Review On Vertical Axis Micro Wind Turbine and Solar Hybrid System

Ashwini D. Mohod, Mrs. V. S. Jahagirdar

M.tech, EDT (National Institute of Electronic and Information Technology,Aurangabad,India)
(Senior Technical Officer,National Institute of Eleectronic and Information Technology, Aurangabad, India)

Abstract: We are going to generate hybrid power by using solar panel and micro wind turbine. Renewable energy source is the future of energy sector for that its management is essential. Solar Energy and wind energy the ultimate and future source of energy is getting its importance day by day and will become important source of energy. Vertical Axis Micro Wind Turbine and solar hybrid system is a microcontroller based charge controller using PWM (pulse width modulation) technique. In this system use solar panel and designed micro wind turbine. This system work in low wind speed at 4m/sec to 35 m/sec and make use of renewable energy such as solar and wind. The turbine is made up of acrylic sheet and is based on medium density fibre.This PWM technique is employed by the PIC16F877 microcontroller. The microcontroller is to charge a 12V battery using micro wind turbine and solar panel. The main feature of this charge controller is limits the rate at which electric current is added to or drawn from batterY. Excessive voltage can also stress loads (lights, appliances, etc.) or cause inverter to shut off. Vertical axis Micro wind turbines have been designed to operate with low wind speeds.
Keywords: Wind Turbine, Solar Panel, Microcontroller, Battery.

INTRODUCTION

Based upon nature, energy sources are classified as 1. Renewable energy sources are endless and are renewed by nature itself. Solar, wind, tidal, hydro and biomass are few examples. 2. Non-renewable energy sources are exhaustible within a definite period of time depending upon its usage. Fossil fuels (coal, oil, gas) and nuclear fuels are few examples. Fossil fuels diminishing rapidly across the world, due to increased demand, the stress over the existing reserves are intensified. however, fossil fuel contributes 80% of world primary energy which is an huge impact on environment. Again our environment is affected by production of greenhouse gas emissions which is driven by human activities which has major role leading to climatic changes. Energy is also responsible for producing environmentally harmful substances during its production, distribution and consumption. For the sustainability of modern societies a secure and accessible supply of energy is thus critical. To meet the present and estimated world demand switching of energy system from conventional to renewable is an urgent need. Among the renewable sources of energy solar energy and wind energy is the most promising renewable.

Solar energy can be used to generate power through solar panel (photovoltaic), is the direct conversion of sunlight into electricity through photocells. Photovoltaic (PV) production becomes double every two years, increasing by an average of 48 percent each year since 2002 due to this reason, it has become the world's fastest growing energy technology And also the Wind is a natural resource and can be harnessed as an alternative energy. Wind energy is a good choice to supplement for fossil energy demand. Vertical axis micro wind turbine has some advantages. VAMWT can capture the wind from all the directions. And also work in low wind speed at 4m/sec to 35 m/sec.

MATERIALS AND METHODS

Hardware design

In this system, we minimize components count using a programmable PIC microcontroller for all the switching actions. The system design is based on the block diagram shown in figure. The detail design procedures are then presented in each of the block.
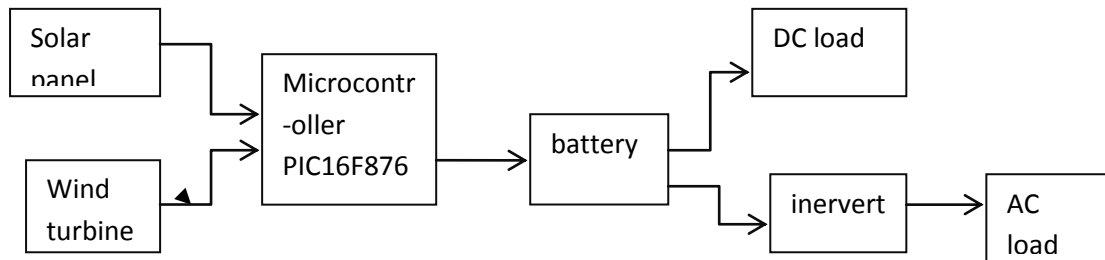
Block diagram of propose system

Solar panel

Solar panel contains solar cells, it made up of silicon which have small p-n junction inside them. Solar panel convert sunlight energy into electricity through silicon cells. The incident photons create free charge carriers. These charge carriers are separated through the junction and then electric current is generated. A solar cell generates approximately 0.6 volts open circuit voltage and 30mA/sq. Cm. Short circuit current Here we use 12v solar panel for generation of electricity.

Wind turbine

A wind turbine is a rotating machine which enables the conversion of kinetic energy in wind into mechanical energy. If the mechanical energy is used directly by machinery, such as a pump or grinding stones, the machine is usually called a windmill. If the mechanical energy is then converted to electricity, the machine is called a wind turbine.

There is basically two types of designs which can be implemented
1) vertical axis wind turbine
2) horizontal axis wind turbine

In this project we use vertical axis wind turbine. This turbine is designed for micro wind generation. Turbine is made up form acrylic sheet. Acrylic sheet have break resistant, weather resistant and also heat resistance capacity. The turbine is design to roated in low wind speed at 4m/sec to 35 m/sec.

Circuit diagram of system
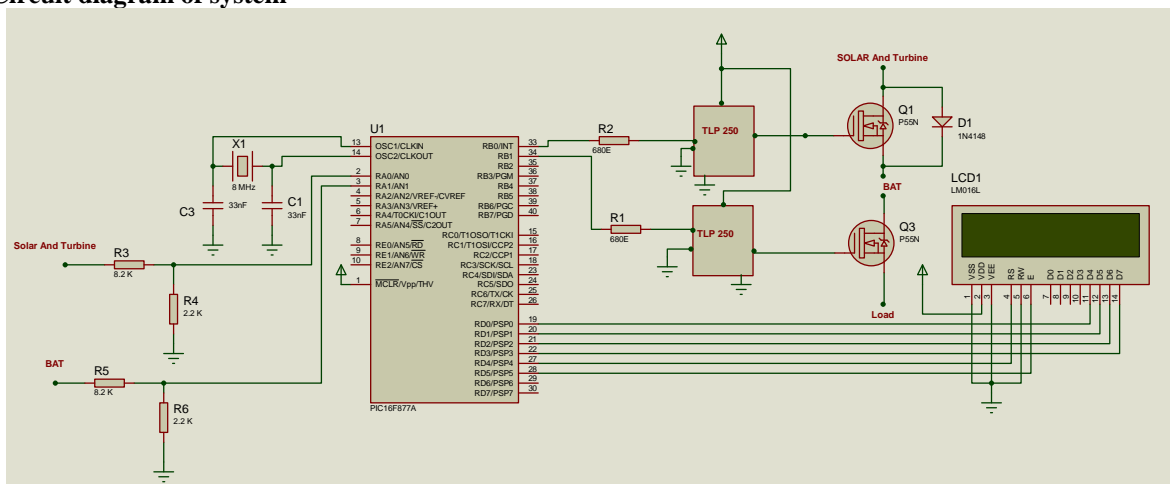
Charge controller

Charge controller is one of the funcational and reliable component in this system. the main function of charge controller is to block reverse current and prevent battery overcharge and over discharge. Charge controller is a nothing but the regulator which regulate the current between solar panel battery. Absence of charge controller in this system results in high maintains cost including frequent battery replacement.

Software design

In this system we use the PIC16F876A microcontroller. The microcontroller operated according to the program written inside its memory. The main objective of the program is to give instruction, control and coordinate the PIC16F876A to execute various tasks, such as to control battery voltage and current. Control has been developed according to flow chart shown in figure. The flow chart represents the software development algorithm. Based on this flow chart a program was developed in C – language and debugged. The software algorithm was then loaded into the PIC16F876A using a PIC programmer.
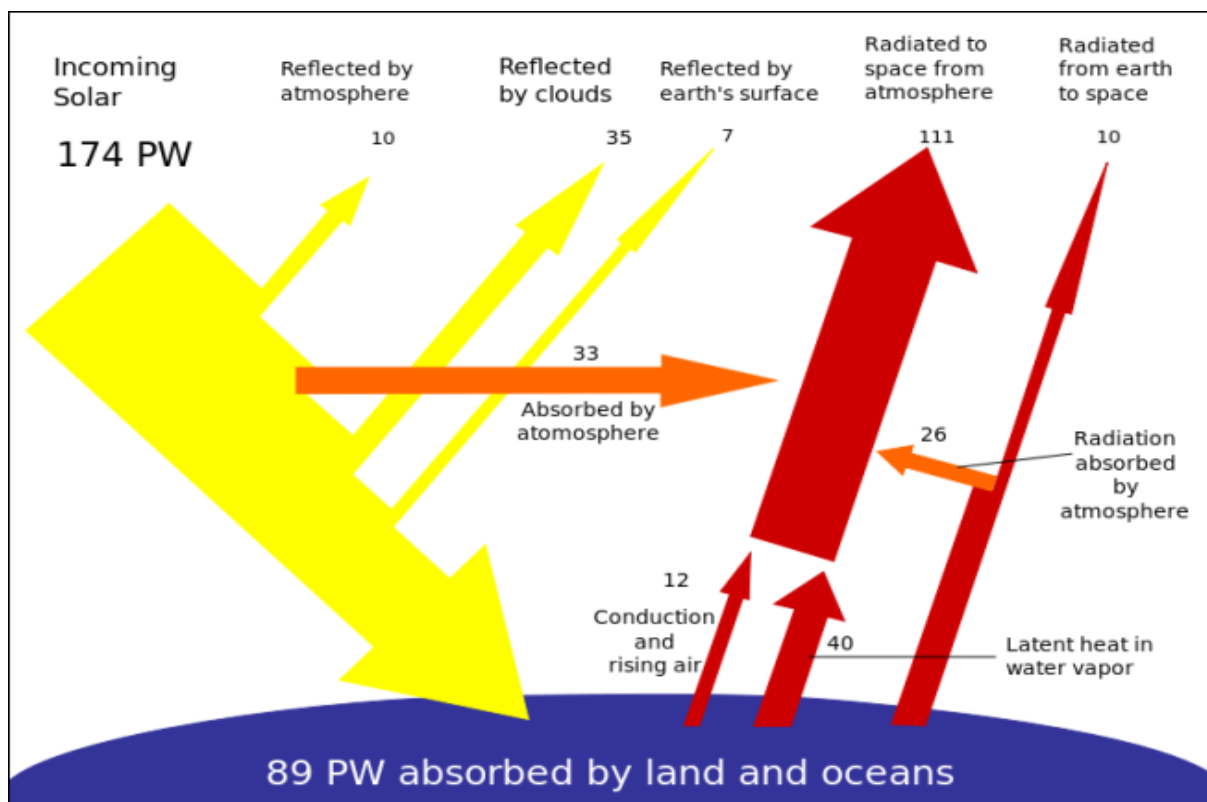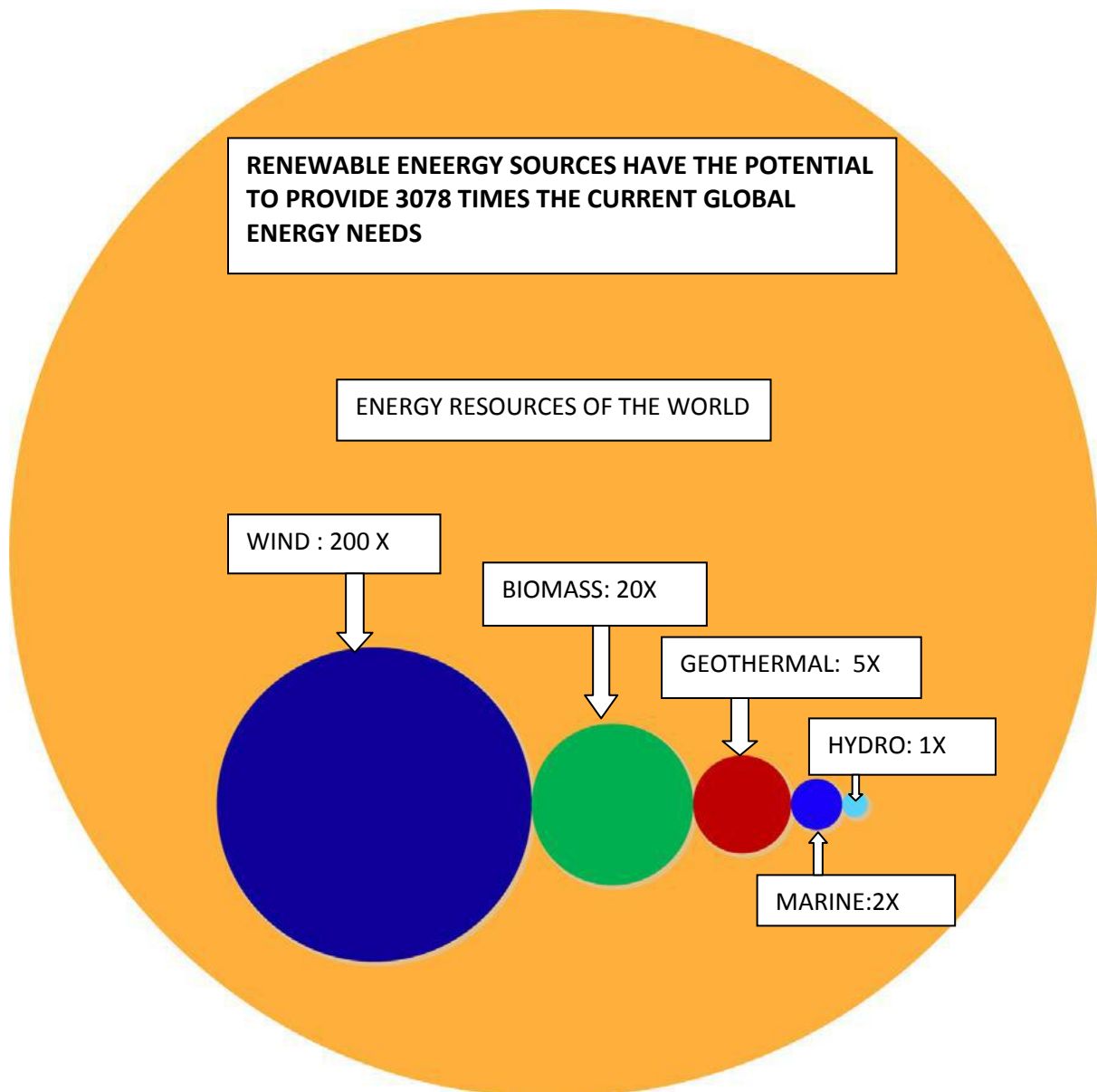
Flow chart of system
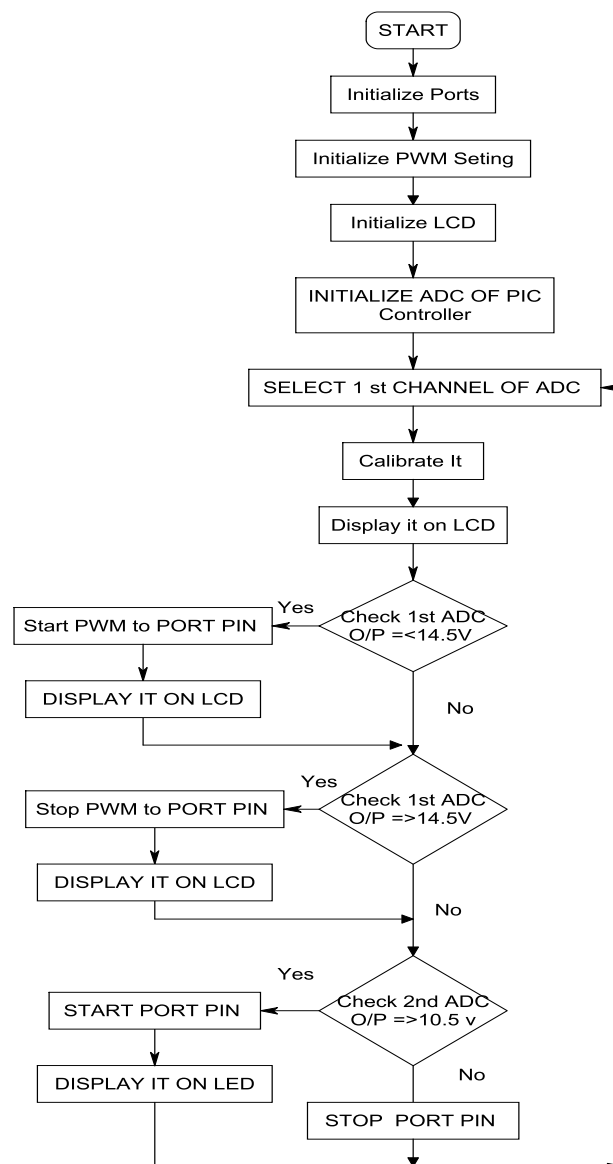
Solar Energy

Solar energy is the most readily available and free source of energy. It is predicted that solar energy equivalent to over 15,000 times the world's annual commercial energy consumption reaches the earth every year.

India receives solar energy in the region of 5 to 7 kWh/m^2 for 300 to 330 days in a year. This energy is enough to set up 20 MW solar power plant per square kilometre land area.

Solar energy can be utilised through two different ways, as solar thermal and solar electric (solar photovoltaic). Solar thermal energy uses the sun's heat to produce hot water or air, cook food, drying materials etc. Solar photovoltaic energy uses sun's heat to produce electricity for lighting home and building, motors, pumps, electric appliances, and lighting.

Energy resources of the world

RENEWABLE ENEERGY SOURCES HAVE THE POTENTIAL TO PROVIDE 3078 TIMES THE CURRENT GLOBAL ENERGY NEEDS

ENERGY RESOURCES OF THE WORLD

WIND : 200 X

BIOMASS: 20X

GEOTHERMAL: 5X

HYDRO: 1X

MARINE:2X

APPLICATION OF SYSTEM
1) These are installable in smaller places due to their small size and modular construction. Smaller places like apartment-balconies, Building-terraces and the small farm-houses.
2) The applications for wind turbine system are in remote houses and farms.

ADVANTAGE OF SYSTEM
1) Turbine rotate in low wind speed at 4m/sec to 35 m/sec .
2) Reduction in operating cost.

CONCLUSION

In this system use renewable sources of energy like solar photovoltaic energy (solar panel), wind energy through micro wind turbine. The cost of energy from the conventional source for generating electricity continuously increase therefore we need to use the renewable energy sources like solar energy and wind energy, it becomes only sustainable alternative. By developing such system reduce the world energy demand by making the renewable sources more efficient.

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