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Aero Dynamic Wind Mill with Reverse Charge Protection for Rural Power Generation Applications

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ABSTRACT: Energy is a major input for overall socio-economic development of any society. Wind energy is the fastest growing renewable energy. From centuries man has been trying to convert wind power to mechanical &, more recently, electric power. Wind technology has improved significantly over the past two decades, and wind energy has become increasingly competitive with other power generation options. Wind power has negligible fuel costs.

A key challenge for wind energy is that electricity production depends on when winds blow rather than when consumers need power. The amount of electricity generated from wind has been growing rapidly in recent years. The power in the wind can be computed by using the concepts of kinetics. The wind mill works on the principle of converting kinetic energy of the wind to mechanical energy. The power available in the wind increases rapidly with the speed hence wind energy conversion machines should be located preferable in areas where the winds are strong & persistent.

KEYWORDS: Wind energy, renewable energy, competitive, kinetics, persistent.

I. INTRODUCTION

This project is designed by using an aero dynamic wind blade arrangement which is connected to the shaft of the dc geared motor such that its output is given to the Reverse polarity preventer cum polarity corrector. Use of embedded technology makes this system efficient and reliable. Micro controller (AT89S52) allows dynamic and faster control. Liquid crystal display (LCD) makes the system user-friendly to get the voltage. AT89S52 micro controller is the heart of the circuit as it controls all the functions.

Depending upon the movement of the wind blade (clock wise / anti clock wise) the polarity can be corrected automatically which is given as an input supply to the 12V DC rechargeable battery. The o/p of this lead acid battery is given as input to the inverter which drives the AC loads. The battery is connected to the inverter.

This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the loads. Here we are also using Conventional Battery Charger Unit to recharge the battery.

The output of wind turbine is given to 12V 1.3 Amp-Hour Lead-acid Battery. The battery is connected to the inverter which is used to convert the D.C 12 Volt to the 230 Volt A.C. By increasing the capacity of battery and inverter circuit, the power rating is increased.

This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

II. BACKGROUND WORK

Energy is a major input for overall socio-economic development of any society. There is a huge shortage of electricity in India. In many parts of the world, you can tap the power of the wind to generate non-polluting renewable electricity.

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Wind plant designs have improved so much and the cost of oil, coal, natural gas and nuclear power companies are so high that the many power companies are building large scale wind plant. Since last 10 to 15 years we have seen very huge development in wind energy generation by companies like TATA Power, Suzlon Energy & Enercon in Western Maharashtra region which is an indicator of good returns of investment. But the present wind-mills generate electricity only while the wind blades are rotating in one direction depending on the direction of wind, so this poses a problem as a key challenge for wind energy is that electricity production depends on when winds blow rather than when consumers need power. And also there very great amount of load shedding in rural areas & no new power plants are expected in the future so there is a very huge demand for wind projects. This project is designed by using an aero dynamic wind blade arrangement which is connected to the shaft of the dc geared motor such that its output is given to the Reverse polarity preventer cum polarity corrector.

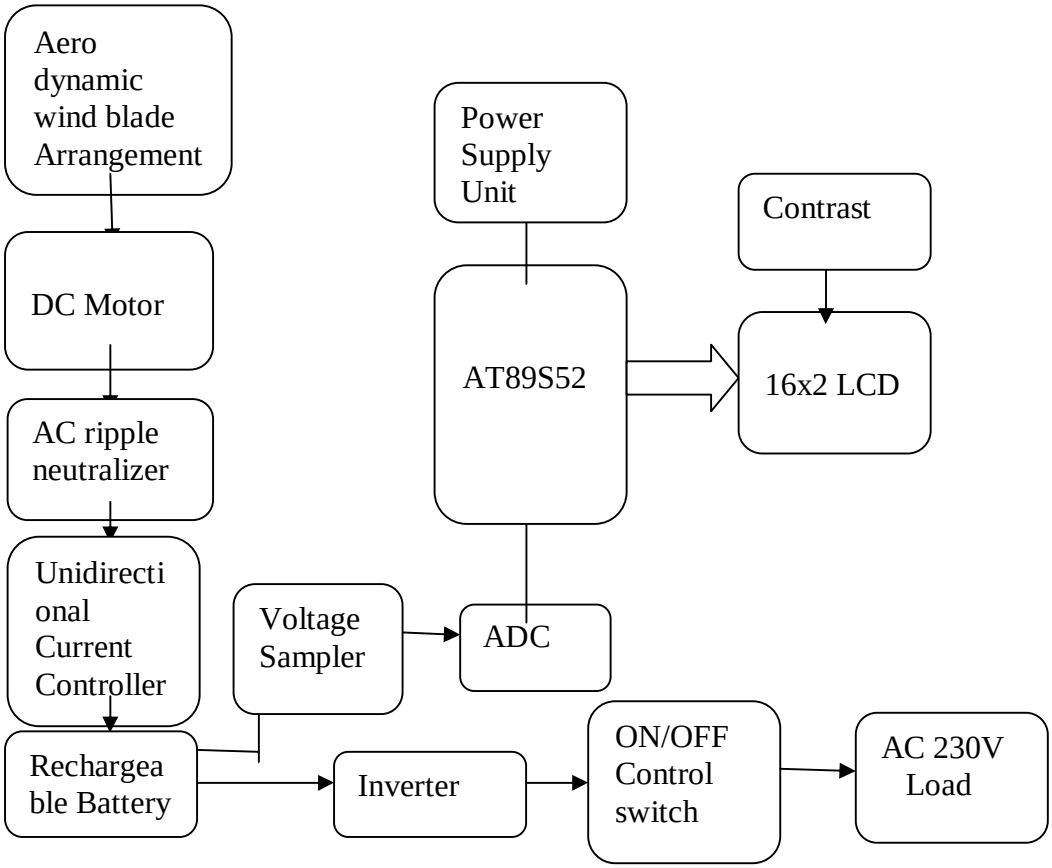
III. PROPOSED METHODOLOGY AND DISCUSSION

This block diagram shown in the fig.1 includes the following main blocks:

- Aero dynamic wind blade
- DC motor
- LCD
- ADC
- Rechargeable batteries
- Micro controller

BLOCK DIAGRAM

FIGURE 1: Aero dynamic wind mill system with reverse charge protection



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This project is designed by using an aero dynamic wind blade arrangement which is connected to the shaft of the dc geared motor. The windmill rotates in both the direction and power is generated during both the direction of rotation. This generation of power is indicated using an LED light and then the output of geared motor is given to the Reverse polarity preventer cum polarity corrector.

A windmill arrangement is given to rotate when the wind is blown. A DC motor used here as a generator which rotates along with windmill. So that charge is sent to bridge rectifier. We are using a bridge rectifier which is also called as AC ripple neutralizer. This is to eliminate AC ripples and to get pure dc. Unidirectional Current Controller is nothing but our diode. This is to make use of the power when the fan/ windmill rotated in any direction i.e. either clock wise / anti clock wise.
Battery is being charged in this way by utilizing the wind energy.

To monitor the battery charge, we are using ADC which is used to convert analog voltage to digital form so that this can be read by AT89S52 MCU. For trigger input to the ADC we are using 555 timer this is to generate clock pulses. Since the ADC cannot tolerate more voltage a voltage sampler is given to cut down the voltage. Voltage is applied to the ADC in the above manner and then given to the controller to display the voltage. Here we are using 16X2 LCD for the purpose of display. From the battery we have connected to inverter to operate AC loads also. This inverter converts DC to AC to power the AC loads.

ADVANTAGES:

1. The wind is free and with modern technology it can be captured efficiently.
2. Once the wind turbine is built the energy it produces does not cause green house gases or other pollutants.
3. Although wind turbines can be very tall each takes up only a small plot of land. This means that the land below can still be used. This is especially the case in agricultural areas as farming can still continue.
4. Many people find wind farms an interesting feature of the landscape.
5. Remote areas that are not connected to the electricity power grid can use wind turbines to produce their own supply.
6. Wind turbines have a role to play in both the developed and third world.
7. Wind turbines are available in a range of sizes which means a vast range of people and businesses can use them. Single households to small towns and villages can make good use of range of wind turbines available today

APPLICATIONS:

- Farm Windmill
- Golf Course Aeration
- Cattle Farm Windmill
- Pond Aeration
- Residential Water Aeration
- Fish Ponds and Hatcheries
- West Nile Virus Prevention

IV.EXPERIMENTAL RESULTS

This project is designed by using an aero dynamic wind blade arrangement which is connected to the shaft of the dc geared motor such that its output is given to the Reverse polarity preventer cum polarity corrector. The Bridge circuit is used as a Reverse polarity preventer cum polarity corrector. The electricity generation is obtained in both the direction of rotation of the wind blades.

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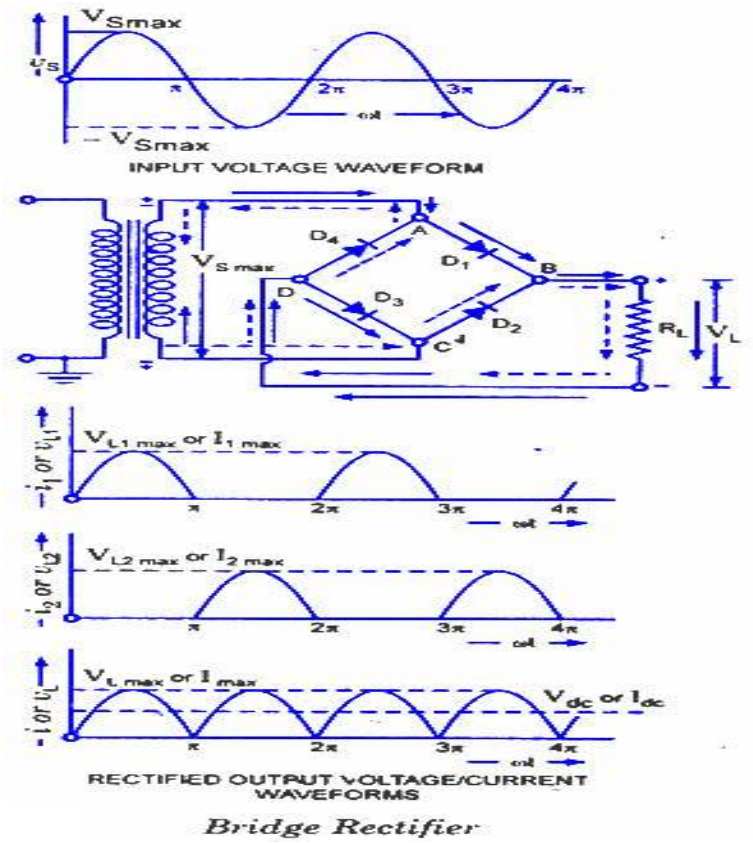

Figure 2(a)

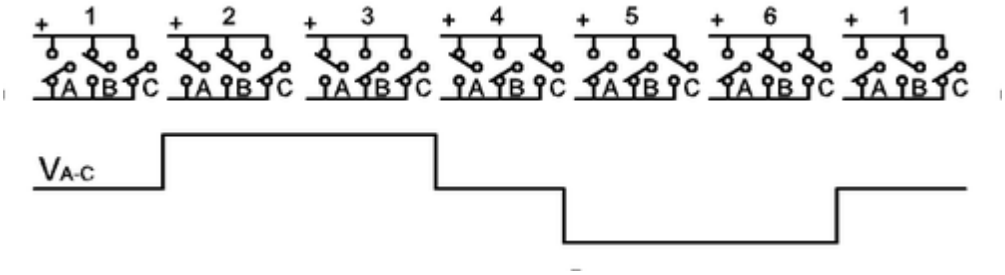

Figure 2(b)

Figure 2: (a) output waveform of bridge rectifier. (b) 3-phase inverter waveform

V. CONCLUSION

Windmills have been used for centuries for various purposes. Today, they are primarily used to generate power and they do so quite efficiently when compared with other renewable resources such as solar. The energy is completely clean and has little effects of the environment. Depending on the overall size the rotor will directly affect the power output capabilities of the system. The larger the rotor is the higher the output power.

The downside to a windmill is that they cannot always generate 100% power. The wind hitting the rotor is constantly changing and with it so does the power output of the windmill.

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Windmills can also be noisy because of the rotation from the rotors, because of this they are not good to be placed near homes.

Another downside, is since wind is not always constant these systems need to be backed up with other renewable sources in case of the absence of wind. However, windmills are still a very vital and important part of the move towards complete renewable energy and we may start to see a substantial increase in their use around the world.

Charge controller circuit can be used to avoid overcharging of the battery as a future extension of the project.

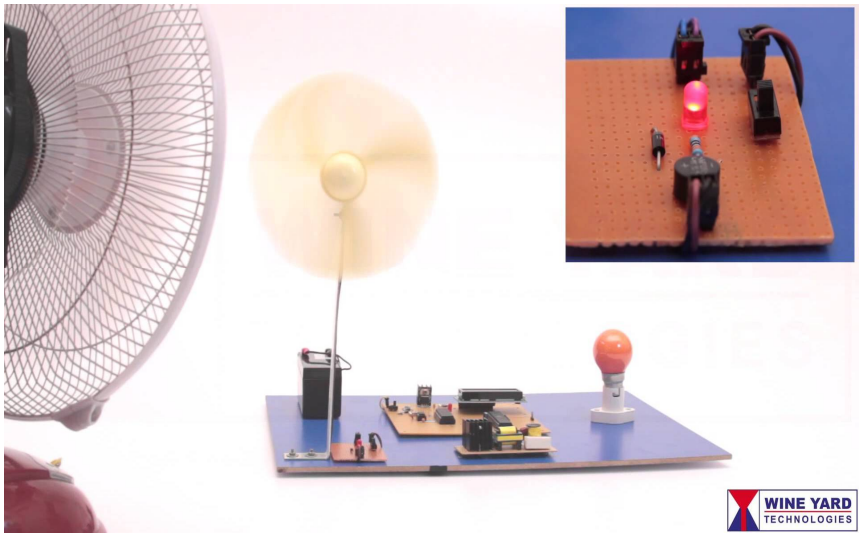

Figure 3: Photograph of the proposed model

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