RESEARCH ARTICLE OPEN ACCESS

AN ENHANCED SYSTEM TO GET THE BETTER OF PV PARTIAL SHADING

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Abstract:

Partial shading of individual Photovoltaic sources connected in series reduces the current and requires incorporation of bypass diodes. The power delivered to the load is also reduced significantly. Introduction of a multilevel inverter in PV power system enables to amplify and generate a clear output waveform with reduced total harmonic distortion.

The problem of partial shading of individual photovoltaic sources that are connected in series is overcome by the application of multilevel H-bridge inverter. A microcontroller is programmed to as to deliver switching pulse to the multilevel circuit with associating PWM code in it. The algorithm consists of three stages: direct pulse width modulation, the program is developed so as to control the switching stages of the multilevel H-bridge inverter.

The program is applied to a nine level inverter for each switching units under pre defined switching levels. A digital oscillator is used for real-time data exchange, to display the extracted power and to show the controlled switching levels as output. The output voltage waveforms under various partial shading levels were analyzed.

Keywords — Photo Voltaic Source, Nine Level Multilevel Inverter, Partial Shading, Microcontroller.

I.INTRODUCTION

The necessity of increasing power quality in the past years leads to the development of inverter due to its efficiency and control methods. An Inverter is a device which converts direct current (DC) into an alternating current (AC) without changing the magnitude. The converted current may contain the required voltage and frequency by using the transformer, switching devices and control circuits.

The general purpose of the multilevel inverter is to synthesize a nearly sinusoidal voltage from several levels of DC voltage, typically obtained from capacitor voltage sources. As the number of level increases, synthesized output waveform has more steps, which produce a staircase wave that approaches a desired waveform. Also as more steps added to the waveform the harmonic distortion of the output waveform decreases, approaching zero as the level increases. As the level increases the voltage that can be summing multiple voltage levels also increases.

Several multilevel inverter topologies are proposed over the past few years, the most popular multilevel inverter which are mostly used are Diode clamped, Flying capacitor and H-bridge multilevel inverter. An advantage of these cascading inverters is that isolated sources are not required for each phase. It should be noted that the cascaded inverter system can be considered in a different view points. Among all variants of multilevel inverters, the cascaded H-bridge inverters most commonly used due to its modular circuit structure.

II. RESEARCH PROBLEM

This paper is concentrated to operate the PV source connected in series under partial condition to deliver maximum power to the load. The existing method has a disadvantage of not reflecting the proper behavior of the PV source and not delivering desired power as output and Harmonic contamination has become a major concern for power system specialists due to its effects on sensitive loads and on the power distribution system. Therefore the compensation for harmonic and reactive current is important owing to the wide use of power electronic equipments. The proposed system of using multilevel inverter with 9

level with using PWM technique helps to reduce the above problems.

III. OBJECTIVES

To design a low cost solar inverter for areas without grid access or for backup power which haves the following advantages

- Affordable
- High efficiency
- Battery charger stage for night time use
- Reduced THD levels

IV. EXISTING SYSTEM

In existing system there is an H-bridge inverter is used to convert the dc source to ac source. There is no possibility to reduce the harmonics level. In old methods normal PWM is only used.

Block diagram

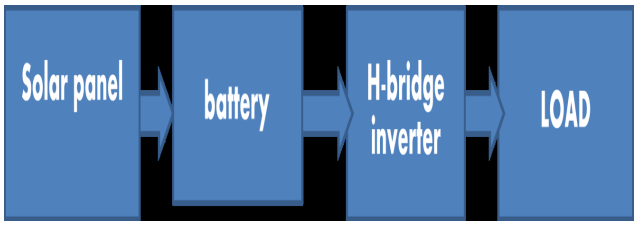


Figure.1. block diagram of existing system

Disadvantage

• Filter size is more

- High Electro Magnetic Interference
- High THD
- Conversion losses was high
- Cost is high

V. PROPOSED SYSTEM

This is in contrast to the systems based on series-connected dc/dc converters or a multistage buck–boost. The presented system has been implemented with the nine-level inverter using processing unit of ATMEGA8 controller. The output voltage waveforms under various partial shading levels were analyzed by fast Fourier transform and the results show low THD system.

Block diagram

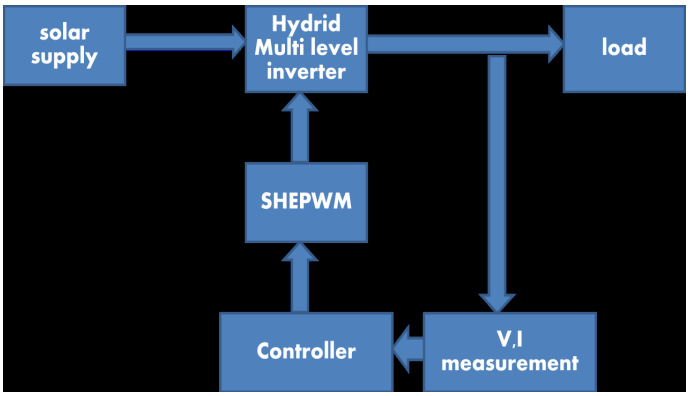


Figure.2. block diagram of proposed system

Advantages

• Improved output wave form
• Reactive power compensation
• Smaller filter size
• Low EMI
• Low THD
• Reduce conversion losses
• Less cost
• Reduce size (transformer less)

VI. CIRUIT DIAGRAM

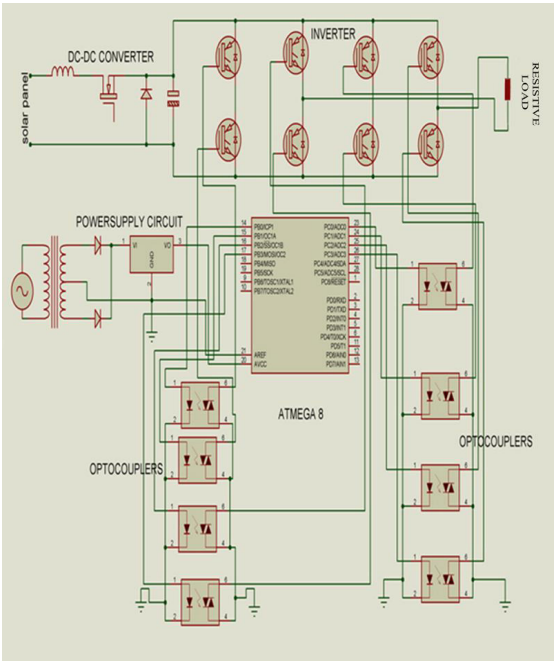


Figure.3. Circuit diagram

OPERATION

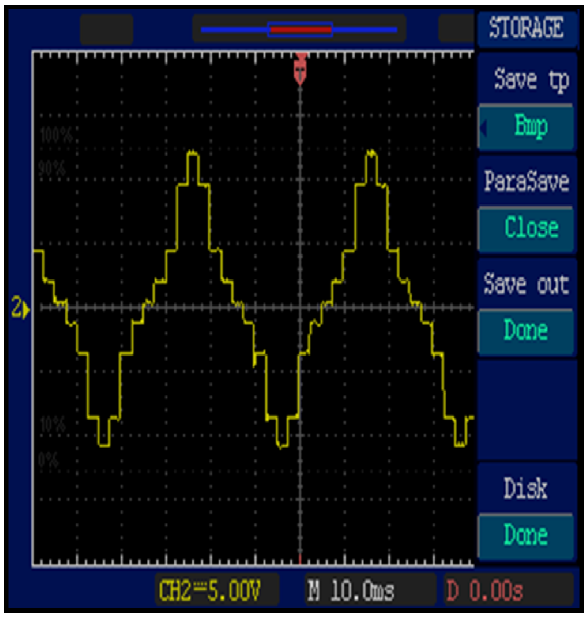
Battery's are charged continuously by taking power from the PV panel at a constant ratio. It uses a 12 v solar panel to charge the battery's consecutively. The microcontroller is driven using a 5v dc supply taken from the battery by using a 5v voltage regulator (7805). As per the pre programmed data in the microcontroller, it generates pulse signal as output through the particular output port. These output pulse are used to trigger the MOSFET IRF840 in the multilevel inverter circuit, for this it uses an additional driver circuit which have a series of 8 optocoupler in them to drive the MOSFET consecutively one after the other to create appropriate switching stages.

This driver circuit helps to drive gate pulse signals to the 8 MOSFET placed in the multilevel inverter circuit. As per the gate pulse triggered, the switching operation is done by the MOSFET in the circuit and thus produces needed switching levels(9 levels) in the output wave form as shown in the graph below.(figure no:6.4).The output produce from the inverter circuit is amplified using a step up transformer and brings the required output power. For a safe concern of the hardware developed we had proposed a relay circuit which has a normally open relay so as to switch the inverter circuit after connecting the source supply. The presence of filter in the output end helps to bring a purified sine wave as output with reduced total harmonic destruction.

VII. OUTPUT WAVEFORMS

Figure.4 (a,b)shows the final output waveform

The figure 4 (a,b) above shows the output wave form representation of the proposed system with 9 level switching stages in them as seen in to the figure above, by this output wave switching level it is clear that the total harmonics disturbances found in the resultant wave is reduce due to an extend of the same .and this figures shows the continuous output waveform representation of the alternating current



wave form obtained as output from the proposed system.

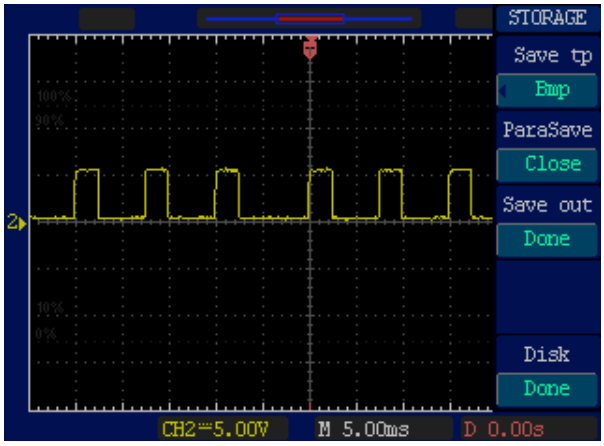


Figure 5 Pulse signal as gate triggering pulse

The figure 5 shows the input pulse signals generated from the microcontroller for giving the gate pulse to the MOSFET driver circuit using optocoupler and it is driven from the consecutive ports of the

microcontroller, this pulse signals are generated in periodic time basis as per the programmed data stored in the microcontroller for driving the gate terminal of the MOSFET so as to create the switched AC signal as output.

VIII.SWITCHING STATES

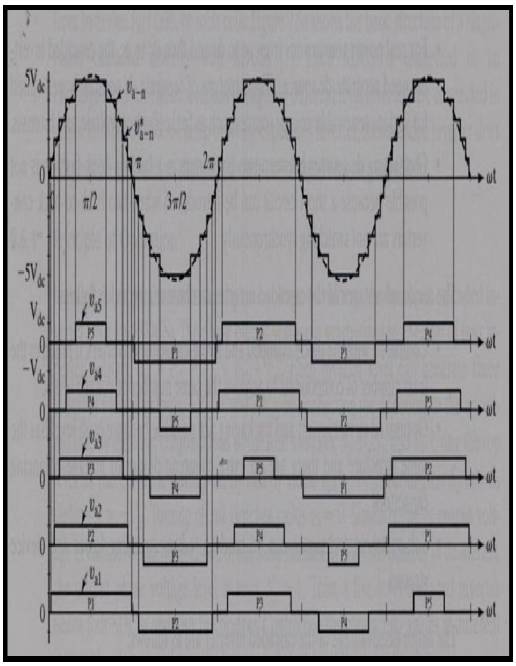


Figure 6 Switching States

OUTPUT VALUES

OUTPUTVOLTAGE	110v AC
SWITCHINGLEVEL	9

VIX.PHOTO COPY OF THE KIT

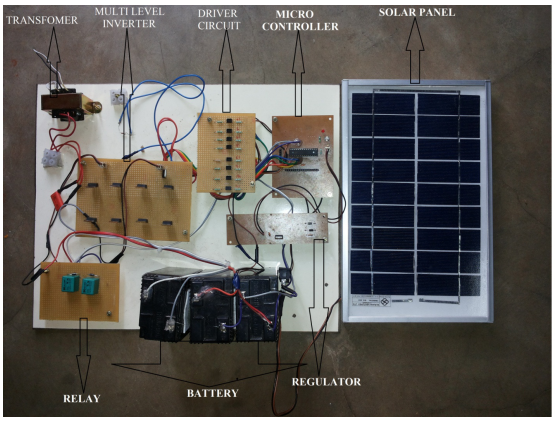


Figure 6 Output Kit

X.CONCLUSION

The overall performance of the system is improved using a standalone hybrid power generation system using ANFIS controller (MPPT Technique).

The proposed hybrid system using ANFIS controller can provide maximum power generation due to hybrid system, better harmonic reduction in the range of 3.21% (THD), better voltage control in the range of 110V and current control in the range of 60A. A new stand-alone wind–PV hybrid generation system is proposed for application to remote and isolated areas. By additionally adding a diesel power generator for stand –alone operation. By varying the constraints in wind turbine system in order to achieve a optimal performance. By using switched MPPT technique in order to meet the continuous load demand without interruption of power.

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