International Journal of Current Science Research
www.drbgrpublications.in

Volume: 4; Issue: 4; April-2018; pp 1548-1559. ISSN: 2454-5422

# Bi device unit using wind energy and solar energy during the bike journey

N.Guru Saran[1*], K.Nagarajan[2] and N.Jeyakumaran[3]

[1]XII Student, K.V.S. Matriculation Higher Secondary School, Virudhunagar, India
[2]Associate Professor, PG & Research Department of Zoology, VHNSN College, Virudhunagar, India
[3]Associate Professor, PG & Research Department of Physics, VHNSN College, Virudhunagar, India
*Corresponding Author E-mail: gurunagan@gmail.com

## Abstract

Wind energy alone can generate 5.8 voltages by the rotation of fan at 60 km/hour to 70 km/hour speed of the bike. Mobile phone got charged at this speed. In the present study, when Solar panel fitted along with the rotor fan to the unit, the bidevice unit with both wind energy and solar energy charged the built-in rechargeable battery by an increased voltage of 6.8 volt at the same bike speed from which the mobile phone can be charged. As a second benefit the voltage produced by the solar panel can be also used for the rotation of Handy fan when switched on. Therefore the present investigation was a worthy one as bidevice unit at cheaper cost.

## Introduction

Energy can be defined based on the context such as thermal energy, radiant energy, electromagnetic energy, nuclear energy wind energy etc. Increase in the global energy demand will arise dramatically by the year 2050 and oil can only supply the world for up to 150 years due to the population burst exploiting the natural resources up to its core (Ali Etamaly, 2001). Electrical energy is the transformation of Wind and heat energy by the rotation of turbine, steam and thermal systems (Daniel and Gaunden, 2001). An investigation of a unit must possess multiple constructive systems for the human benefits. Combination of the wind energy and solar energy for the innovation study is inevitable now days. Solar energy a renewable energy must be utilized for the up gradation of technology. Sunlight provides by far the largest of all Carbon neutral energy source. Solar energy conversion systems are solar electricity, solar fuels and solar thermal systems. Challenge in converting sunlight to electricity via photovoltaic cells is drastically reduces the cost/watt of delivered solar electricity by approximately a factor of 5-10

to compete with fossil or nuclear electricity (Nathan Lewis, 2005). Backed up by these facts in mind, science has started emphasizing upon sustainable development and has come up with advanced methods of energy and technologies are also being implemented in almost all sectors. Whether it is a power generation by hydro projects or use of large scale solar panels, these technologies are being used in extensive scale. Literature studies reveals that the enormous work have been done on conversion of energy by using wind turbines, steam turbines and magnetic power generator to generate electricity (Eltamaly, 2005; Rizk and Nagriak, 2010; Singh *et al*., 2011). Wind energy can be transformed into electrical energy by the rotation of fan or turbine. Sun transforms nuclear potential energy to various forms of energy. Rotation of wind mill leaves and leaves of wind mill and fan generated electricity. Wind energy is a form of kinetic energy. Wind energy describes the process by which wind is used to generate electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. A generator can convert mechanical power into electricity.

## Solar Energy

Light source from the sun is utilized for various purposes. Sun light possess a quantum of energy which is dissipated to different objects. Utility value of the rays from the sun by the objects depends upon the living or non-living things. In living things both the plants as well as animals make use of the sun light energy for various physiological activities. A physics engineer focuses these light rays in different ways. Solar energy conversion to electrical energy is inevitable now days. As a compensation of electricity produced from the non renewable source such as coal, fossil fuels and nuclear materials, solar energy can be exploited. Solar energy is a renewable source therefore

* an attempt was made to exploit the sun light for the invention of a mobile charger.
* a maximum exposure to the sunlight by the solar panel paves the way for the excessive generation of electricity. This was attempted by inventing a charger unit during the bike journey.
* This is an alternative device to cut down the electricity usage in the house thereby electricity wastage in the house is prevented.

## Smart Energy - Producing Buildings

Energy efficient measures like improved insulation, heat pumps and PV panels are common place. In a house for various purpose we are lavishly procure as much as electricity. For example

to switch on the light we are lighting 4 to 5 bulbs at a time on an average. We use 2 to 3 fans at a time and even more number of times during the summer. Handling the iron box, kitchen oven, air conditioners, refrigerators etc. On an average in a house with full facility it runs to about 200 to 300 units per month. Considering the mobile charging per day in a house minimum of 3 mobile phones were charged. This may consume minimum of 2 units per day. Therefore for 60 units/month the electricity bill charged will be Rs3/ x 60 units =Rs.180/ per month.

Now a day's usage of electricity is enormous. Due to population explosion the utilization of electricity is increasing and the prevention of wastage was not possible. In day today life activity, human being is pronged to lead a comfortable and luxurious life. To meet out the demand of electricity, it is the need of the hour to produce more electricity on one hand and controlled usage of electricity on the other hand. Therefore every attempt of remedies has to be taken to cut down the usage of electricity in the house in near future.

In order to cut down this electricity wastage and cut down in the electricity bill amount, an alternative device was invented in my present study. Energy performance of whole buildings is inevitable now a day, but in spite of all these facilities as shown in the picture, we are lacking in the utilization of electrical energy during our journey trip by motor bike. An attempt was made to study the utilization of wind energy conversion to electrical energy during the bike ride step to obtain smart energy external to our home. "HOME away from HOME".

Due to the convertible nature of energy, its utilization is of high value and hence can be promoted economically, for the benefit of human society. As a part of non-pollution today with the advancement of technology in automobile sector a large range of automobiles are being produced which run on battery. Singh (2011), studied the Wind driven mobile charging of automobile battery. Desining (2013) reported the Digital Energy Meter to measure the electrical energy. However, so far no work has been reported in the generation of electricity by combining the two resources such as in energy and solar energy. Therefore in the present investigation by exploiting the Wind energy and Solar energy mobile phone charging was attempted during the bike drive. This study was performed to conserve the electricity and make best utilization of the renewable resources at cheaper cost.

## Origin of the Project

Electric chargers for fan, for mobile phones, LED light system, power pack, car etc. were in the progress in the present day situation. Need for the human society is cropping up generation after generation. Usage of the energy from household purposes to charge any devices may shoot up the electrical energy consumption. Economic status of a mediocre family will be disturbed and they could not cope up with the increased electricity bill. Common people have to face the following drawbacks also in their costly life style.

1. Charging the Mobile phones in home leads to excessive utilization of electricity.
2. At present Charging the mobile phones may curtail the life of the vehicle battery
3. Discharge of the power of the battery in a vehicle leads to more consumption of petrol

An alternate source or remedy has to be made for this heavy loss of electric energy for the simple process of Mobile charging. Therefore it was planned to convert the "WIND ENERGY and SOLAR ENERGY TO ELECTRICAL ENERGY", for mobile charging from the Wind and Sun light respectively during the Bike ride.

Investigation was done in the present study keeping the following criteria in the mind,

* Mobile charger in the bike to reduce the excess time consumption in the house.

* To reduce the power pack usage during the drive.

* Benefits of LED bulb light, Handy fan in addition to mobile charger is attempted

Globally for the people it is a fast moving world, people are often behind the instant facilities. Globally any commodities preferably must be reaching the common people at cheaper cost. Application of scientific theories for the construction of any devices for the betterment of human society is always a welcome note in the world scenario now a days. Charging the mobile with the solar panels, with the batteries and USB port attached vehicles linked to the battery of a vehicle is available, but work on the mobile charging from the wind energy during the bike drive is lacking therefore, a novel attempt was made in the present investigation to find out the possibility of charging the mobile phones or smart phones in the motor bike during the ride itself in the National Highway road by studying the following objectives

Wind----------→ Mechanical energy-------→Electrical energy--------→Charge the mobile

Sun light-----→ Storage device----------→Electrical energy-------→Charge the mobile

## Materials and Methods

In the previous investigation by Guru Saran *et al.*, (2017) a prototype mobile bike charger have been done. But in the present study addition of the following tools have been included as an attempt to have more benefits out of solar energy.

**1. 9 volt Dynamo:** Capable to work 9V electricity. It is a in built coil dynamo which is capable of producing electricity up to 9V at the speed of bike 70 km/hr (wind speed). Fixed in a stand mounted to the box.

**2. USB Port**: Gives 6V output from the motor to the Phone charger cable. Connected to the 9V rechargeable battery as well as to the dynamo.

**3. Solar panel**

Other materials used in this unit to get bidevice condition are a fan with 3 leaves. Each leaf is made up of strong plastic blue colour. Radius of fan is 8 cm. Fan is attached with 9V Dynamo. The overall unit is attached to the wooden box which contains PCP Circuit board; 9V DC motor gives the volts produced in 9V DC Motor. Mobile charger with capacity of charging the mobile phone of 3-5 volt. A charger having the range of 3-5 volt can charge the mobile. Charger must have enough wire cord length so that it can be of maximum distance between the mobile and the unit. Mobile phone of high sensitivity is used in the present study. Micromax luminous model with the charger is tested. In addition to all these tools following materials are added in this unit for the benefit of two more additional benefits.

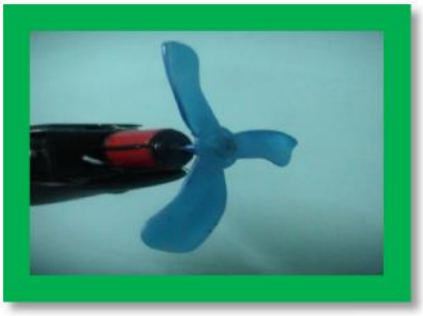
## Procedure

A unit was assembled with the help of a metal box. Inside the metal box a 9 volt DC motor in front end of the box. Leading from the edge a plastic fan was attached above the box. PCB was connected with a motor inside the box. From the PCB the wire was connected to the USB port at the fag end opposite to fan inside the box. External battery and rechargeable battery was connected in between the motor and USB. USB port holder was fixed on the top surface of the

unit. Holder can be plugged with a charger and connected to a Android mobile phone for charging

## Tools for the Bike Mobile Charger

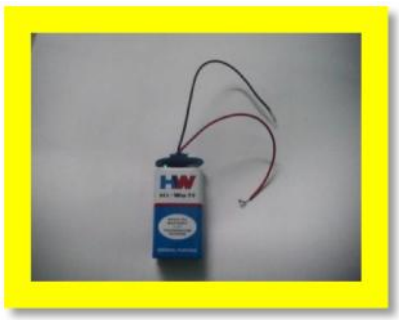
**3 leaf Fan**



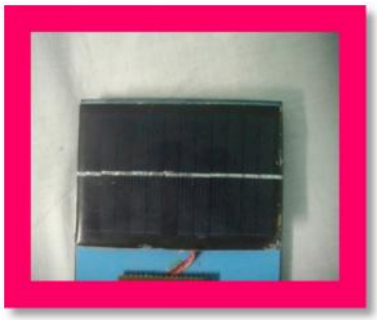
**Bidevice unit**

**Rechargeable Battery**

**External Battery**



**Solar panel**



## Experimental Trial: I – Testing with Moped Bike using Single device (Rotor fan)

Single device unit was fitted on the Handle bar of the Moped bike and tested the drive. With the help of multimeter and wind meter the speed of the bike was recorded. The voltage was recorded in the multimeter. Bike driving was done continuously for one hour. Bike was driven and tested on all the Northern, Southern, Eastern and Western directions. A recording was recorded in the Table.I. Experimental trial was done for three times in every directions and average value was taken. Wind speed was measured with the help of multimeter and speed of the vehicle from the speedometer of the bike was noted. At different speeds of the bike the mobile charging was tested. When mobile phone was started charging immediately the bike speed as well as the wind speed was also recorded.

## Experimental Trial: II – Testing with Bidevice unit (Rotor fan + Solar panel)

New version of Bidevice unit was fitted on the Handle bar of the Moped bike and tested the drive. The same experimental trial I was carried out and recorded in the Table.II.

**BIDEVICE UNIT WITH ROTOR FAN (Wind) & SOLAR PANEL (Solar)**

## Result

### Experimental Trial. I

At the speed of moped bike with the wind of 35 km/hr average current produced was 2.1 volt. At the speed of the wind 45km/hr was 3.2 volt, at the speed of the wind 52 km/hr average current produced was 3.9 volt. at the speed of the wind 65km/hr average current produced was 4.9 volt at the speed of the wind 72 km/hr average current produced was 5.7 volt Experimentation was done three times for each and every speed of the vehicle generation of the current is directly proportional to the Speed of the vehicle **(Table.I ).**

### II. Experimental trial. II. with the Bidevice unit

In all the directions the voltage produced by the bidevice unit was found to be increased.
The voltage raise form the value of 4.8v to 6.5 from 4okm/hr speed to 70km/hr.
Comparatively the voltage produced by the bidevice unit was higher than the prototype unit.
Voltage produced by the device is 1 to 2 volt higher than the prototype unit

### II. Trial with HANDY FAN

**FAN**: A fan with 3 leaves. Each leaf is made up of strong plastic blue colour. Radius of fan is 8 cm. Fan is attached with 9V DC dynamo.

**External High volt Battery**: This battery is directly connected to rotor fan. It will supply the electric current of 12 volt output to the handy fan.

**Graph.I.** reveals that with the single device unit (Solar energy only) at the speed of the bike as proceeds from 30km/hr to 70 km/hr rise in the voltage from 3.8 to 5.8 was observed in all directions. Higher voltage of 6.0 volt was found at the speed of 60 to 70 km/hr towards Southern direction. Lower voltage of 3.5 volt was found at the speed of 40 to 50 km/hr towards Western direction.

**Graph.II.** reveals that with the Bidevice unit (Wind energy + Solar energy) at the speed of the bike as proceeds from 30km/hr to 70 km/hr rise in the voltage from 4.8 to 6.8 was observed in all directions. Higher voltage of 6.8 volt was found at the speed of 60 to 70 km/hr towards Southern direction. Lower voltage of 4.8 volt was found at the speed of 40 to 50 km/hr towards Northern direction.

## Discussion

Minimum of 5 volt is required to charge a mobile phone. Saikumar Pattabiramamn (2014) reported, Bike moped at the speed of the wind 52km/hour the current produced in the unit was 4.1 volt, at the speed of the wind 65km/hour average current produced was 5.0 volt and at the speed of the wind 72km/hour current production was 5.0 volt and gradually increased to 5.8 volt at the bike speed of 75km/hour. Same trend was obtained in the present study. By putting input voltage Singh *et al* (2011), observed the generation of current voltage up to 13 volt for 20 and 30 volt input current. In the present work with the help of the inbuilt battery form the solar charging 6.5 volt current was produced by the bidevice unit. Additional features of solar panel and inbuilt rechargeable battery may be the reason for the increased voltage production.

Battery is involved in the present work by directly obtainining current from the wind of beyond the speed of 70km/hour thrusting the close association between the speed of the wind and electricity produced. This findings was supported by Muljadi *et al*.,(1998). Wind turbines can be regulated by the control strategy for variable speed with the help of capacitors the electricity of more than 5 volt was produced even at the speed of 45km/hour (Sudhakar and Priyanka saxena, 2017). Solar energy produced from the solar plate is an additional feature for the generation of voltage by the wind energy is clearly proved from the present study. Previous study reported that

lesser voltage was produced by the only wind energy device in all the different speed of the bike (Guru Saran *et al*., 2017). But in the present investigation one voltage in addition was generated by the combination of both wind energy and solar energy.

## Conclusion

Rotation of fan by the Bike charger unit produced 5.8 volt at 70 km/hr which is sufficient to charge a mobile phone. Solar panel can be used as a combined structure to charge the rechargeable battery for which the mobile phone can be charged. By the bike speed of 60 to 70km/hr generated the voltage of 6.8volt and charging of the mobile phone can be done at cheaper cost. In Bidevice unit of addition of Handy fan can be also used directly from the external battery component as a second facility for the user. Therefore as a bidevice unit is of high importance for the bike riders. By the utilization of Wind energy and solar energy Mobile can be charged, LED bulb can be lighted and Rotor fan can be also used as Handy fan. This is a new invention at cheaper cost.

## Reference

Ali.M.Eltamaly, 2001. Modelling of Wind turbine driving permanent magnet generatator with maximum power point tracking system Elminig, Egypt.

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 Int. conference on energy, automation and Information technology, Kharagpur, India, 667-670

Desining .A. 2013. SEPIC converter by Dongbing Zhang from texas instruments

Eltamaly, A.M. 2005. Modeling of wind turbine driving permanent magnet generator with maximum power point tracking system. Proceeding of 2nd MInia International conference for advance trends in Engg. Elminia, Egypt.

Guru Saran, N. Nagarajan.K and T.PonPandi. 2017. Mobile charger from wind energy during bike journey. *International Journal of Current Science Research*, 3(2): 1113-1121.

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

Nathan.S Lewis, 2005. Basic Research needs for Solar Energy utilization. Report of the Basic Energy Sciences Workshop on Solar Energy Utilisation, April: 18-21.

Rizk, J.and Nagriak, M.H. 2010. Design of permanent magnet generator for wind energy application, power Electronics, Machines and Drives. 5th IET Int. Conference, Australia.

Saikumar,P. Tahamaraikannan,D.Yuvaraj,G. 2014. Wind Energy Based Mobile Charging and Battery Applications. *Int. J. Res. & Development in Engg.* ISSN: 2279-0500: 006-011.

Singh. S.N, Sumit Kumar Jha, Sudhirkumar Sinha, 2011. Wind driven mobile charging of automobile battery. *Int. J. of Engg. Sci. & Technol*. (IJEST) (3): 68-74.

Sudhakar,K and Priyanka Saxena. 2013. A novel design of wind driven mobile battery charger. *Int. J. Sci. Engg. & Technol. Res.*

**Table-I. Experimental Trial. With the help of Single device (Wind energy)**

| Sl.No. | Speed of the Wind (Km/hr) | Replicates | Acceleration of the Moped Bike (Km/hr) | Voltage produced (Volt) | Average voltage produced (Volt) |
|---|---|---|---|---|---|
| **1** | 52 | 3 | 50 | 4.3 | |
| **2** | 52 | 3 | 50 | 3.5 | **3.9** |
| **3** | 52 | 3 | 50 | 3.9 | |
| **4** | 65 | 3 | 60 | 4.7 | |
| **5** | 65 | 3 | 60 | 4.2 | **4.9** |
| **6** | 65 | 3 | 60 | 4.8 | |
| **7** | 72 | 3 | 70 | 5.7 | |
| **8** | 72 | 3 | 70 | 5.6 | **5.7** |
| **9** | 72 | 3 | 70 | 5.8 | |

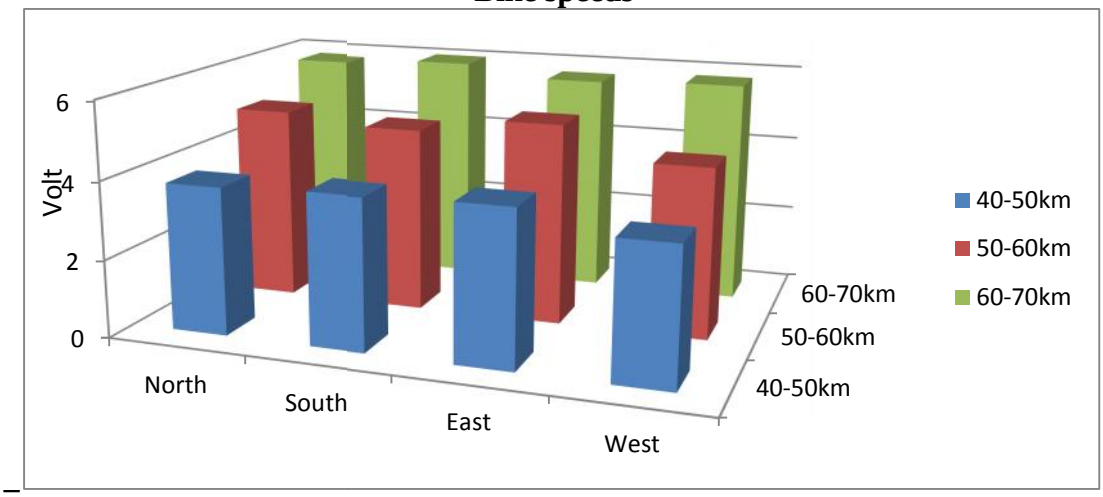
**Average of 3 replica**

**Table. II. Comparison of voltage current produced by the Single unit (Solar energy unit) and Bidevice unit (Solar & Wind energy)**

| **Bike Speed→** | **40 to 50 km** | | **50 to 60 km** | | **60 to 70 km** | |
|---|---|---|---|---|---|---|
| | **Prototype (Volt) (Wind energy)** | **Bidevice (Volt) (Wind & Solar energy)** | **Prototype (Volt) (Wind energy)** | **Bidevice (Volt) (Wind & Solar energy)** | **Prototype (Volt) (Wind energy)** | **Bidevice (Volt) (Wind & Solar energy)** |
| **NORTH** | **3.8** | **4.8** | **5.0** | **6.2** | **5.8** | **6.5** |
| **SOUTH** | **3.9** | **5.2** | **4.8** | **6.5** | **6.0** | **6.8** |
| **EAST** | **4.0** | **5.0** | **5.2** | **6.3** | **5.7** | **6.6** |
| **WEST** | **3.5** | **4.9** | **4.4** | **6.0** | **5.5** | **6.3** |

**Average of THREE trials in each directions**

**Graph-I. Voltage produced by the Solar Energy Unit to Different Bike speeds**




**Graph-II. Voltage produced by the Solar & Wind Energy Unit to different Bike speeds**