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Generation of Electric Power Using Wind Energy through Moving Vehicles

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ABSTRACT: Vehicle Mounted Wind turbine (VMWT) could be a mounted horizontal axis turbine system for vehicles. This paper presents implementation of VMWT to come up with electricity from vehicle. VMWT has many good options together with high rate rotary engine, convenient weight, practical shape and portability. In addition, this paper evaluates the VMWT performance in terms of power generation. It is shown that, with proper designing, VMWT can generate approximately 200 W of power at vehicle speed of 80 Km/hr. A number of design issues have taken under consideration for coming up with VMWT to confirm its correct practicality. The current generation needs more energy for daily consumption and this condition leads to an exhaust of non-renewable energy sources. Hence, tapping energy from non-conventional source is an important aspect of an energy production all over the world. So, the main objective of this paper is to generate electrical energy using renewable energy sources by accelerating the wind energy through wind turbine. Here, a free energy is generated. When the vehicles are moving at a high speed, it cuts the air with the high amount of pressure. Thus, the pressurised air is collected at the top of the vehicles. The main purpose of this paper is to generate electric power with the help of wind energy and by this method our work taps energy in a possible way which is eco-friendly and can produce electricity which is used to supply for lightings and for many internal purposes Wind energy has been used since several years to power homes, sail boats and pump water from wells or heating and cooling homes and offices. Hence in upcoming years the demand percentage might get increased.

KEYWORDS:Vehicle Mounted Wind turbine, Wind Energy, Electric power, PIC microcontroller

I. INTRODUCTION

Renewable energy sources supply limitless resource and atmosphere friendly operation compared to standard energy sources. There are many kinds of renewable energy like solar power, wind energy, heat energy, periodic event energy, hydro energy and bio-energy. However, wind energy is that the most useful, safe and quickest growing renewable energy. At the top of 2013, wind energy has served around 318.13 GW (GWEC, 2013) that is twelve-tone system of world demand. Moreover, it's low value (0.12/kWh) (Ravi et al., 2009), low carbon footprints (< 5CO2/kWh), minimum pressure level (50-60 decibel from one hundred feet) and straightforward integration with different energy sources. However, industrial turbine (WT) isn't appropriate for tiny scale application because it needs huge land, high installation value, lack of energy storage and not moveable. In addition, in some places wind speed isn't enough to run a domestic Wind Turbine (WT). Hence, a changed WT system is important which may be economical underneath this type of circumstances. Many attempt taken to supply electricity by vehicle as variety of literatures as already exists. However, these proposals never meet the edge of the sensible. From these motivations, this paper proposes a changed, moveable and distributed turbine system for vehicles. It's potential to extend the incoming wind speed for a mounted WT by artificial means by mistreatment the vehicle speed. Hence, a WT is mounted with vehicle to use the advantage of changed speed.

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II. WINDMILL

A windmill is a machine which translates linear motion of wind to rotational motion by means of vanes called sails. The main use is for a grinding mill powered by the wind, reducing a solid or coarse substance into pulp or minute grains by crushing, grinding, or pressing. Other uses of windmill are Wind energy conversion systems as wind pumps (US term - called Drainage windmills in UK) and wind turbines.

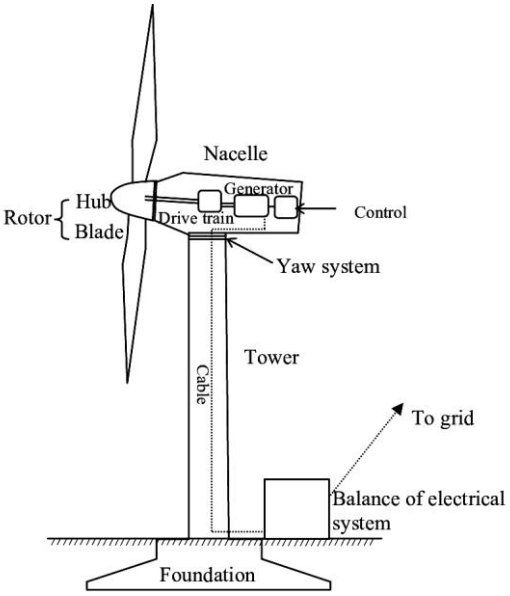

Fig.1 Windmill

Fig 2: Multi Sailed Windmill

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The majority of windmills had four sails. An increase in the number of sails meant that an increase in power could be obtained, at the expense of an increase in the weight of the sail assembly. The earliest record of a multi-sailed mill in the United Kingdom was the five sail Flint Mill, Leeds, mentioned in a report by John in 1774. Multi-sailed windmills were said to run smoother than four sail windmills. In Lincolnshire, more multi-sailed windmills were found than anywhere else in the United Kingdom. There were five, six and eight sail windmills.

III. MICROCONTROLLER

Microcontrollers are destined to play an additional necessary role in revolutionizing numerous industries and influencing our day to day life more powerfully than one will imagine. Since its emergence within the early 1980's the microcontroller has been recognized as a general purpose building block for intelligent digital systems. Microcontrollers were developed to fulfill a requirement for microprocessors to be place into low value merchandise. Although a product design could need solely terribly straightforward system, the components required to form this technique as an occasional value product. To unravel this drawback silicon chip system is enforced with one chip microcontroller.

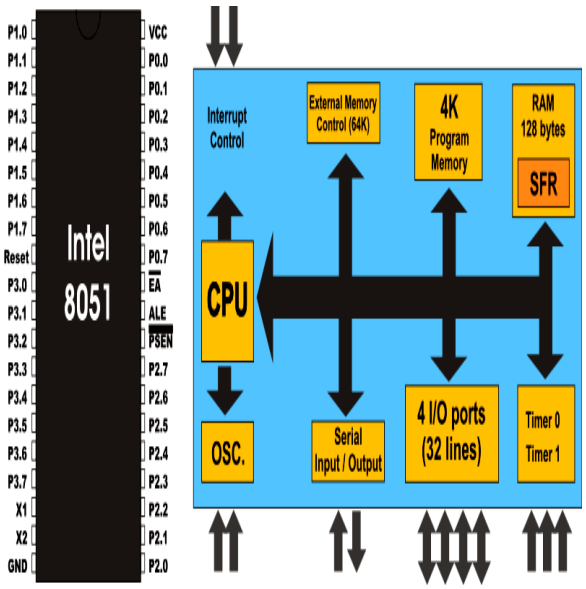

Fig. 3 Microcontroller basic architecture

a. PROGRAMMABLE INTERFACE CONTROLLER (PIC)

The microcontroller that has been used for this work is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complementary metal oxide semiconductor) that uses separate bus for instruction and data allowing simultaneous access of program and data memory.

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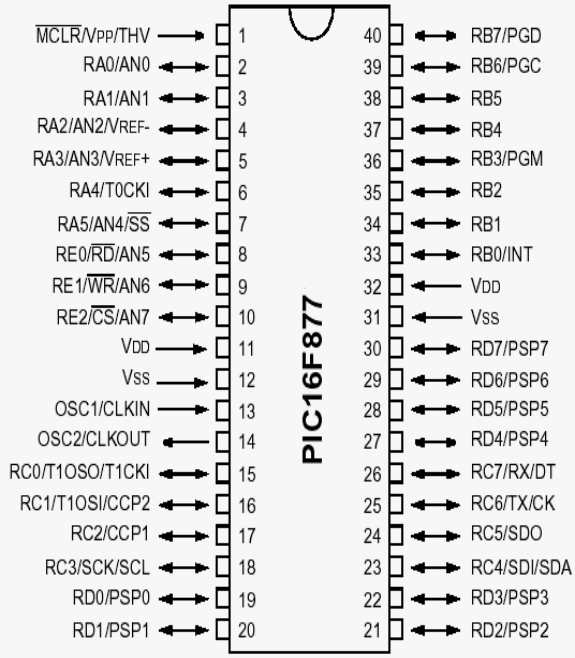

Fig. 4 PIC 16F877 Pin Details

b. DATA MEMORY ORGANISTION

The data memory is partitioned into multiple banks which contain the General Purpose Registers and the special functions Registers. Bits RP1 (STATUS<6) and RP0 (STATUS<5>) are the bank selected bits.

TABLE. 1 REGISTER PAGES WITH ITS BANKS

RP1:RP0	Banks
00	0
01	1
10	2
11	3

c. EEPROM

EEPROM is the non-volatile storage of variables to a PIC-controlled device or instrument. Some instruments use an EEPROM to store calibration data during manufacture. There are six special function registers (SFR) used to read and write the program and data EEPROM memory. They are: EECON1, EECON2, EEDATA, EEDATH, EEADRE, EADRH

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d. ANALOG TO DIGITAL CONVERTER (ADC)

There are two types of analog to digital converter is present in this IC. We used 10-bit ADC. The ADC module can have up to eight analog inputs for a device. The analog input charges a sample and hold capacitor. The output of sample and hold capacitor is the input into the converter.

e. REGISTERS

The controller IC has two 8 bit registers, an instruction register (IR) and a data register (DR). The IR stores the instruction codes and address information for display data RAM (DD RAM) and character generator RAM (CG RAM). The IR can be written, but not read by the MPU.

TABLE. 2 REGISTERS

RS	R/W	Operation
0	0	IR write as an internal operation
0	1	Read busy flag(DB7) and address counter(DB0 TO DB6)
1	0	DR write as an internal operation(DR to DD RAM or CG RAM)
1	1	DR read as an internal operation(DD RAM)

IV. POWER REQUIREMENTS

f. BATTERY

A rechargeable battery or a storage battery is a group of one or more secondary cells Rechargeable batteries use electro-chemical reactions that are electrically reversible.

Fig. 5 Battery model

Rechargeable batteries come in many different sizes and use different combinations of chemicals. The commonly used secondary cell chemistries are lead-acid, nickel-cadmium, nickel metal hydride, lithium ion, and lithium ion polymer. The rechargeable batteries can offer economic and environmental benefits compared to disposable batteries. Rechargeable batteries currently are used for applications such as automobile starters, portable consumer devices, light vehicles, tools, and uninterruptible power supplies. Emerging applications in electric and hybrid electric vehicles are driving the technology to reduce cost, reduce weight, and increase lifetime. Unlike non-rechargeable batteries rechargeable batteries have to be charged before use.

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Some of the common rechargeable batteries are :

1. Nickel Cadmium Battery
2. Nickel Metal Hydride Battery
3. Lithium-ion Battery

4.2 LCD DISPLAY

Fig.6 LCD Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. One each polarisers are pasted outside the two glass panels. These polarisers would rotate the light rays passing through them to a definite angle, in a particular direction

4.3 POWER SUPPLY

The power supply should be of +5V, with maximum allowable transients of 10mv. To achieve a better suitable contrast for the display, the voltage at pin 3 should be adjusted properly. A module should not be inserted or removed from a live circuit. The ground terminal of the power supply must be isolated properly so that no voltage is induced in it. The module should be isolated from the other circuits, so that stray voltages are not induced, which could cause a flickering display.

4.4 INVERTER

An inverter is an electrical device that converts direct current (DC) to alternating current (AC); the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries. The electrical inverter is a high-power electronic oscillator. It is so named because early mechanical AC to DC converters is made to work in reverse, and thus was inverted to convert DC to AC. The inverter performs the opposite function of a rectifier.

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V. PROPOSED CIRCUIT DIAGRAM

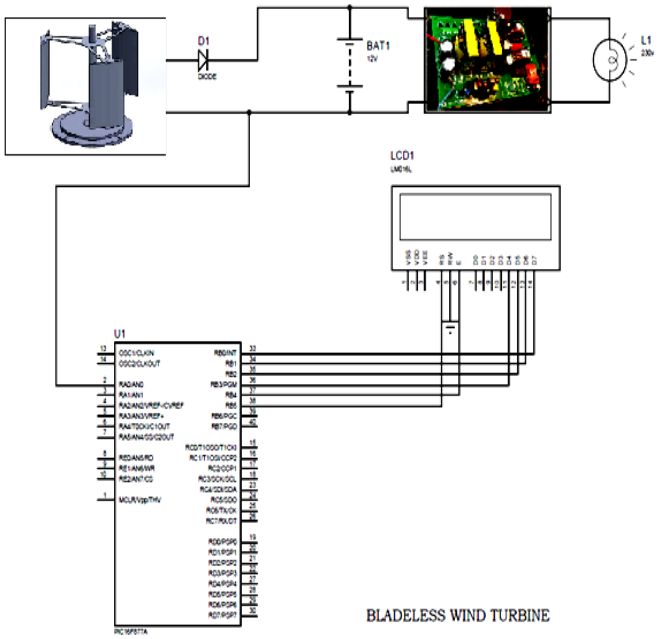

Fig. 7 Circuit diagram

5.1 PROPOSED PROTOTYPE MODEL

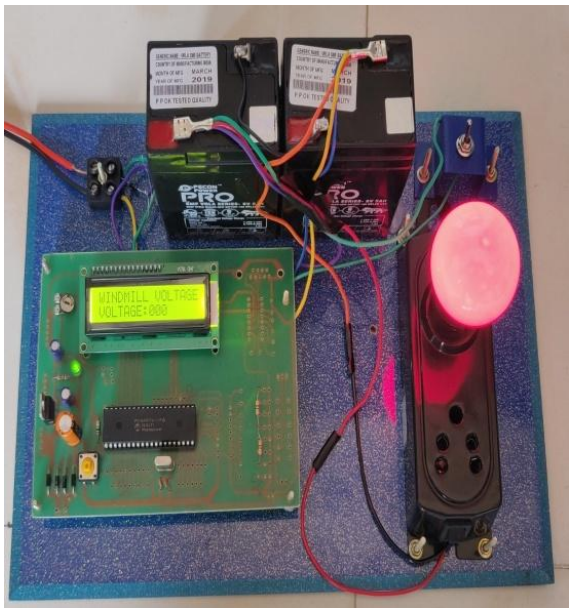

Fig.8 Prototype Model

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V. RESULTS

Thus, the output is verified when the turbine is rotated with the alternator output of 12V and the output of alternator is given as an input into the electrical circuit. Hence, the input is given to LCD Display where the voltage reading is displayed and the output is given to the battery through the diode. Finally, the output of the battery is given to the inverter circuit where the output current source is used for charging mobiles and lighting purposes.

Fig. 9 Hardware results

TABLE. 3 HARDWARE RESULTS

Vehicle Speed	Dynamo Rotation	Voltage Generated (in Volts)	Voltage Displayed (in Volts)
15 Km/ph	65Rpm	5.75	6
32 Km/ph	150Rpm	7.1	7
40 Km/ph	175Rpm	8.72	9

VI. CONCLUSION

The project hardware module worked satisfactorily as per the design. The project work was developed after conducting a number of experiments before finalizing the design work, this reduced the bottle necks and we did not face much difficulty in the final integration process.

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