



Wind Energy Harvesting Mobile Charger

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ABSTRACT

Owing to fast growth in the world population and aspiration of people for higher standards of living, the world will need greatly increased energy supply in the coming years, especially cleanly-generated electricity. A cleaner energy future depends on the development of alternative energy technologies to meet the world's growing energy needs. The transition to sustainable energy resources and systems provides an opportunity to address multiple environmental, economic and development need. In recent days power generation availing renewable energy sources accumulated enhanced captivation. The most universally available energy resource is wind. The objective presented here is charging of mobile phone using the wind energy available during travelling. A DC generator provides voltage obligatory for charging the mobile when the vehicle speed exceeds 25Km/hr. Even though the speed fall is perceived, the mobile will get continuously charged by the external battery source which is affixed to the proposed circuit. This could be used as an exigency source for charging the mobile while travelling in a vehicle

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1. Introduction

Mobile phone plays an important role in communication. The growth of mobile phone market is phenomenal in recent years and the need for charging the mobile battery is required anytime and anywhere. It becomes very difficult to charge the mobile phone while travelling from one place to another. With the rapid industrialization development and exploitation of natural resources many times condition occurs which result in non-charging of mobile. But this problem can be tackled by using renewable energy resources like solar charger. But a problem occurs when there is no sun light or the light is not in a proper amount. In order to overcome these types of problem this paper proposes an idea to use wind power for charging the mobile.

This concept utilizes wind generated electrical energy to charge the mobile phone battery. Transformation of mechanical energy into electrical energy to charge the mobile phone is done using DC generator. Wind powered mobile charger converts wind energy into electrical energy using wind turbines. The generation of current increases as the speed of the vehicle increases. Consistent 5V is obtained by an IC7805. Electrical energy produced by a wind turbine has many uses. Converting wind energy into electric energy enables the user to store energy in a battery transmit it over distances or convert the energy into many different forms (mechanical energy, heat etc.). Battery charging is very popular because of its simplicity and versatility. By

understanding the basic characteristics of the components, many of the performance imitations of the system can be remedied and the optimization of the system can be explored

The model consists of five main components that are propeller, DC generator, speed sensor, battery, microcontroller, and regulator.

2. Hardware Description

Figure 1 shows the block diagram of Wind Energy Harvesting Mobile Charger.

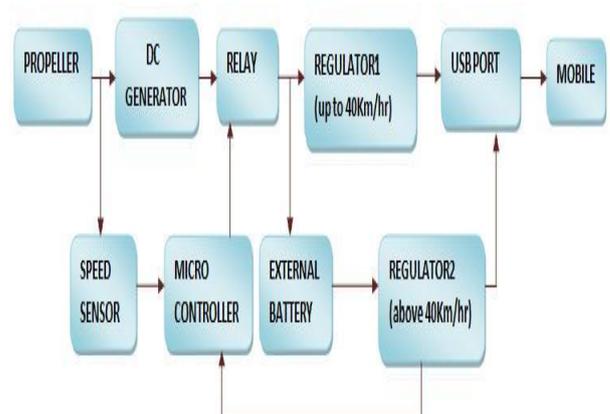


Fig. 1 Block diagram of Wind Energy

2.1 Harvesting Mobile Charger

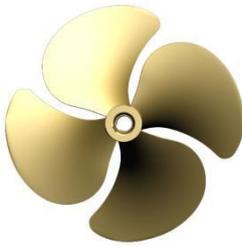


Fig. 2. propeller



Fig.3 DC generator



Fig.4. Speed sensor

The speed sensor used here is LM393. The major goal is to check the rate of an electric motor. The module can be used in association with a microcontroller for motor speed detection. In principle, any rate meter simply measures the rate at which some events occurs. Usually this is done by counting the events for a given period of time and then simply dividing the number of events by the time to get the rate. It is a simple device that yields processed pulse trains when the visual path of its optical sensor is physically interrupted by some sort of slotted wheel or similar mechanism. It commonly consists of a light emitting diode that provides the illumination, and a phototransistor that senses the presence or absence of a light.

2.2 Microcontroller



Fig. 5.pic16f877a

Microcontroller used in this system is pic16f877a. This is one of the most renowned microcontrollers in the industry. This controller is very convenient to use, the coding of this controller is also easier. One of the main advantages is that it can be write-erase as many times as possible because it use FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output.

2.3 Regulator

This system uses I.C. 7805 as a voltage regulator. This voltage regulator employ built in current limiting, thermal shutdown, and safe area protection which make them virtually immune to damage from output overload.

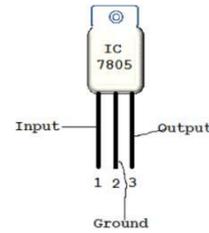


Fig. 6. IC 7805 regulator

Typical application will include local regulators which can eliminate the noise and degrade performance associated with single point regulation. As the most prominent voltage for charging the mobile phones is 5v. So, I.C. 7805 is used as a regulator.

2.4 LM317

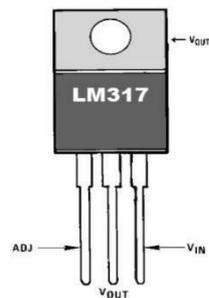


Fig. 7. LM317

The LM317 device is an adjustable three terminal positive voltage regulator capable of supplying more than 1.5A over an output voltage range of 1.25V-37V. It requires only two external resistors to set the output voltage. The device features a typical line regulation of 0.01% and typical load regulation of 0.1%.

2.5 Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts.



Fig. 8. 12V relay

The coil current can be ON or OFF so relays have two switch positions and most have double throw switch contacts. Relays allow one circuit to switch a second circuit which can be completely separate from the first. A relay used in this system is 12V SPDT (Single Pole Double throw).

2.6 External Battery



Fig.9. External Battery

External battery used in this system is Li-ion battery. It is a type of rechargeable battery in which lithium ions move from the negative electrode to the positive electrode during discharge and back when charging. Unlike other batteries, lithium-ion has built in electronic controllers that regulate how they charge and discharge. They prevent overcharging and overheating.

2.7 USB Port

A final hardware is a USB interface which shall be connected to the mobile phones. The regulated output is connected to a female USB cable. As it is only intended to data transfer via USB. Data lines of the port are left unconnected. Only power lines V_{cc} ground are used for connections.



Fig.10 USB Ports

Table 1. Pin details

Pin	Signal	Description
1	Vcc	+5V
2	D-	Data-
3	D+	Data+
4	GND	ground

3. Software Description & Working Principle

The Micro C PRO for PIC is a powerful, feature-rich development tool for PIC a microcontroller which is used in this system. It is designed to provide the easiest possible solution to develop applications for embedded systems. PIC is the most popular 8-bit chip used in a variety of applications. Micro C PRO for PIC provides as successful match featuring highly advanced IDE, ANSI compiler, broad set of hardware libraries, etc.

The wind turbine is used to convert wind energy into mechanical energy. This wind turbine is mechanically coupled with the shaft of the small permanent DC generator. This generator is used to convert the mechanical energy into electrical energy. The speed of the vehicle is not constant. So, the velocity of the wind energy is also not constant one. Due to this function the induced EMF in the machine is always variable.

The small DC machine gives 3 Volts to 24 Volts according to the wind speed velocity. This variable DC output supply will regulated by IC7805. To make the system more precise, speed of the generator is measured using speed sensor LM393, Which senses the rpm of DC generator. The sensed information is transferred to microcontroller. At this point the circuit gets divided into two. This circuit switching is performed by relay which is triggered by the control signal from microcontroller.

If the sensed rpm is below 300 relay will be in OFF state and circuit 1 will be performed else relay will be in ON state and circuit 2 will be performed.

Circuit 1: The generated voltage is regulated by using IC7805. The regulated voltage is fed to USB port.

Circuit 2: The LM317 voltage regulator is used in current regulating mode. Since the current has to be regulated before feeding it to the Li-ion battery. This battery is used to power microcontroller and to charge mobile in emergency case. The voltage from the battery is regulated using IC7805 and is fed to USB port.

4. Analysis

Table 2. Output voltage in accordance to speed

S. No.	Speed in km/hr	Output Voltage (approx) in volts	Circuit 1 (upto 40 km/hr)	Circuit 2 (above 4 km/hr)
1.	20-30	8	5 V	-
2.	30-40	12	5 V	-
3.	40-50	15	-	5 V
4.	50-60	19	-	5 V

5. Results and Discussions



Fig 11. Before charging

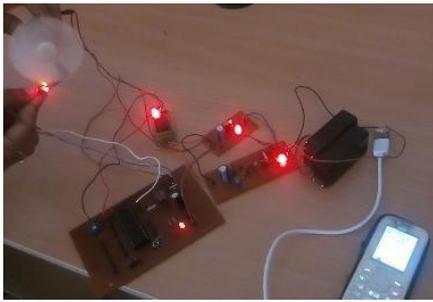


Fig.12. After charging

6. Conclusion

Wind Energy Harvesting Mobile Charger has been investigated to charge the mobile phone while travelling. This technology can help to meet the emergency power requirement when electricity is not available. The wind driven mobile charger is also portable, cost effective and energy efficient as it uses green energy to charge. By further suitable modifications the system could be used to charge gadgets for daily use. In the future work, based on this exploration, charging of laptop and other high power gadgets will be accomplished.

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