ISSN 2395-1621

Wind Solar Complementary Power Inverter Based On Microcontroller

[#1]Gayatri Chaudhari, [#2]Varsha Kasar, [#3]Pratiksha Pawar, [#4]Prof. Shital Gudhade

[1]chaudharigayatri3@gmail.com
[2]varshakasar56@gmail.com
[3]pratikshapawar911@gmail.com

[#123]Department of Electrical Engineering
[#4]Prof. Department of Electrical Engineering

Jayawant Shikshan Prasarak Mandal's
Bhivarabai Sawant Institute Of Technology &Research, Wagholi, Pune -412207
.

ABSTRACT

This paper represent generation of electricity by using wind solar complementary system and design single phase half bridge sine wave inverter. It describes hardware structure, operating principle and microcontroller. The microcontroller is design for charging and discharging purpose. In these liquid crystal display (LCD) is used which shows the battery status, temperature, wind output and solar output with the help of reasonable calculation and simulation analysis. The technique used is pulse width modulation (PWM). A prototype of 100W/230V /50 Hz single phase sine wave inverter used for lower application such as lamp and buzzer.

Keywords: Controller, Inverter, Battery, Ac Load, Dc Load.

ARTICLE INFO

Article History

Received :8th March 2016

Received in revised form :

10th March 2016

Accepted :12th March 2016

Published online : 14th March 2016

I. INTRODUCTION

The wind solar complementary power supply system is renewable energy sources. Solar energy is an important clean, cheap and always available in environment. Solar is available in day time, day time is good illumination but wind energy is poor at that time. Solar energy is not available at night time and that time wind energy available in more quantity. Therefore, wind solar complementary is best power supply system.

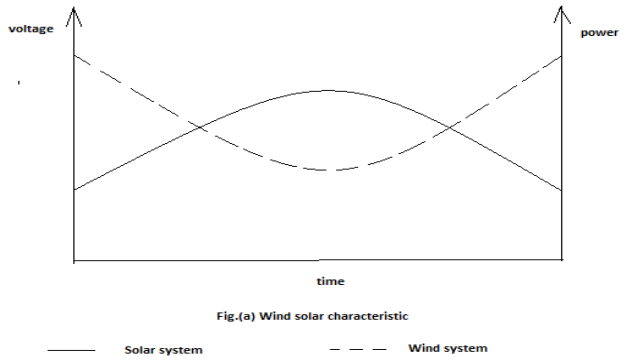

Fig 1. Graphical representation of wind solar hybrid system

Fig(1) shows the graphical representation of wind solar hybrid system. This hybrid system represent characteristic between wind solar for whole day. Voltage and power of wind energy are strongest range when sun light is poor.The microcontroller, PIC16F4520 sampled the input signal such as battery status, temperature, turbine voltage, solar voltage to determine the system state. Microcontroller generates the necessary PWM waveform due to built in PWM module. The microcontroller is more easy and flexible to change program without any changes in hardware. It can not only use for controlling purpose but also use for charge the redundant battery when present condition is reach.In this project we will focused on the inverter which will take it's power from both wind and solar. Then we will try to implement a dual level three stage charging and discharging based on PIC MCU. The method realizes auto switching of battery lifetime effectively. For the prototype 60W/12V/50Hz single-phase sine wave DC/AC power inverter, the output voltage wave at empty load is consistent with that of full load. The total harmonic distortion factor (THD) is small. It reduces the switching consumption and improves the inverter operation efficiency.

II. LITERATURE SURVEY

Gao Yulei, Xiao Zhang, "Renewable Energy: Green Drive for Chinese Sustainable Development", proposed wind-solar complementary single-phase sine wave power inverter along with intelligent control method to design for charging and discharging. Which has small THD, excellent steady state and dynamic response characteristics, the design scheme is feasible and reliable. Wind-solar complementary sine inverter power supply gives good solution to the problems, such as low efficiency, high THD, difficult charging and discharging. It also provides a reference for further research on high-power wind-solar complementary sine wave power inverter with inductive or capacitive load. [1]

Li Defu. Technology and application of household "wind-solar" complementary power system. In this paper developed the control circuit for a single phase inverter which has been implemented using PIC microcontroller. The designed inverter was tested on various ac loads and essentially focused upon low power electronic application such as a lamp, a fan and charger etc. The proposed model of the inverter improved the output waveforms of the inverter and the dead time control reduced to 63µs. [2]

Daolian Chen, Lei Li. "Bi-polarity phase-shifted controlled voltage mode AC converters with high frequency ac link" present this paper to analyzed the solar wind hybrid power system (SWHPS) and improve the quality of power supply and improving better life by using fuzzy logic technique. A fuzzy logic algorithm has been implemented to compare the reference voltage and actual voltage output of the converter.

III. OBJECTIVE

The Objectives of this project is to design an inverter that can be derived by 12V battery and can be used to operate AC loads while minimizing the conventional inverter cost and complexity using Microcontroller. The main objectives are,

a) Generation of a pure sine wave signal from a solar panel reducing the dependency on the fossil fuels and limited energy source .

b) Reduction of circuit's complexity by using micro-controller to generate modulating signal.

IV. PROPOSED SYSTEM

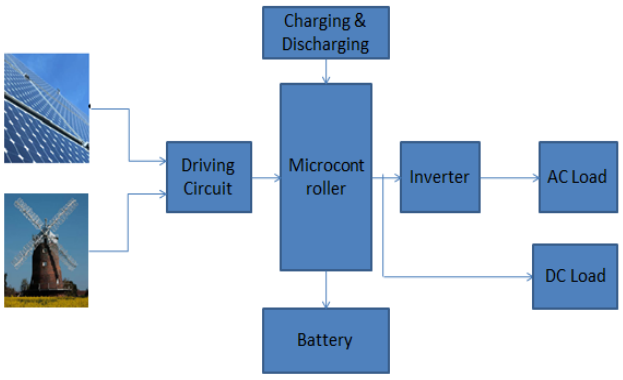

Fig. 1.Block Diagram

Solar-Array

In India the annual global solar radiation is about 5 KWh/ sq m per day with about 23003200 sunshine hours per year. Solar radiations represent the earth's most abundant energy source. The perennial source of solar energy provides unlimited supply, has no negative impact on the environment. The solar photovoltaic (PV) modules convert solar radiation from the sun into electrical energy in the form of direct current (DC). Converting solar energy into electricity is the answer to the mounting power problems In the rural areas. Its suitability for decentralized applications and its environment friendly nature make it an attractive option to supplement the energy supply from other sources. 1 KWp of SPV generates 3.5-4.5 units (KWhr) per day. If we could install Solar Photovoltaic Cells much of the rural exchange power needs could be met, adequately cutting down harmful greenhouse gases.

Wind Energy

Wind energy is another viable option. The Wind Turbine Generator is designed for optimal operation at wind speed of 10-14m/s. The Turbine Generator starts at a cutin speed of 3.5 m/s and generates power at speeds 4.5 m/s and above. In India the best wind speed is available during monsoon from May to September and low wind speed during November to March. The annual national average wind speed considered is 56m/s. Wherever average wind speed of 4.5 m/s. and above is available it is also an attractive option to supplement the energy supply. Wind generators can even be installed on telecom tower at a height of 15-20 mt. with suitable modification in tower design, taking into account tower strength and EMI & EMC. 1 KW WTG generates around 3 units (KWhr) per day.

Solar-Wind Hybrid Power System

Hybrid Wind-Solar System for the rural exchanges can make an ideal alternative in areas where wind velocity of 5-6m/s is available. Solar-wind power generations are clear and non-polluting. Also they complement each other. During the period of bright sun-light the solar energy is utilized for charging the batteries, creating enough energy reserve to be drawn during night, while the wind turbine produce most of the energy during monsoon when solar-power generation is minimum.

Inverter Circuit

Here is the circuit diagram of simple 100 watt inverter using IC CD4047 and MOSFET IRF540.The circuit is simple low cost and can be even assembled on a veroboard.CD4047 is a low power a low power CMOS astable / monostable multivibrator IC. Here it is wired as an astable multivibrator producing two two pulse trains of 0.01s which are 180 degree out of phase at the pins 10 and 11 of the IC. Pin 10 is connected to gate of Q1 and pin 11 is connected to the gate of Q2 Resistors R3 and R4 prevents the loading of the respective MOSFETs. When pin 10 is high Q1 conducts and current flows through the upper half of the transform primary which accounts for the positive half of the output AC voltage. When pin11 is high Q2 conduct and current flows through the lower half of the transformer primary in opposite direction and it accounts for the negative half of the output AC voltage.

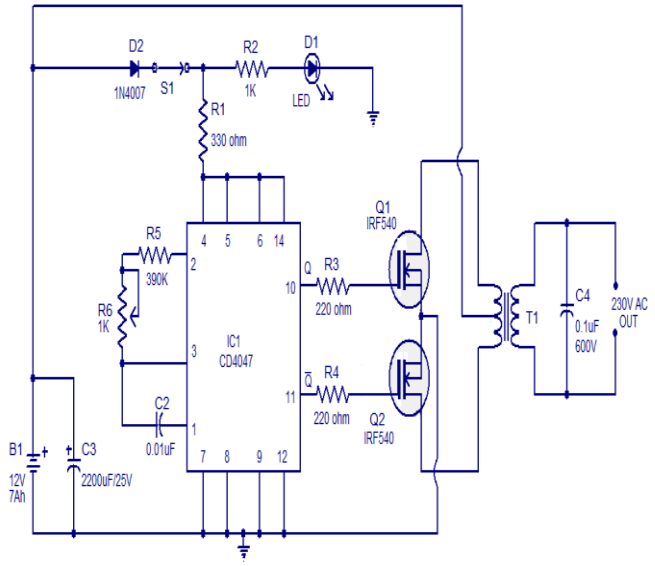

Fig. 2. Inverter Circuit Diagram

Driving Circuit-

Driving circuit is used for getting pure DC output. Hybrid system output is containing many ripples. So here we are using timer IC for generating PWM waveform.

V. RESULT

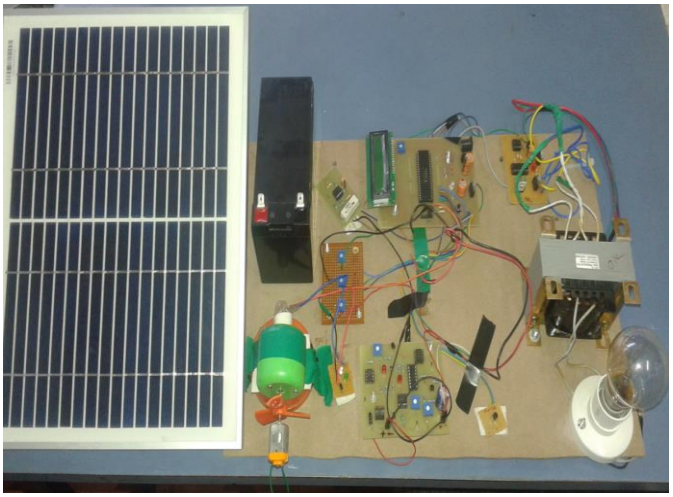

Fig 3. Final Result of our System

VI. APPLICATION AND ADVANTAGES

Application:

1] Household Appliances.
2] Water Pumping System.
3] Power Failure.

Advantages:

1] Provides un-interrupted power supply to the equipment.
2] Provide clean, green, reliable, pollution free, low emission and distributed technology power.
3] Saves from high-running cost of generator and increasing diesel cost.
4] The system gives quality power out-put of 48 volt DC to charge directly the storage battery or provide direct power to telecom installations.
5] The system can be designed for both off-grid and on grid applications.
6] Efficient and easy installation, longer life.

VII. CONCLUSION

According to experimental result we are generate the electricity by using solar wind hybrid system. The microcontroller charging and discharging based on PIC MCU plays an important role in the wind solar complementary regulation. Wind solar complementary sine wave inverter has low cost. The tested inverter is loaded as various ac load such as 60W, 30W, 20W.

REFRENCES

1] Gao Yulei, Xiao Zhang. Renewable Energy: Green Drive for Chinese SustainableDevelopment. Green Vision, 2006(2)

2] Li Defu. Technology and application of household "wind-solar" complementary power system. Transactions of the CSAE, 2006,22(Supp 1):162-166.

3]Daolian Chen, Lei Li. Bi-polarity phase-shifted controlled voltage mode AC-AC converters with high frequency ac link. IEEE PESC, 2003: 677-682.

4]Zhao Chunjiang, Yang Jinhuan, Chen Zhonghua, Zou Qianlin. State & Development of Photovoltaic Application. Energy Conservation Technology, 2007, 25(5):461-465

5] Www.alldatasheet.com

6] Www.nptel.com

7] S.P.Sukhatme,"Solar Energy",Tata McGraw Hill[book].

8] Mukund R.Patel"Wind and Power Solar System",CRC press.[book].

9] P.S.Bhimbra"Power Electronic"[book].

