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A novel design of wind driven mobile battery charger

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***Abstract*— This paper discusses a novel type of energy converter that use wind energy technology to produce electricity. The objective is to harvest energy from low-speed wind flows in order to power mobile electronics applications devices .A DC generator and integrated circuit is used in this method at constant rate.DC motor is used as generator in the place of AC generator with a regulator circuit comprising of different components like Voltage regulator IC, Battery, Charging pin and a capacitor for ripple free voltage. The system is able to charge the battery when the vehicle speed exceeds 30 km/hr.This could be used as emergency source for charging mobile phone while travelling in a vehicle.**

***Index Terms*—DC motor, IC, Voltage, Mobile charger, Wind energy.**

I. INTRODUCTION

With the rapid industrialization, development and exploitation of natural resources. Many times condition occurs which result in non charging of our daily use gadgets and mobile. But this problem can be tackled by using renewable energy resources[1-5]Technologies like solar charger, charging pins powered through automobile battery and gadgets through hand operated dynamo through a combination of many gears are used for charging mobile phones .But a problem occurs when there is no sunlight or the light is not in a proper amount or when the automobile battery is not in a condition to charge the other one and also the use of hand operated gadget is very laborious work and also not effective for long. In order to overcome these types of problem, exploration has been carried out with mobile phone and at present we have come with a solution of maintaining sustainability of energy stored in the phone battery by "Wind Driven Mobile Battery Charger" .This concept utilises wind generated electrical energy to charge the mobile phones battery.

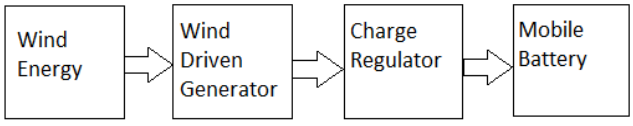

Figure 1: Block diagram of whole setup

The proposed model consists of four main components that is propeller, generator, chip integrated on PCB, and mobile set suitable charging pin.

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II. MATERIALS AND METHODS

A. Propeller

A propeller is a type of fan that transmits power by converting rotational motion into thrust. A pressure difference is produced between the forward and rear surfaces of the airfoil -shaped blade, and a fluid (such as air or water) is accelerated behind the blade. Propeller dynamics can be modelled by both Bernoulli and Newton's third law. A propeller is often colloquially known as screw. Propeller can be of two types which is shown below.

(a) 4 wing simple type (High R.P.M)

(b) Slow fly propeller (Low R.P.M)

Figure 2: Types of propeller

B. 12 volt D.C Generator

A simple D.C generator is preferred over the A.C generator so as to avoid the use of rectifier circuit and to make the circuit cheap and compact and also to avoid extra cost. The main difference in the A.C and D.C generator lies in the manner in which the rotating coil is connected to the external circuit connecting the load. In an A.C generator both end of the coil is connected to the external circuit via brushes. In this manner, the e.m.f $E_{ext.\ in\ the}$ external circuit is always the same as the emf E generated around the rotating coil. In a D.C generator the two ends of the coil are attached to the

different halves of a single split ring which co-rotates with the coil. The split ring is connected to the external circuit by means of metal brushes.

Figure 3: DC Generator

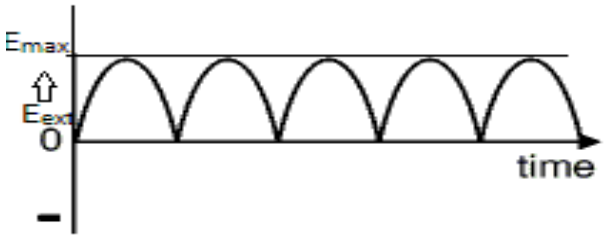


Figure 4: Sine Wave form of a DC Generator

The combination of split rings and the stationary metal brushes is called a commutator. The purpose of the commutator is to ensure that the emf $E_{ext.}$ in the external circuit is equal to the emf E generated around the rotating coil for half the rotating period, but is equal and opposite of polarity of this emf for the other half. In the special case as theoretical, the emf seen in the external circuit is simply.

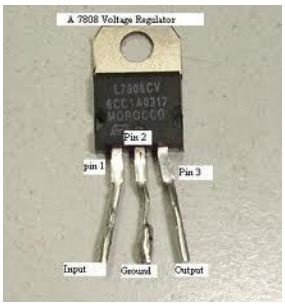
$$E_{ext.} = E = E_{max.} \sin(2\pi ft)$$

If $E_{ext.}$ plotted as a function of time according to the formula. The variation of the voltage with respect to time is very similar to that of an A.C generator, except that when the negative polarity of an A.C generator is reversed to the positive one by the commutator. So, as to avoid the use of diodes in the A.C generator D.C generator is preferred. So, as a result a bumpy direct emf which rises and fall but never changes the direction is achieved at the output terminals.

C. Charging Regulator Circuit

This is a combination of a 6v/22µf capacitor. I.C 7805, charging pin

6V/22µf capacitor: The bypass capacitor is hooked up at the output terminal of the DC generator .The capacitor is there to filter out any noise coming from the voltage source (the generator). The voltage regulator I.C will work best if a clean D.C is fed to it. To avoid any A.C noise (ripple) imposed on the D.C line voltage, the capacitor in essence act as a bypass capacitor. It shorts the A.C signal of the voltage signal (which is noise on the voltage signal) to ground and only the D.C portion of the signal goes to the regulator.



IC7805 6V/22µf capacitor

Figure 5: IC and Capacitor

I.C 7805: I.C. 7805 voltage regulator employ built in current limiting, thermal shutdown, and safe area protection which make them virtually immune to damage from output overload. With adequate heat sinking it can deliver in excess of 0.5 A of current. 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 5 Volts. So, I.C 7805 is used as a regulator.

Battery: In ordinary mobile a 3.7 volts Li^+ battery is used 3.70 Wh rating the battery when fully charged shows the voltage of about 3.95 volt and when discharged it shows 1.75 volts. .

Figure 6: Mobile Battery

Figure 7: Wind Operated Mobile Battery charger

Table 1: Specifications of the experimental setup

S. No	Module	Specifications
1.	Wind Driven Generator	Gen. voltage (12V max.)
2.	Wind Speed Range	35 kmph (min.)
3.	Bypass Capacitor	6V/22µf
4.	Voltage Controller	Ic 7805
5.	Battery	3.7V,970mAh

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III. RESULTS & DISCUSSION

The generator case installed with propeller is held in the direction of moving vehicles. The positive and negative port of the generator is identified by using the multimeter.It was found that whenever the generator is held in the same direction of moving vehicle it will rotate exactly in one direction that is the polarity of the output terminal will remain fixed and never change until the generator direction is changed. There can be two types of charging methodology one is constant current and other is constant voltage. And here the constant voltage technique is used. Constant Voltage charging, also known as constant potential charging is done with a generator. This generator produces current to charge the battery. The voltage in this type charging system held constant. With a constant voltage, the charging voltage will be high. But as the battery approaches full charge, the opposing voltage of the battery goes up and strongly opposes the charging current. The charge cannot be terminated on a voltage. The capacity reached is around 4.2 volts per cell which is only about 40 to 70 % of full capacity unless charged very slowly. For this reason charger need to charge until the current drops and to terminate on the low current. The mobile charger was tested outdoors in low & medium wind conditions. At the speed of 35 to 40 km/hr mobile battery starts charging. Graphs are drawn for charging and power developed with respect to the speed of the vehicle as shown in Figure 7 & 8

Results of the charging testing are shown in Figure 9 below. The initial battery voltage was 2.9V, and the final voltage after an eight hour charging time was 3.8V. The Battery Charge plot is an excellent representation of the phases of the battery. Phase I is seen in the initial 250 minutes of charging. Current is kept constant as the voltage of the battery increases steadily to about 3.7V. The constant voltage Phase II can be seen in the final 200 minutes of the plot. In this phase, the battery voltage remains constant as charge is deposited and stored.

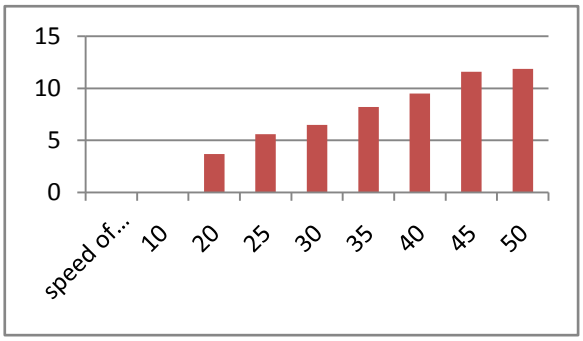

Figure 7: Vehicle Speed Vs EMF without using IC 7805

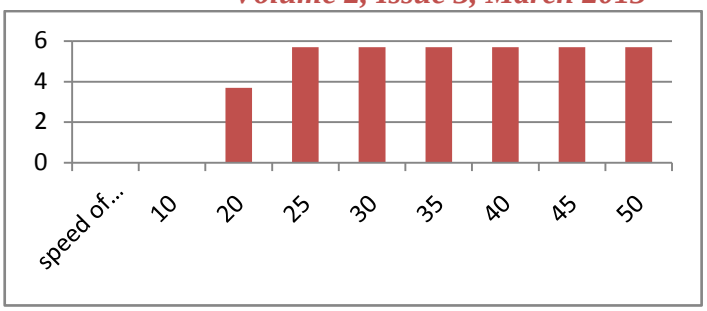

Figure 8 : Generated Voltage Vs Vehicle Speed with using IC 7805

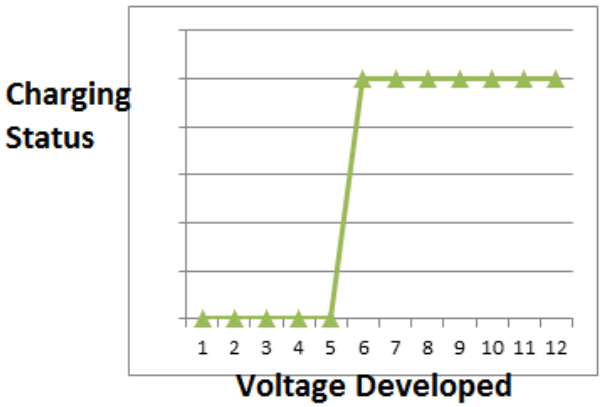

Figure 9: Battery Charging Status

IV. CONCLUSION

Use In this work a wind battery charger has been investigated to charge the mobile phone or battery while travelling .This technology can help to meet the emergency power requirement when grid electricity is not available. The wind driven mobile charger is also portable, cost-effective and energy efficient .By further suitable modifications, the system could be used to charge gadgets for daily use.

REFERENCES

[1] S.N. Singh ,Sumit Kumar Jha, Sudhir Kumar Sinha," 2011, Wind driven mobile charging of automobile battery .International Journal of Engineering Science and Technology (IJEST) : (3):1:68-74,

[2] Daniel S. A.and Gaunden,N.A. 2001, A stand alone integrated array wind turbine gen and photovoltaic-array in feed-forward controlled PWM inverter*", Proceedings of the International Conference on energy, automation and information Technology(EAIT 2001)*, Indian Institute of Technology, Kharagpur, India, pp. 667-670.

[3] Eltamaly, A. M. 2005 Modelling of wind turbine driving permanent magnet generator with maximum power point tracking system, *Proceeding of 2nd MInia International conference for advance Trends in Engg (MICATE2005)*, Elminia, Egypt.

[4] Muljadi, E., Piercek, K.and Migliore,P. 1998 Control strategy for variable speed Stall regulated wind turbines , National Renewable Energy Laboratory 1617 Cole Boulevard Golden, Colorado 80401-3393.

[5] Rizk, J. and Nagriak, M.H..2010 Design of permanent magnet generator for wind energy application, Power Electronics, Machines and Drives (PEMD2010) *5th IET International Conference*, Australia.