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Design and performance analysis of Hybrid electric vehicle

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Abstract: Hybrid electric vehicles (HEVs), which combine an internal combustion engine (ICE) and an electric motor, are a promising way to cut emissions and fuel use without sacrificing a vehicle's functionality or driving ability. The implementation of a hybrid car with a gasoline engine and battery pack is discussed in this essay. Hybridization reduces fuel consumption compared to regular gasoline and diesel-powered cars. A car with no emissions is an electric vehicle. The separate issues with the gasoline engine and the electric car are cleverly avoided by the suggested HEV. It reduces fuel use and pollutant output. Batteries for electric vehicles are less of a worrisome. The motor has capability to operate as generator to move energy if a battery is not present.

Keywords: Hybrid electric vehicle, petrol engine.

I. INTRODUCTION

HEVs, or hybrid electric vehicles, provide a range of fuel options. HEVs have an electric motor in addition to an internal combustion engine. These vehicles are propelled by a battery that receives electricity by being plugged into an electrical outlet or charging station, alongside an alternative fuel or traditional fuel, such as gasoline. With the low noise, low exhaust emissions, and energy independence benefits of electric vehicles, a hybrid can combine the cruising range and performance advantages of conventional automobiles. Another growing class of vehicle that blends alternative fuels to reduce oil usage is the hybrid electric vehicle (HEV). HEVs are a specific class of hybrid electric vehicles, as their name suggests (HEV). PHEVs integrate the electric power path with the mechanical power, similar to HEVS.

Another significant distinction between PHEVs and HEVS is the capacity of the former to recharge their batteries by connecting their vehicles directly into outside electric power outlets. As petroleum is no longer the exclusive fuel source for the car, this is also the main advantage of PHEVS. In actuality, the predominant source of energy utilized in HEVs is electricity, substantially diminishing the reliance on petroleum-derived resources. Electricity is often generated via electrical grids, which may use traditional coal energy, nuclear energy, or renewable energies like wind and solar energy. There are differing levels of well-to-wheel fuel economy and pollution reductions that can be accomplished depending on how energy is produced in different places. Consequently, HEVs reduce reliance on either petroleum energy or any other single form of energy by providing the option to choose among affordable and clean energy sources that create electricity, as opposed to conventional ICEs that only use petroleum fuel.

II. BENIFITS AND CHALLENGES

A. Benefits:

- **Environmentally friendly**: The fact that a hybrid electric vehicle is more environmentally friendly than a scooter powered by gasoline is one of its main advantages. An electric car that works on a pair of engines—a gasoline engine and an electric motor—reduces fuel consumption and saves energy.

- **Financial benefits**: Many subsidies and incentives assist hybrid electric vehicles, helping to keep their price low. Less money is spent on gasoline as a result of lower yearly tax bills and exemption from congestion fees.

- **Less dependence on fossil fuels:** Because a hybrid electric car is significantly cleaner to operate and uses less gasoline, it produces less emissions and is less reliant on fossil resources. In turn, this lowers the price of oil on the domestic market.

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- **Regenerative braking system:** Driving a hybrid electric vehicle allows you to somewhat replenish your battery each time you hit the brakes. There is no longer a need to stop or waste time waiting for the battery to recharge since an internal mechanism starts up and utilises the energy that is released to charge the battery. periodically.

- **Built from light materials:** Due to their lightweight construction, hybrid electric vehicles use less energy to operate. Moreover, a smaller and lighter engine uses less energy.

- **Higher resale value:** As the price of fuel continues to rise, hybrid electric vehicles are becoming more and more popular. As a result, these green cars are now selling for more money than the industry standard. Thus, if you're not happy with your car, you can always sell it to those who are interested in it for a higher price.

B. Challenges:

- **Low Power:** Twin engines power hybrid vehicles. The principal source of power, a petroleum engine, is far less powerful than a single engine vehicle and an electric motor. The total power of both is frequently less than an engine driven by petroleum. Thus, it is appropriate for city driving rather than for accelerating quickly.

- **Compact size:** A hybrid electric car has a powerful battery pack and a lightweight electric engine. This increases the weight and takes up more room in the car. Manufacturers reduce weight to reduce fuel efficiency, which leads to smaller motors and batteries and less support for the suspension and body.

III. HYBRID VEHICLE SYSTEM

An electric hub motor, controller, throttle controller, battery, IC engine, front wheel, and rear wheel make up a fundamental design. The two-motor wheeler's is attached to the back wheel. The connected wheel turns as the motor does, which causes the entire vehicle to move. Batteries and rear wheel are both connected. In this case, lead acid batteries are linked in series to add the entire output voltage to the motor's requirements.

Batteries are connected to the motor, and power is transferred through the controller, which receives a variable voltage (1-4V) from the throttle mounted on the vehicle's left handlebars.

A direct plug-in option or regenerative braking method can be used to change those batteries. The apparent IC Engine throttle is located at the right handlebars of the vehicle. Only while the IC Engine is running and the electric motor is spinning is regenerative breaking possible.

When a vehicle is powered by an IC engine, regenerative charging occurs when magnetic flux is produced in the motor. When driving and charging are both done using an IC Engine. The battery has been discharging.

BLOCK DIAGRAM

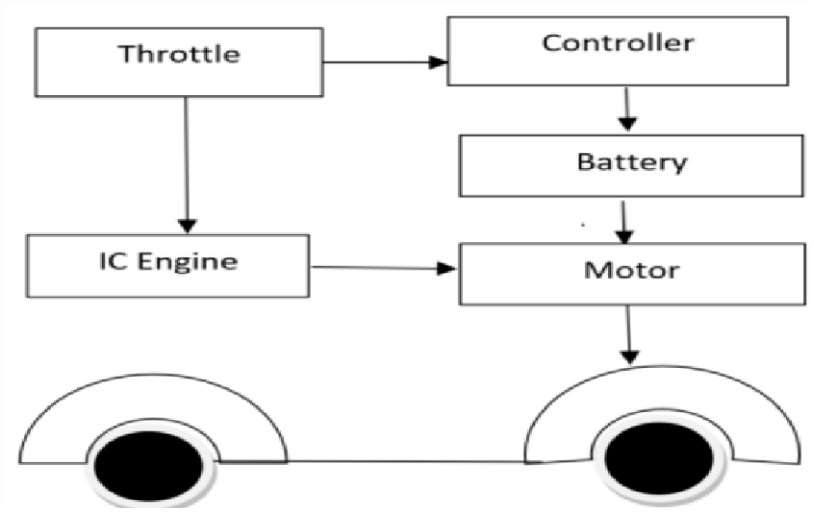

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Fig.1. Electric Vehicle

IV. COMPONENTS

Electric Hub Motor: The wheel hub motor (also called wheel motor) is an electric motor that is incorporated into the hub of a wheel and drives it directly.

Fig.2

Specifications:
Electric Scooter Hub Wheel Motor 24V 36V 48V 350W DC Brushless Toothless Wheel Motor Scooter Wheel Bicycle Bike Motor

Products Details
Rated power: 350 W Voltage:
24/36/48 V speed: 800RPM
(400-1000RPM)
Motor efficiency: ≥ 83%

Battery: Batteries are portable sources of electrical energy which is converted to mechanical energy in the electric motor for propulsion

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Table.1

Product Group	**Lead acid battery**
Manufacturer	Battery
Manufacturer number	BP7.2-12
Maximum charge current	2,1A
Nominal voltage	12V
Length	151mm
Width	65mm
Height	93mm
Rechargeable	Yes
Weight	1Kg
Life span	10-12years
Battery type	Leak proof.
Capacity	7.2AH

Controller: It is a brain of the complete hybrid system. It decides the fuel mode that is, to run the vehicle on petrol or to electrical power. It checks the battery voltage.

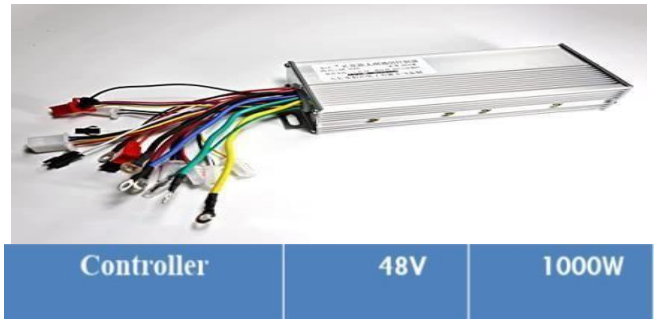

Fig. 3

Handlebars: The handlebars are your main connection with the scooter. They are fitted with all the controls, including the accelerator, brakes, speed/ settings display, and power buttons.

Light: Good scooter lighting is important for seeing and staying visible at night. Nearly every electric scooter comes with at least one LED headlight.

Charger: Fast charging Hero scooter charger with 48V-2000MA output. which charges quickly and can help to save time.

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Specification:
Input voltage: AC (170V-300V)
Output voltage: DC (59V)
Current: 2.7A

Fig.4

IC Engine: The fundamental chemical process of releasing energy from A blend of fuel and air undergoing combustion, occasionally denoted as burning, occurs within an internal combustion engine (ICE), where the gasoline is ignited and incinerated within the engine's confines. The energy stemming from the combustion process is subsequently transformed, in part, into mechanical work by the engine.

Fig. 5

V. RESULT AND DISCUSSION

When compared to conventional automobiles, hybrid electric vehicles have a higher purchase price but can improve fuel efficiency. Throughout the course of their lifespan, consumers, society, automakers, and policymakers generally profit economically from their lower petroleum consumption and greater productivity. This paper provides a detailed overview of the literature, overview, and guidelines for HEV penetration rate studies into the Indian Market.

The Indian government's recent measures and several incentives will support the country's move towards mobility. When unconventional energy sources are not available, a novel idea called "vehicle-to-grid" can either supply energy to the grid or be utilized to recharge the battery. This technology is crucial for energy security, renewable energy, and energy efficiency. and giving a great scope to deal with global warming issues. This paper provides a summary of an electric vehicle's barriers and problems in the Indian context and is the main novelty of the paper.

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VI. CONCLUSION

A hybrid electric vehicle (HEV) employs a battery and gasoline as power sources. There is no hope of travelling quickly in congested urban areas. When this happens, IC engines use more gasoline than they should because of the fluctuating acceleration. The amount of power consumed by the vehicle is decreased if the hub motor is powered by a battery. For 1 litre of gasoline, the bike's range is improved from 60 to 90 km. Battery drives are utilised for low-power applications, while gasoline engines are used for high-power applications with very high-power requirements.

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REFERENCES

[1]. Rao Rangaraju, Venu Dunde, "A Brief Study on Hybrid Electric Vehicles", 2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA), pp.54-59, 2021.
[2]. Mojtaba Shams-Zahraei and Abbas Z. Kouzani School of Engineering Deakin University Geelong, Victoria 3217, Australia A Study on Plug-in Hybrid Electric Vehicles
[3]. A Full Hybrid Electric Scooter T.W. Ching, Senior Member, IEEE and K.U. Chan
[4]. Implementation of a Highly Reliable Hybrid Electric Scooter Drive Cheng-Hu Chen and MingYang Cheng, Member, IEEE
[5]. Tulasi Krishna Gannavaram V, Rahul Bejgam, Saideep Sunkari, Sai Bhatt Keshipeddi, Madhava Rao Rangaraju, Venu Dunde, "A Brief Study on Hybrid Electric Vehicles", 2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA), pp.54-59, 2021.
[6]. Waled M. Elsayed, Jorge O. Estima, Chiara Boccaletti, Antonio J. Marques Cardoso, "Energy management strategy of a propulsion system with supercapacitors for electric and hybrid vehicles", 2016 IEEE International Power Electronics and Motion Control Conference (PEMC), pp.1210-
[7]. International Journal of Applied Engineering Research ISSN 0973-4562 Volume 14, Number 4 (2019) pp. 930-935Research India. Publications. Design and Fabrication of Hybrid Electric Bike Department of Mechanical Engineering, N.B.K.R. Institute of Science and Technology.
[8]. Xin Li, Sheldon S. Williamson, "Efficiency and suitability analyses of varied drive train architectures for plug-in hybrid electric vehicle (PHEV) applications", 2008 IEEE Vehicle Power and Propulsion Conference, pp.1-6, 2008.
[9]. Karan C. Prajapati, Ravi Patel and Rachit Sagar[3]Department of Mechanical Engineering.
[10]. School of Technology, Pandit Deendayal Petroleum University Raisan, Gandhinagar, Gujarat - 382007, India: Hybrid Vehicle: A Study on echnology
[11]. Zaki Syed"[1] Mechanical Dept. DBIT Mumbai, India. Siddesh Venkateswaran Mechanical Dept. DBIT Mumbai, India. V Siddesh: Hybrid Engine
[12]. Design of Series Hybrid Electric Vehicles Madhwi Kumari'. P. R. Thakura, D.R. Badodkar Electrical engg Dept., LTCOE navi Mumbai India, Dept of EEE, BITMesra, India, BARC Mumbai, India.
[13]. System design and control development for an air/electric hybrid scooter," 2016 International Conference on Applied System Innovation (ICASI).

DOI: 10.17148/IARJSET.2024.11556

[14]. Omkar S. Kadam, Upendra N. Dandawate, Manoj A. Deshmukh, "Design and implementation of a system for electrification of Gasoline bikes using adequate Swingarm and Green charge technique", 2021 IEEE Bombay Section Signature Conference (IBSSC)

[15]. G. Sreeramulu Mahesh, C.V. Mohan, B.K. Nagesh, G. Dillibabu, Sustainable and Optimized Harmonic Filter Design for Industrial Loads, Procedia Computer Science, Volume 230,2023, ISSN 1877-0509.

[16]. R. H, B. Bairwa, A. Banik and S. Jagadeesh, “Development of ON Road Charging System for Electric Vehicle Applications,” 2023 International Conference on Recent Trends in Electronics and Communication (ICRTEC), Mysore, India, 2023, pp. 1-6.

[17]. M. Faiyaz, D. Pranay, R. K. Gatla and S. Chatterjee, “A Study on Various Electric Vehicle Charging Technologies,” 2023 International Conference on Sustainable Computing and Smart Systems (ICSCSS), Coimbatore, India, 2023.

[18]. Z. Jinwen and Q. Yumei, “Research on motor control of new energy electric vehicle,” 2023 IEEE 3rd International Conference on Electronic Technology, Communication and Information (ICETCI), Changchun, China, 2023, pp. 637-640.