FABRICATION AND ANALYSIS OF SELF CHARGING ELECTRIC CAR

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Abstract - *Electric vehicles (EVs) have emerged as a promising alternative to gasoline-powered vehicles, owing to their environmental friendliness and lower operating costs. However, one of the major challenges faced by EV owners is the need for frequent charging, which limits their range and convenience. In recent years, self-charging electric cars have been developed as a potential solution to this problem, which can help to extend the range of EVs and reduce the dependency on external charging infrastructure.*

This research paper explores the concept of self-charging electric cars, their working principles, and potential benefits for sustainable transportation. The paper also provides an overview of various self-charging technologies, such as solar panels, regenerative braking, and thermoelectric generators, which can be integrated into EVs to generate electricity on-the-go. The paper analyzes the feasibility and limitations of self-charging electric cars, and presents case studies of successful self-charging EV models. Additionally, the paper examines the potential environmental and economic impacts of self-charging EVs, such as reduced greenhouse gas emissions and lower cost of ownership. The findings of this research paper suggest that self-charging electric cars have the potential to revolutionize the EV market and significantly contribute towards sustainable transportation. However, further research and development are needed to improve the efficiency and reliability of self-charging technologies and to address their limitations.

Key Words**: Electric Car, Self charging, EVs, Charging technologies, Solar panels etc.**

1. INTRODUCTION

The growing concern over climate change and the depletion of fossil fuel resources has driven the world towards sustainable transportation solutions, and electric vehicles (EVs) have emerged as a promising alternative to gasoline-powered vehicles. EVs offer several benefits such as lower carbon emissions, reduced noise pollution, and lower operating costs. However, one of the major challenges faced by EV owners is the need for frequent charging, which limits their range and convenience. To overcome this limitation, self-charging electric cars have been developed as a potential solution, which can generate electricity on-the-go and reduce the dependency on external charging infrastructure. Self-charging technologies such as solar panels, regenerative braking, and thermoelectric generators can be integrated into EVs to generate electricity from renewable sources and provide a continuous supply of energy.

This research paper aims to explore the concept of self-charging electric cars, their working principles, and potential benefits for sustainable transportation. The paper will analyze the feasibility and limitations of self-charging technologies and provide an overview of successful self-charging EV models. The paper will also examine the potential environmental and economic impacts of self-charging EVs and their contribution towards achieving sustainable transportation. The findings of this research paper will provide insights into the potential of self-charging electric cars to revolutionize the EV market and contribute towards sustainable transportation.

2. LITERATURE REVIEW

1) Kannan Shrinivasa Using two auxiliary power sources, Jeyakanthan, Sudharshan (2017) "Design and Fabrication Of Self-Charging Electric Vehicle" has created a self-charging electric vehicle that produces the electricity needed to power it while it is operating. Two power sources are used by the car: a horizontal windmill situated in front of it and a dynamo that is directly connected to the driving motor. A current regulator is used to control the power source so that the battery can be charged concurrently.

2) Suhas V, Sukeerth Calastawad, Phaneesh M, and Swaraj S (2015) "Performance Of A Battery Electric Vehicle With Self Charging Capacity For Its Own Propulsion" In this

work, they designed and built a self charging system for 2 passengers and for weight up to 250 kg. They created an electric vehicle similar to readily available golf carts on the market.

3) "Constant Electricity Generation From Self Charging Inverter" by Abatan O.A., Adewale A.O., and Alibi A.A. (2008) focuses on the self charging inverter, a cheap, silent, emission-free, and uninterrupted alternative source.

4) "Battery Electric Vehicles Performance, CO2 Emissions, Lifecycle Costs And Advanced Battery Technology Development" by Daan Bakker (August 2010).

3. PRESENT WORK

In our project, we utilized a 1000 watt dual shaft 48v DC motor. One of the shafts provides power to the back wheels while the other is connected to a dynamo via belt drive. The dynamo's output is directly linked to five 12v, 35 Ah batteries, which are connected to a controller rated at 48v - 72v. This controller governs all of the car's operations. With the use of five batteries, the car's speed can reach up to 60kmph without the dynamo and 50kmph when the dynamo is connected. The car can accommodate four people under full load conditions. All of the components have been assembled, and the car is ready to move; only some finishing work remains to be completed.

3.1. DIFFERENTIAL

A solid differential makes up the E-rickshaw model that is being proposed. The E-rickshaw's back axle is coupled to this differential. Heavy loads can be supported by this disparity. The differential supports the car in a variety of driving circumstances and easily accomodates road sways. The vehicle's ability to turn without skidding is due to the differential. The motor uses the power produced by the batteries. The differential receives this power from the engine, which then divides it effectively into equal amounts and sends it to the wheels.

Figure 01- Differencial

3.2. A DC- An electrical device known as a DC motor transforms electrical energy into mechanical energy. A current-carrying wire encounters a mechanical force whenever it enters a magnetic field; this is the fundamental operation of a DC motor.

Figure 02- Motor

3.3. LEAF SPRING

A straightforward type of spring frequently utilized for the suspension in wheeled vehicles is the leaf spring. One of the earliest types of vehicle suspension is the laminated or carriage spring, also known as a semi-elliptical spring, elliptical spring, or cart spring. A leaf spring is made up of one or more thin, arc-shaped, narrow plates that are fastened to the axle and chassis so they can bend vertically in reaction to imperfections in the road surface. Although transverse leaf springs are also widely employed, lateral leaf springs are more frequently used as they traverse the length of the vehicle and are installed perpendicular to the wheel axle.

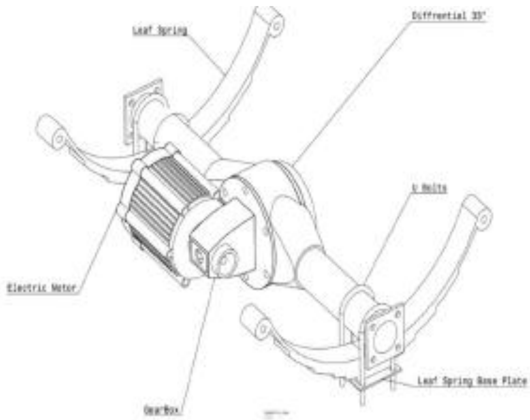


Figure 03- Rear axel assembly

3.4. BATTERY

The most popular battery type in solar systems is the lead acid battery. In contrast to other battery types, lead acid batteries have a long lifespan and inexpensive cost despite having a low energy density, only modest efficiency, and high maintenance needs. Because lead acid batteries are the most often used type of battery for the majority of rechargeable battery applications (such as starting automobile engines), they have a well-established, mature technology basis. This is one of the main benefits of lead acid batteries.

Figure 04- Battery

3.5. Controller 48volts

One of the key elements of a battery-powered vehicle that controls its overall operation is a controller. This controller is responsible for drawing electricity from the battery and supplying it to the electric drive motor.

Figure 05- Controller

3.6. Dynamo

Originally another name for an electrical generator, dynamo (from the Greek word dynamis; meaning power) mainly refers to a generator that produces direct current by using a commutator. The rotary converter, electric motor, alternating-current alternator, and other later electric-power conversion devices were all based on dynamos, which were the first electrical generators capable of supplying power for industry. Because of its efficiency, dependability, and low cost, the simpler alternator currently predominates in large-scale power generation.

Figure 06- Dynamo

3.7. Steering Column

The automotive steering column is a piece of equipment designed primarily to transmit the driver's input torque from the steering wheel to the steering mechanism.

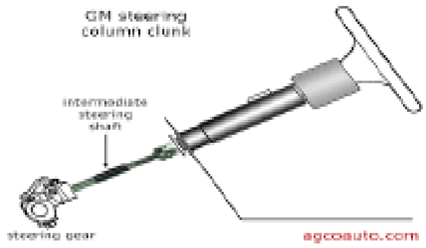


Figure 07-Steering wheel arrangment

3.8. ACCELERTOR

The controller receives a signal from the accelerator pedal and changes the frequency of the AC power from the inverter to the motor to change the speed of the vehicle. Through a cog, the motor is connected to and rotates the wheels.

Figure 08- Accelerator

3.9. SPEEDOMETER

A speedometer, often known as a speed meter, is a gauge that calculates and shows the current speed of a moving object. They began to be offered as choices in the early 20th century and became standard equipment starting around 1910. Today, they are fitted to all motor vehicles. Other vehicles may utilize speedometer-like instruments with other methods of measuring speed, such as pit logs for boats and airspeed indicators for aircraft.

Figure 09- Speedometer

3.10. FORWARD/REVERSE SWITCH

An electric switch that has four terminals capable of being connected in pairs in two different ways so as to reverse the direction of current flow.

Figure 10- switch

3.11. MCB

When a system fault, such as an overload condition, occurs, the MCB shuts down the entire electrical circuit. Mechanical latches are the components of MCB bimetallic strips that assist in switching the circuit when an overload occurs because the bimetallic strip moves and comes into contact with the mechanical latches when deflection occurs. The mechanical latch, which is a part of this system's mechanism, provides the signal and enables it to stop the circuit flow.

Figure 11-MCB

3.12. Complete Fabricated self electric car

Figure 12- Complete fabricated model of self charging electric car

4. CALCULATION

- Area= Length* Width
- A= 1.67 m2
- Total weight of Vehicle= 180 kg
- Weight of motor and generator = 10kg
- Weight of chassis = 60kg
- Weight in Newton= 180*9.81= 1765.8N
- Weight of Battery= 40 kg

4.1. Calculation of rolling Resistance

Rolling resistance,

RR= weight of Vehicle* coefficient of RR,

RR in Concrete fair = 0.015

Gross vehicle weight is 180 kg= 1765.8N

RR= 1765.8* 0.015 RR= 26.487N

4.2. Calculation of Grade Resistance

Grade resistance= Gross vehicle weight* sinθ

Grade of inclination Angle θ= 0 Degree (since the surface is flat)

GR= 1765.8*sin(0)

GR= 0N

4.3. Calculation of Acceleration Force

FA= m*a

m= Gross vehicle weight/g

FA= Acceleration Force

m= mass of the vehicle

g= Acceleration due to Gravity (9.81 m/sec^2)

a= Required Acceleration

m=1765.8/9.81

m= 180kg

a= final velocity-initial velocity/time

final velocity 40 kmph= 11.11 m/sec

Initial velocity= 0 m/s

Time= 60 sec

a= (11.11- 0)/60

a= 0.1851m/sec^2

FA= 180*0.1851

FA= 33.31N

4.4. Calculation of Total Tractate Effort

TTE= Rolling Resistance+ Grade resistance+ Acceleration Force

TTE= 26.48+0+33.31 TTE= 59.79N

4.5. Calculation to Torque Required on the drive wheel

Torque= Rf*TTE*r(wheel)

Rf= Frictional Resistance= 0.7

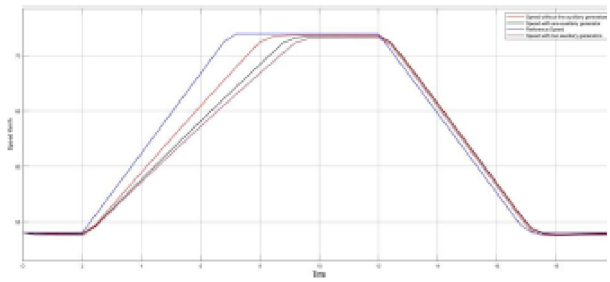
R(wheel)= Radius of the drive wheel= 0.18m

Torque= 0.7*59.79* 0.18

Torque = 20 Nm

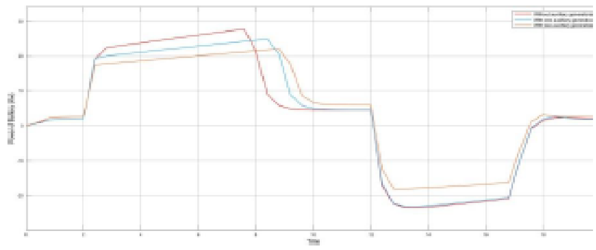
5. RESULT

Electrical and mechanical energy are converted by chemical energy, and electrical energy is then converted by mechanical energy once again. By applying a few technical principles, we can convert kinetic energy into electrical energy. Finally, dynamos generate electricity, which is then stored in batteries. The dynamo's output voltage is 24 volts.



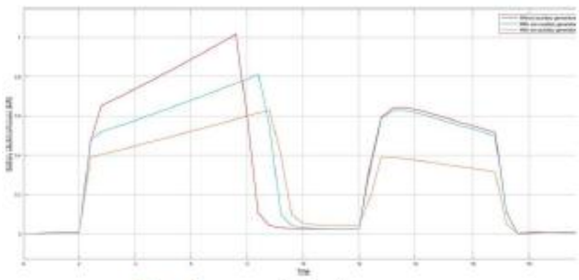
The speed of the electric vehicle.

Figure 13-Speed graph



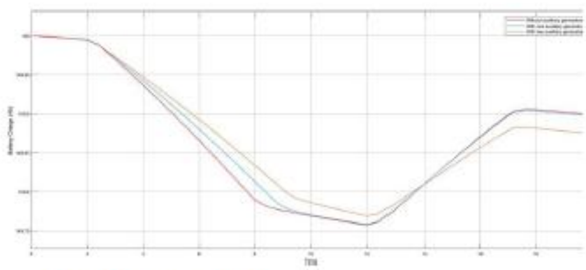
The energy which is consumed by the battery.

Figure 14-Energy consumption grapgh



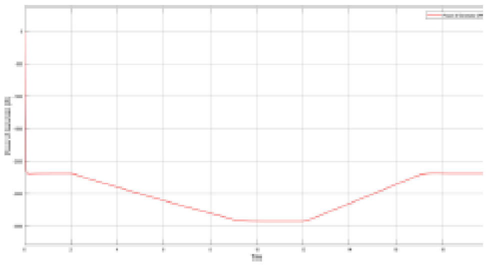
The losses in battery.

Figure 15-Speed graph



Battery recharging.

Figure 16-Battery recharging graph



The power of Dynamo

Figure 17-Speed graph

6. CONCLUSIONS

- In conclusion, the development of self-charging electric cars has the potential to revolutionize the EV market and contribute significantly towards sustainable transportation. Self-charging technologies such as solar panels, regenerative braking, and thermoelectric generators can provide a continuous supply of energy, reducing the dependency on external charging infrastructure and extending the range of EVs.

- This research paper has provided insights into the concept of self-charging electric cars, their working principles, and potential benefits for sustainable transportation. The paper has analyzed the feasibility and limitations of self-charging technologies, provided an overview of successful self-charging EV models, and examined the potential environmental and economic impacts of self-charging EVs.

- The findings of this research paper suggest that self-charging electric cars have the potential to significantly reduce carbon emissions, lower the cost of ownership, and provide a more convenient and sustainable transportation option. However, further research and development are needed to improve the efficiency and reliability of self-charging technologies and address their limitations.

- In conclusion, the adoption of self-charging electric cars can contribute to the transition towards a more sustainable transportation system, providing several environmental, social, and economic benefits. This research is crucial in guiding policymakers, manufacturers, and consumers towards making informed decisions about the adoption of self-charging EVs and driving the transition towards a sustainable future.

7. FUTURE SCOPE

The future scope of self-charging electric cars includes advancements in technology, integration with smart grid technology, expansion of charging infrastructure, collaboration between manufacturers, and adoption by fleets, all of which can contribute towards a more sustainable transportation system.

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