinear as controller tuning is difficult to insufficient knowledge of parameter of the system
2	fuzzy logic provide a means of converting control strategy based on expert knowledge into a automatic control strategy	non fuzzy logic controller is not provide a means of converting control strategy based on expert knowledge
3	fuzzy control has emerged one of the most active and fruitfull area of research especially in industrial process	conclude that proportional integral derivative (PID) controller are widely used in process control application
4	fuzzy logic controller has achieved better performance	the non fuzzzy logic controller is not provide to better performance and setting time
5	fuzzy logic control is able to handle imprecision and uncertainly	non fuzzy logic controller is not able to handle uncertainty

5.FUZZY LOGIC CONTROLLER ARE BEST WHY?

Fuzzy control is based on fuzzy logic, a logical system which is much closer to human thinking and natural language than traditional logical systems . Fuzzy logic controller (FLC) based on fuzzy logic provides a means of converting a linguistic control strategy based on expert knowledge into an automatic control strategy. Fuzzification, defuzzification strategies and fuzzy control rules are used in fuzzy reasoning mechanism. Fuzzy logic enables control engineers to efficiently develop control strategies in application areas marked by low order dynamics with weak non linearities. Fuzzy logic control has been successfully used in various application areas ranging from automatic train operation to flight systems. Neuro fuzzy controller gave a better performance compared to the PID controller. It gives better performance with reduced oscillations and faster settling time The controller performance can still be improved by training the neural network with more number of input and output combinations

fuzzy logic controller is a good alternative to a PID controller, for flow measurement and control applications. From all the above discussions we can conclude that Fuzzy Logic controller has better stability, small overshoot, and fast response. Overall, fuzzy logic controller is a good alternative to a PID controller, for flow measurement and control applications. From all the above discussions we can conclude that Fuzzy Logic controller has better stability, small overshoot, and fast response. the fuzzy logic controller has achieved better performance . Fuzzy logic control is able to handle imprecision and uncertainty.

6. FUZZY LOGIC CONTROLLER PROBLEM

Fuzzy logic achieves better control and improves the performance of the system. A.S. Kamal set out to apply the fuzzy logic to control the refrigerant flow of a refrigeration system. Fuzzy logic is relatively easy to design and implement. Its performance has been compared with that of a well-known commercial controller. Fuzzy logic is a viable alternative to conventional forms Fuzzy logic control is able to handle imprecision and uncertainty.

Elangeshwaran illustrates the advantages of a fuzzy based controller over a PID controller are derived from the experiment results. Better control performance, robustness and overall stability can be expected from the fuzzy controller.

M.M concluded that Fuzzy control combined with conventional PID controller constitutes an intelligent control, which adjusts the control parameters depending upon the error. A two input and three output fuzzy adaptive PID control was presented by them. The controller was simulated in MATLAB environment. The simulation results show that the fuzzy adaptive PID controller have better stability, small overshoot, fast response.

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7. RESULT AND DISCUSION

Fuzzy Logic Controller is an attractive choice when precise mathematical formulations are not possible. Other advantages are:

- It can work with less precise inputs and more robust in nature.
- It doesn‟t need fast processors.

Fuzzy logic rules are simple and do not require precise control algorithm. Fuzzy logic systems are suitable for approximate reasoning. Fuzzy control has emerged one of the most active and fruitful areas of research especially in industrial processes which do not rely upon the conventional methods because of lack of quantitative data regarding the input and output relations. Fuzzy control is based on fuzzy logic, a logical system which is much closer to human thinking and natural language than traditional logical systems.

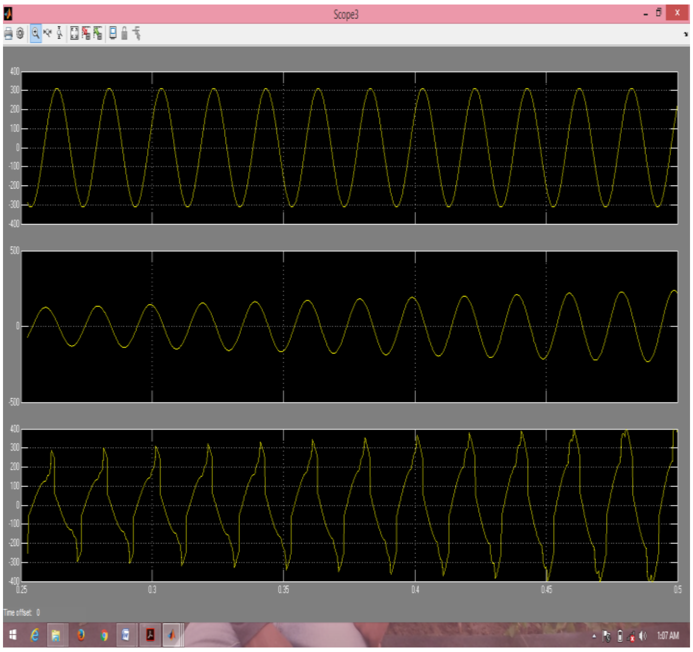

Fig.10 Output voltages and current are in fuzzy logic o/p

8. SIMULATION RESULT

Fuzzy Logic controllers respectively. Fuzzy logic controller is used in this process because of following reasons:

- It can work with less precise inputs.
- It doesn‟t need fast processors.
- It is more robust than other non-linear controllers.
- Fuzzy controllers have better stability, small overshoot, and fast response.

After comparing the graphs of conventional closed loop controller and fuzzy logic controller it is clear that fuzzy logic has small overshoot and is having the fast response as compared to conventional closed loop Controller. Then, various time domain specifications of both the controllers are compared such as:

- Rise Time(Tr) and Delay Time (Td),
- Settling Time (Ts
- Peak Overshoot (Mp)
- Steady State Error (Ess)
- Transient Behaviour

9. CONCLUSION

Overall the projects feasibility lies in the simplicity of its implementation. The advantages of a fuzzy based controller over a closed loop controller are derived from results. Better control performance, robustness and overall stability can be expected from the fuzzy controller. Fuzzy controllers have better stability, small overshoot, and fast response. From the results the following parameters can be observed. Hence, fuzzy logic controller is introduced for controlling fluid flows. Further, adoption of a simple control scheme and grid synchronization strategy that would make the inverter more reliable. Since it uses only three switches, the cost and size of this inverter would also be relatively low as minimum number of power devices is used to execute this configuration as compared to movable types of photovoltaic panel the increasing of efficiency and output power The physical fabrication and test of the proposed grid connected inverter is yet to be done and will be implemented in future

10. REFRENCES

[1] A. S. K. Chowdhury and M. A. Razzak, "Single phase grid-connected photovoltaic inverter for residential application with maximum power point tracking," in Proc. IEEE ICIEV, 17-18 May 2013.

[2] T. K. K wang, S. Masri, " Single phase grid tie inverter for photovoltaic application," in Proc. IEEE Sustainable Utilization and Development in Engineering and Technology C onj, pp. 23-28. Nov 2010.

[3] P. G. Barbosa, HAC. Braga, M. e.B Rodrigues and E. e. Teixeira, "Boost current multilevel inverter and its application on single-phase grid-connected photovoltaic system," IEEE Trans. Power Electron., vol.21, no. 4, pp. 1116-1124, July. 2006.

[4] R.Gonzalez, E.Gubia, 1. Lopez and L. Marroyo, 'Transformerless single phase multilevel-based photovoltaic inverter," IEEE Trans. Ind. Electron., vol. 55, no. 7, pp. 2694-2702, .luI. 2008.

[5] S. Jian, V. Agarwal, " A single-stage grid connected inverter topology for solar PV system with maximum power point tracking," IEEE Trans.Power ElectroniCS., Vol. 22, No. 5, pp. 1928-1940, Sept 2007.

[6] W. Chien-Ming, "A novel single-stage series-resonant buck-boost inverter," IEEE Trans. Ind. Electron., vol. 52, no. 4, pp. 1099-1108, Aug. 2005.

[7] Y.Xue and L. Chang, " Closed-loop SPWM control for grid-connected buck-boost inveters," in Proc. IEEE PESC, vol. 5, pp. 3366-3371, 2004.

[8] L. Chang, Y. Xue, G. Gou, " Design of a 400W single-phase buck-boost inverter for PV applications, " SESCI, pp. I -6, June 2007.