Impact Factor (SJIF): 3.632

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444
(Special Issue for ITECE 2016)

Improvisation Of Elecric Car Efficiency With Use of Renewable Energy Sources

Sapariya Jay V.
B.E. (Electrical),Om Engineering College,Junagadh, India
Gajera Vishal C.
B.E. (Electrical),Om Engineering College,Junagadh, India
Kalariya Ankit R.
B.E. (Electrical),Om Engineering College,Junagadh, India
Gediya Keyur M.
B.E. (Electrical),Om Engineering College,Junagadh, India
Pradip B. Vala
B.E. (Electrical),Om Engineering College,Junagadh, India

Abstract— Now-a-days, dealers of natural resources like fuel, coal, etc. are facing a hard time to keep pace with the increasing demand. Therefore, to carry out this demand it is quite necessary to make a new exploration of natural resource of energy and power. The main motto of this project is to use the wind energy and store the energy of it in a battery. This concept can be used in a car to keep the battery on a trickle charging mode. So the overall efficiency of the car is improved. The future scope is to use this concept with the solar plate so a hybrid of renewable energy sources can be used to charge the battery. So, due to this the whole car battery can be charged and car can be run with maximum efficiency.

Keywords— Improvisation, efficiency ,Electric Car ,Renewable energy ,Trickle Charging

I. INTRODUCTION

An electric car is an automobile that is propelled by one or more electric motors, using electrical energy stored in rechargeable batteries or another energy storage device. Electric car will have high scope in future time because in some year there will be short of oil, gases, coal and other sources. Electric cars are typically easy to drive, perform well, and are significantly noiseless than diesel or petrol car. They also do not emit pollutants giving a large reduction of local air pollution and, in many cases, a large reduction in total greenhouse gas and other emissions There are many device used in electric car such as electric motor, battery, control system. The electric car can be driven by using the battery as a supply to the system. The drawbacks of electric car are battery discharge time is very fast, so we can't travel for a long distance. So we are working on improving the efficiency of the battery by using renewable energy, so that car can run more efficiently. There are many renewable resources are available, such as Hydro, Wind, Solar, tidal, etc. so, In this application we can use wind or solar energy we are using wind energy to charge the battery.

II. MATERIAL AND METHOD

A. Material:

The basic materials that are used in electric car are lead-acid battery, induction motor, controller, generator with propeller, charging circuit. We have analyzed many electric car parameters like its speed, battery charging time, efficiency, weight, torque, etc. after this analysis We are selecting the Mahindra Reva e2o because its efficiency is lower than the other cars and the details of this car is shown in the table.

Height	1560mm
Length	3280mm
Width	1514mm
Weight	830kg
Power	19kw at 3750 rpm

Torque	53.9 N.m
Battery	48v li-ion
Transmission	Auto
Charging time	5 hours
Top speed	81kmph
Wheel diameter	13inch

Table2.1 Specification of Reva e2o car

B. Methods:

There are many renewable resources available which we can use such as wind, solar. We are using wind resource because the energy generated is much more and when vehicle is in running condition we can get maximum power output.

In this project we calculated all the parameter of the electric vehicle and when the speed reaches to 40km/s, the propellers receive enough pressure to activate the generator [2] and generation of electricity get started. There are two types of propeller

(1)Vertical axis wind turbine
(2)Horizontal axis wind turbine

We select horizontal axis turbine because maximum output can be obtained on the shaft of generator. We are placing these generators on the roof of the vehicle so that maximum wind strikes on the blades of propeller. As the number of blades increase then the output of propeller increases [4].

Figure2.1 position of the generator

When the car is in running condition following forces affects the car and all parameters as below. [1]

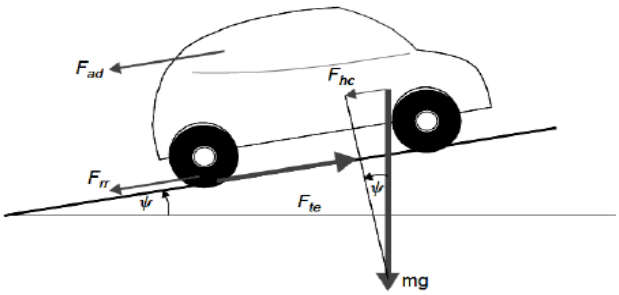

Figure2.2 Forces on electric vehicle

1. Rolling Resistance

$$F_{rr} = \mu_{rr} mg$$

Where Frr is the rolling resistance force, m is mass of vehicle, g is the gravity and μrr is the coefficient of rolling resistance.

2. Aerodynamic drag

$$F_{ad} = \frac{1}{2}\rho A C_d v^2$$ [5]

Aerodynamic drag is the force on the vehicle that caused by the vehicle aerodynamic. This force is determined by the shape of the surface of the vehicle (*A*), drag coefficient of (*Cd*), velocity (*v*) and air density (*ρ*).

3. Resolution force

$$F_{hc} = mg\ \sin(\psi)$$

Where Ψ is the Slope
But as we have considered straight road so the value of Ψ is 0.

4. Acceleration force

Acceleration force is the force required to increase the speed of the vehicle. If the linear acceleration of the vehicle according to Newton's second law is:

$$F_{la} = ma$$

5. Angular acceleration

$$F_{\omega a} = I\frac{G^2}{r^2}a$$

Where I is the moment of inertia = 4.17, G is gear ratio = 1

Total tractive force:-

$$F_{te} = F_{rr} + F_{ad} + F_{hc} + F_{la} + F_{\omega a}$$

By this equation we can find all the forces that affect the car in running condition and the values are as given below:

Rolling resistance	16.268N
Aerodynamic drag	48.938N
Resolution forces	0
Acceleration force	922.222N
Angular Acceleration	169.810N
Total Tractive force	1157.238N

Table2.2 forces on vehicle without regenerative system.

Form the above value the Efficiency of the vehicle is

Efficiency = Pout/ Pin
= 67.6%

Now, when we place the generator on the roof of the car than due to weight increase to 2kg so some parameters get affected and the value of it is as below:

Rolling resistance	16.111N
Aerodynamic drag	48.938N
Resolution forces	0
Acceleration force	929.520N
Angular Acceleration	169.810N
Total Tractive force	1164.379N

Table2.3 forces on vehicle with regenerative system.

The efficiency from above parameter can be given

Efficiency= 86.7%

III. SIMULATION AND RESULTS

The MATLAB model of this system is as below:

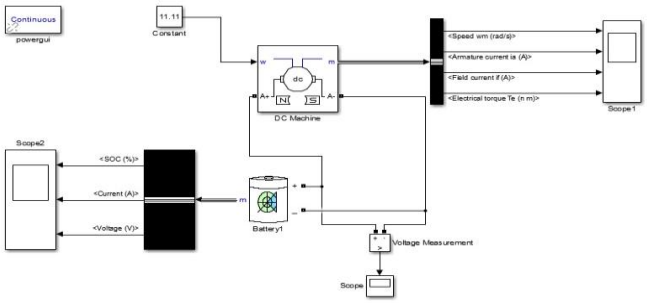

Figure2.3 Matlab simulation of Regenerating system

The output waveform of generator, SOC & battery charging are as below:

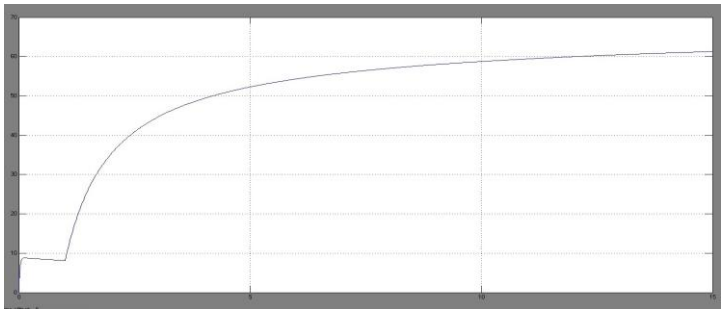

Figure2.4 Output waveform for generator

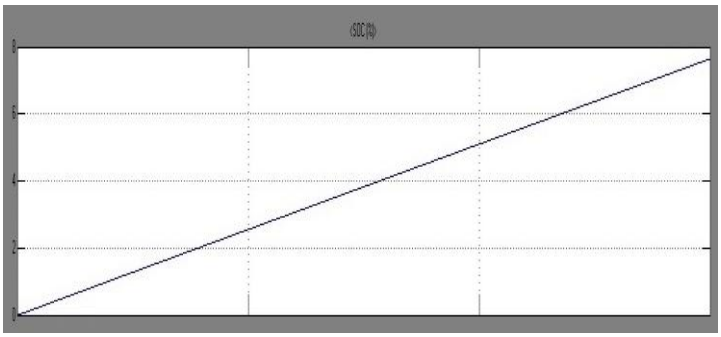

Figure2.5 Output waveform for State of charge (SOC)

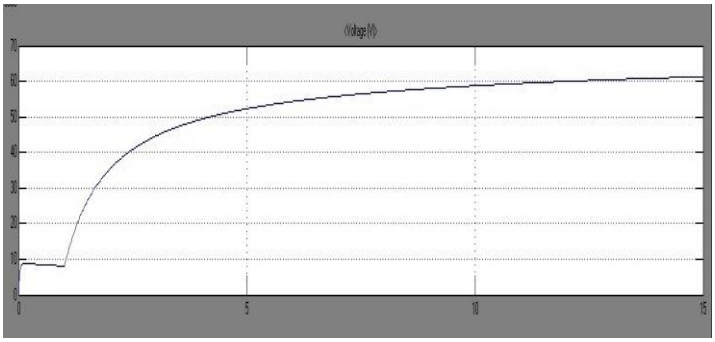

Figure2.6 Output waveform for battery charging voltage

IV. FUTURE SCOPE

- The future scope of this project is that we are going to use solar plate on the roof of car and the energy generated by that will be used to charge the battery [3].
- The other scope is that piezoelectric sheet will be used inside the wheel so when car will run it will generate the energy and charge the battery.
- By using wind, solar and piezoelectric as a hybrid energy source we will charge battery and the efficiency of the car increases.

CONCLUSION

We concluded that if we use regenerative system then the efficiency of the car can be increased by 19.10%. By this regenerative system vehicle can travel more 53.05 km. if we use more regenerative system then efficiency is more increase.

Acknowledgment

This paper work would not have been possible without the kind support of many people. I take this opportunity to acknowledge that who has been great sense of support and inspiration thought the paper work successful.

There are lots of people who inspired me and helped, worked for me in every possible way to provide the details about various related topics thus making paper success.

I am very grateful to our H.O.D. Mr. .M. M. Baraiya & Guide Mr. P. B. Vala, for his guidance, encouragement and support during my study. Despite his busy schedule, he is always available to give me advice, support and guidance during the entire period of my study. His insight and creative ideas are always the inspiration for me during the work.

I am also grateful to our principal Prof. C.N.Jasani (Director) OM Engineering College Junagadh, for his kind support along with his valuable guidance has been instrumental in the successful completion of this project.

Last, but not the least, I want to thank my college, Om Engineering College, Junagadh, for giving me this opportunity to work in the great environment.

References

[1] Bambang Sri Kaloko, Soebagio and Mauridhi Hery Purnomo, "Design and Development of Small Electric Vehicle using MATLAB/Simulink," Dept. of Elect Eng., University of jember, postgraduate student in Instiute of Technology 10 Nopember, Indonesia.

[2] Laurent Michaud, Denis Blanchette, Joann Michaud, "Propuision and recharge system for an electric vehicle with a propeller system" US Patent No.: US2005/0103537 A1, Laurent michaud, 8240 Laferte, Saint-Leonard, QC H1P-2N9 (CA).

[3] Awash Tekle, "Renewable Energy Use for Continuous Electric Vehicles Battery Charging Capacity in Mobile" School of Mechanical and Industrial Engineering, Institute of Technology, Hawassa University, P.O.Box 05, Hawassa, Ethiopia.

[4] Philip C. Damron;~ Jane L. Damron, "propeller wind charging system for electrical vehicle" US patent No.:5920127. 1611 Edwin Ave., woodland, calif. 95695.

[5] Wei Zhan, "Requirement Development for Electrical Vehicles Using Simulation Tools" Member, IAENG, Make McDermott, Behbood Zoghi, and Muhammad Hasan. Proceedings of the World Congress on Engineering and Computer Science 2009 Vol II WCECS 2009, October 20-22, 2009, San Francisco, USA