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Hybrid Electric Vehicle Using Generator

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***Abstract*— In today's world the pollution is increasing due to the emission of carbon dioxide from the engine vehicles. In order to reduce this problem electric vehicles are the only solution for transportation without any emission of toxic gases. A hybrid electric vehicle is designed in this project. The main motive of this project is to consume less power since the power is backed up by an alternator by rotation of the wheels while the bike is in running condition. An alternator is specifically selected for its less weight and more power generating capacity. This paper presents a novel approach to enhance the sustainability and efficiency of electric vehicles through the integration of onboard generators. By exploring the concept of E- Vehicle Using Alternator, this research addresses the limitations of current EV technology.**

***Index Terms*— Alternator, Controlled Output Voltage, Efficiency, Electric vehicles, Frequency, High efficiency.**

I. INTRODUCTION

Global warming is becoming a major problem in today's world. Therefore, people are starting to move towards clean energy especially in the field of transportation and electricity. Transportation is one of the main sources of pollution or global warming because vehicle works on fuel (petrol, diesel) by burning and produce harmful gasses to the atmosphere, due to the increased pollution and limited source of energy their becomes a compulsion to move towards clean source of energy for transportation that makes free from pollution. The e-bike is driven with the help of electric power. In this bike energy is generated by using alternators while the bike is in running condition. The generated energy is stored in the secondary battery. The stored energy can be used to drive the bike while the primary battery gets fully drained. E-vehicle bikes are powered by electricity and offer several advantages over traditional bikes and motorbikes. However, one of the main challenges of e-vehicle bikes is the limited battery life, which can restrict the range and duration of travel. To address this issue, some e-vehicle bikes are equipped with an alternator system that generates electricity while the bike is in motion, extending the battery life and improving the overall efficiency of the bike. The alternator system in a e-vehicle bike works by capturing kinetic energy produced by the rider's pedaling motion and converting it into electricity. This electricity is then stored in the bike's battery, providing a continuous supply of power to the motor. As a result, the bike can travel longer distances without needing to recharge the battery, making it a practical and convenient mode of transportation. Another advantage of a vehicle bike with an alternator system is that it reduces the reliance on fossil fuels Unlike traditional motorbikes, e-vehicle bikes produce zero emissions, making them an environmentally friendly choice for urban and rural transportation. Moreover, the use of an alternator system in the electric vehicle means that the battery can be charged not only with the external power source, reducing the need for conventional electricity sources. Furthermore, e-vehicle bikes with an alternator system are cost-effective and low- maintenance. The alternator system reduces the need to replace the battery frequently, reducing the overall maintenance cost of the bike. Additionally, the use of electricity to power the bike is much cheaper than using gasoline, making it an affordable mode of transportation for daily commuting.

II. COMPONENTS USED

A. BLDC Motor

In this electric vehicle, the motor used to drive the vehicle is Brushless dc motor. Its rating is 750 watts. Based on the calculation to pull the vehicle with the load of approximately 100 kgs, the 750 watts motor is best to drive the vehicle. This motor gets supplied from both the primary and secondary batteries at two conditions, One is at starting condition and another one is at running condition. At starting condition of the vehicle, the required 48 volt dc supply is fed from primary battery which is charged by external supply and this circuit goes on until the primary battery drains out. Once the primary battery drained, the secondary battery is made to fed the motor. This secondary battery is also with same 48 voltage rating and it is not charged with the external supply because this secondary battery is charged in the running condition of the vehicle which is while the vehicle is driven with the primary battery. This BLDC motor is connected with the bike wheels through chain and sprocket.

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Table.1. Component Rating

Components required	RATING
BLDC Motor	750 Watts
Alternator	360 Watts
Controller	48 Volt DC
Battery	1.5 KWH

B. Controller

The Controller acts as a brain for the electric vehicle because it controls the various components of the vehicle by controlling the required input current of the components. The controller is connected with battery, motor, Throttler, display and other speed sensors. The controller initially fed the source from the primary battery to the motor. Once the primary battery drains out, the controller switches to secondary battery to fed current source to the motor. The controller monitors the user throttle level and gives the controlled power supply to the motor from the battery. So that the speed is increased or decreased.

Its specification is:

- Rate voltage : DC 48 volt
- Rate power : 750 Watt
- Rated current : 13.5 Amp

C. Battery

Battery is a device which is used to store energy at one time and provide energy for later. There are many type of batteries available like lead-acid battery, lithium-ion battery, Aluminum-ion battery, calcium battery, etc. Out of these batteries, Lithium-ion batteries are mostly used for majority purpose for its specification and efficiency. The most commonly used batteries are lithium-ion and lead acid battery. Out of these two batteries lithium-ion batteries are mostly preferred because compared to lead acid battery lithium-ion batteries are smaller in size, high efficiency, less self-discharge rate, etc. In electric vehicles, the lithium-ion batteries are widely preferred. In this electric vehicle, a 1.5 kWh lithium-ion battery is used to drive the vehicle. Due to the self-charging, two batteries are used to charge and discharge at the same time. The primary battery is used to drive the vehicle at starting condition and the secondary battery is used to store the generating power from the alternator. Once the primary battery drains out, the secondary battery starts to provide energy for the motor.

D. Alternator

An alternator is a device which converts mechanical energy into electrical energy. The alternators are widely used in regenerative braking systems. In this electric bike, the alternator is connected with wheels so that it generates electricity while the bike is in running condition. As the wheel of the vehicle attains a certain rpm, the alternator starts to generate electricity and stores in the secondary battery which is used at the drained out condition of the primary battery. The rated power of the alternator is 360 watts.

III. SIMULATION ANALYSIS

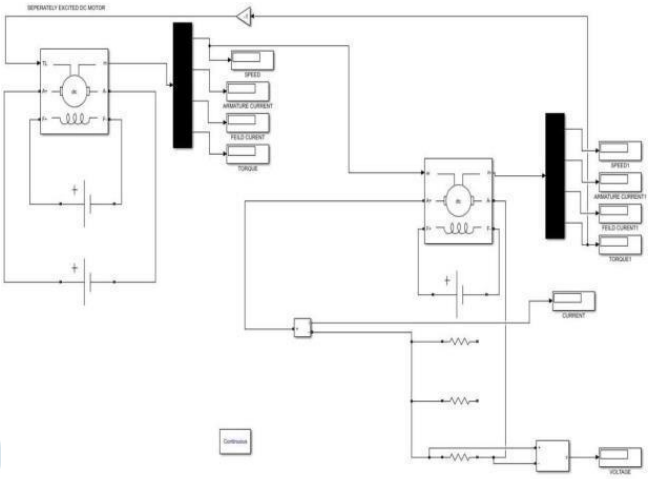

Fig.1. Simulation model of EV

The simulation is done by coupling the DC motor with an alternator. The speed of the motor is given as the input to the alternator. The alternator starts to rotate and produces electricity at a particular speed. The produced electricity is stored in a secondary battery. Again the torque of the alternator is given as feedback to the motor to move. By this feedback method the energy is not wasted in any places and is given as a supply.

IV. SIMULATION RESULT

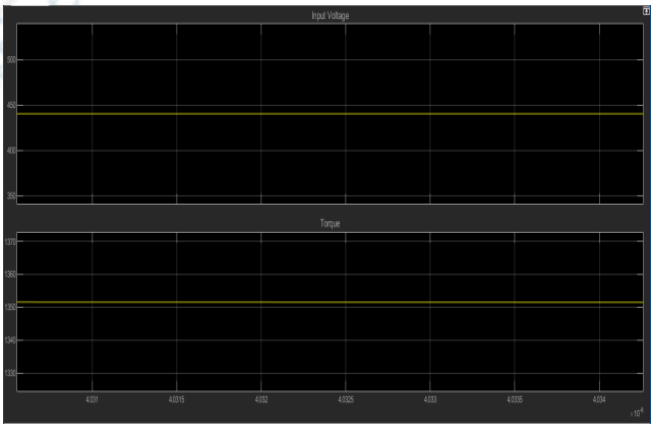

Fig.2. Simulation Output of EV

The simulation results are compared between the input voltage and the torque between the motor and the alternator respectively. The output torque was supplied constantly with respect to the given voltage.

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V. WORKING MODEL

Fig.3. Final Prototype of Hybrid

The main motive of this project is to consume less power since the power is stored in the battery with the help of an alternator by the speed produced by the motor the alternator gains its supply and feedback the torque which is produced in the alternator back to the motor. The alternator has the major role in this project. The alternator converts the mechanical energy to electrical energy with an AC current.

The produced current from the alternator is being stored in the battery to back-up the vehicle when the charge is low on the primary battery. The driver can use the charge on the secondary battery as in an emergency situation.

VI. CONCLUSION

In conclusion, the proposed E-bike with an advanced alternator system offers several advantages over traditional transportation options. The system is designed to extend battery life and improve efficiency, providing a convenient and eco-friendly mode of transportation. By capturing kinetic energy produced by the rider's pedaling motion and converting it into electricity, the alternator system reduces reliance on fossil fuels and is cost- effective and low-maintenance. The proposed system is a practical solution that can help reduce air pollution and promote sustainable clean energy transportation, while also providing a comfortable and efficient way to get around. Overall, we believe that the proposed EV bike with an advanced alternator system has great potential to revolutionize urban transportation and contribute to a cleaner, more sustainable future.

VII. FUTURE SCOPE

The future scope for EV bikes with an advanced alternator system is promising. As the demand for eco-friendly transportation options continues to grow. E-bikes with an advanced alternator system have the potential to be a practical and cost-effective solution, especially in urban areas where traditional transportation options are often congested and polluting. In the future, we envision that the technology used in the advanced alternator system will continue to evolve and become more efficient, further reducing reliance on external power sources and increasing the overall sustainability of E-bikes. Additionally, we anticipate that advancements in battery technology will continue to improve, allowing E-bikes with an advanced alternator system to travel even longer distances without needing to recharge. Overall, we believe that E-bikes with an advanced alternator system have a bright future ahead, offering a sustainable and convenient mode of transportation that can help reduce carbon emissions and promote a cleaner, greener future.

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