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DESIGN & DEVELOPMENT OF HYBRIDS VEHICLE

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ABSTRACT

With the expansion of the twenty-first century, the usage of oil and gas has expanded, contributing to problems like global warming, climate change, a lack of crude oil, etc. Due to these reasons, automakers have started looking at practical applications for hybrid technology. The paper begins with an introduction and a succinct history of hybrid technology. The study also discusses the technology used to make hybrid automobiles, including "plug-in hybrid electric vehicles," "hybrid solar vehicles," and "hybrid electric vehicles." Our paper's assertions are supported by an explanation of these technologies' operations. The shortcomings of this technology, the efficiency of hybrid vehicles, and case studies of recently released hybrid vehicles such as the Toyota Prius series and Astrolabe. Allof the basic materials and fuels used in hybrid vehicles are discussed. The final section of the paper covers the advantages and disadvantages of hybrid automobiles as well as how, in the future, this technology will take over the world and supplant petrol and diesel vehicles.

1. INTRODUCTION

A vehicle that combines an internal combustion (IC) engine and an electric power system is known as a hybrid electric vehicle. Depending on the kind of hybrid system, the electric powertrain may improve fuel efficiency, boost performance, or independently move the car to pure electric power. A hybrid electric vehicle (HEV) is a car that, depending on the system type, combines a conventional internal combustion engine with an electric motor to help the engine achieve higher performance and/or greater fuel efficiency. In the parts that follow, we will go into more detail on the various types of HEVs.

One of the biggest challenges to the globe today is air pollution. a nation with the second-largest population in the world—nearly 130 million people, or 17.7% of the world's population—people are finding it difficult to breathe in most major cities. Since a decade ago, India has been dealing with significant air pollution problems, which are getting worse atan alarming rate. Poor fuel quality, old cars, poor maintenance, jammed traffic, bad roads, outdated automotive technology, and traffic are the key contributors to this exponential rise inpollution levels. India is now among the top 10 automobile markets in the world, with a rapidly growing middle-class population, strong purchasing power, and consistent economic development. But over the past two years, the price of petrol has increased by more than 50%in 13 different steps. In India, there may be a demand for alternative automotive technologies like electric cars (EVs).

An electric propulsion system replaces an internal combustion engine (ICE) in an electric vehicle, or EV. An electric motor, which also acts as the main source of the vehicle's drive, provides all of the vehicle's power. The main advantage is the electric motor propulsionsystem's excellent power conversion efficiency. Both in academia and industry, there has been a lot of recent research and development work recorded. With the widespread use of electric vehicles, a number of governments have provided incentives to consumers, including reduced taxes or tax refunds, free parking, and low-cost or no-cost charging stations. On the other hand, a hybrid electric vehicle (HEV) is a practical choice. It has gotten a lot ofattention recently At least one model from a major automaker worldwide employs hybrid technology or has been converted entirely to electricity.

Four major worldwide trends are driving fast growth in electric vehicles (EVs):

(i) Depletion of fossil fuels
(ii) Growing public awareness
(iii) Technology advancements
(iv) The advancement of electronic control systems and electric motors

1.1 Current Situation of Hybrid Vehicles in India

In India, the market for hybrid cars was starting to take off. To encourage the use of hybrid and electric cars in the nation, the Indian government had put out several measures and incentives. The necessity to cut emissions and the growing concern for environmental sustainability were two major reasons behind the emergence of hybrid cars in India. In contrast to conventional petrol or diesel automobiles, hybrid vehicles which combine an internal combustion engine with an electric motor offer a cleaner and more economical option.

To appeal to various market groups and pricing points, several manufacturers developed hybrid cars in the Indian market. Hybrid vehicles from manufacturersincluding Toyota, Honda, Hyundai, and Mahindra had been introduced in India, with models ranging from tiny sedans to SUVs. It's crucial to remember that hybrid car adoption in India was still rather low when compared to traditional petrol and diesel automobiles. This was principally caused by the higher initial prices of hybrid cars,the lack of adequate infrastructure for charging electric components, and the relative scarcity of hybrid models in comparison to conventional vehicles.

However, it was anticipated that the Indian government's initiatives to promote electric and hybrid cars, together with its push for greener transportation, wouldenhance the development of hybrid vehicles in the nation.

1.2 Current Situation of Hybrid Vehicles in the World

Due to their greater fuel efficiency and lower emissions compared to regular gasoline-powered automobiles, hybrid vehicles were gaining popularity on a global scale. It's crucial to keep in mind, though, that things can have changed since then.

some important details about the state of hybrid cars today:

Growing Market: Hybrid vehicle sales have been gradually rising on a worldwide scale. Hybrid vehicles are available from several major automakers, and new hybrid versions are often released.

Technological advancement: Hybrid car technology has advanced quickly in recent years. More advanced hybrid systems are being created by manufacturers, which provide a better performance, efficiency, and electric range.

Government incentives: To encourage the use of hybrid cars, several nations offer subsidies and other forms of financial assistance. Tax rebates, lower registration costs, and access to special lanes or parking spaces are a few examples of these incentives.

Environmental laws: The development of hybrid cars has been aided by environmental concerns and stricter emissions laws. Hybrids are viewed as a stepping stone towards fully electric cars by governments throughout the world that are putting policies in place to minimize greenhouse gas emissions.

Benefits and Drawbacks: Hybrid cars include advantages including increased fuel efficiency, lower pollutants, and cheaper operating expenses. In contrast to fully electric vehicles, they still rely on internal combustion engines and may only have a short electric-only range.

2. OBJECTIVES

- Lessen reliance on petroleum.
- Offer a comparable amount of power.

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- Cut back on noise pollution.
- Assure the security.
- Indicate the range.
- Lower operating expenses.
- Boost performance.
- Reduced emission.

3. NEED OF HYBRID ELECTRIC VEHICLE

Because the supply of petroleum is finite and will eventually run out. Petrol will be unaffordable by the arbitrary year 2040, when there would be an estimated 1 billion petroleum-fueled automobiles on the world's roadways. The 400 million otherwise worthless automobiles in the world want answers. When the supply of petrol runs out in 2040, petroleum will no longer be used for personal transportation. The global energy usage For EVs the size of a scooter or golf cart, a market could emerge. Hybrid trains and buses will be more prevalent since hybrid technology is applicable to big vehicles. The fact that hybrid cars run cleaner and have greater gas economy than gasoline-powered cars make them ecologically friendly, which is one of their main advantages over gasoline-powered cars. An electric motor and a petrol engine work in tandem to power a hybrid car, which reduces fuel consumption and saves energy.

4. METHODOLOGY OF HEVs

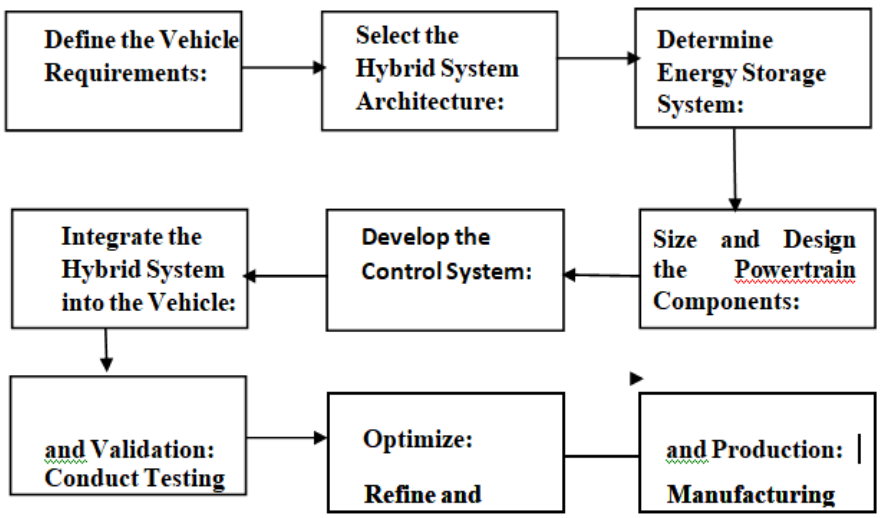
Define the Vehicle Requirements:

Determine the target market and intended use of the hybrid electric vehicle. Identify performance requirements such as acceleration, top speed, and range.
Define fuel efficiency goals and emission standards to be achieved.

Select the Hybrid System Architecture:

Evaluate various hybrid system architectures, such as series, parallel, or series-parallel. Consider factors such as cost, complexity, efficiency, and packaging constraints. Choose the architecture that best meets the vehicle requirements.

Optimize:



Methods of Hybrid Vehicle

Methods of Hybrid Vehicle

Determine Energy Storage System:

Evaluate different energy storage options like batteries, ultracapacitors, or acombination. Consider factors such as energy density, power density, cost, weight, and lifecycle.

Size and Design the Powertrain Components:

Calculate the power and torque requirements of the vehicle.

Select an appropriate internal combustion engine (ICE) based on the desired performance and efficiency. Choose an electric motor(s) based on power requirements and desired functionality. Design the transmission system to optimize power delivery and efficiency.

Develop the Control System:

Design the control strategy to manage the power flow between the ICE, electric motor(s), and energy storage system. Implement algorithms for regenerative braking, start-stop functionality, and hybrid modes of operation. Validate and optimize the control system through simulation and testing.

Integrate the Hybrid System into the Vehicle:

Design the vehicle's mechanical and electrical systems to accommodate the hybrid components. Ensure proper cooling and thermal management for the powertrain components. Optimize the packaging to maximize interior space and maintain vehicle balance.

Conduct Testing and Validation:

Perform component testing, including the electric motor(s), batteries, and control system. Conduct system-level testing to evaluate overall vehicle performance, fuel efficiency, and emissions. Validate the vehicle's compliance with safety regulations and industry standards.

Refine and Optimize:

Analyze test data and identify areas for improvement in performance, efficiency, and reliability. Refine the control algorithms and optimize the powertrain calibration. Iterate the design and testing process to achieve desired targets.

Manufacturing and Production:

Prepare the manufacturing process for mass production of the hybrid electric vehicle. Collaborate with suppliers to ensure the availability of components and materials.

Implement quality control measures to maintain consistency and reliability.

5. WORKING PRINCIPLE OF HYBRID ELECTRIC VEHICLE

Hybrid Electric Vehicles (HEVs) include an internal combustion engine (ICE) and batteries, which are utilized to move the vehicle; hence, the energy source can be either a battery or an ICE. As a result, the HEV is often known as a vehicle with two power sources. Because the battery may be recharged by recapturing the vehicle's kinetic energy through regenerative braking, HEVs are superior for city driving. The car often starts and stops while city driving. As a result, HEVs are better for city driving than country or highway travel.

Unlike an electric vehicle, the working mechanism of an HEV is relatively simple to understand. The below points explain how an HEV works.

- Powering a hybrid electric vehicle is an IC engine and an electric motor.
- The electric motor utilizes the electrical energy stored in the battery pack.
- The battery pack gets charged with the help of regenerative braking orElectricity.
- An HEV plugged into a power source to charge the battery.
- The electric motor power the vehicle as well as resists its motion.
- The additional power from the electric motor assists the engine, and it enhances the performance and improves the fuel economy.
- The battery pack can also power other electrical components such as lights. lights.

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5. ADVANTAGES

- Financial Benefits
- Regenerative Braking System.
- Built From Light Material.
- Assistance From Electric Motor.
- Automatic Start & Stop.
- Higher Resale Value.
- Electric and IC Engine.
- Less Dependence on Fossil Fuels.
- Smaller Engines.

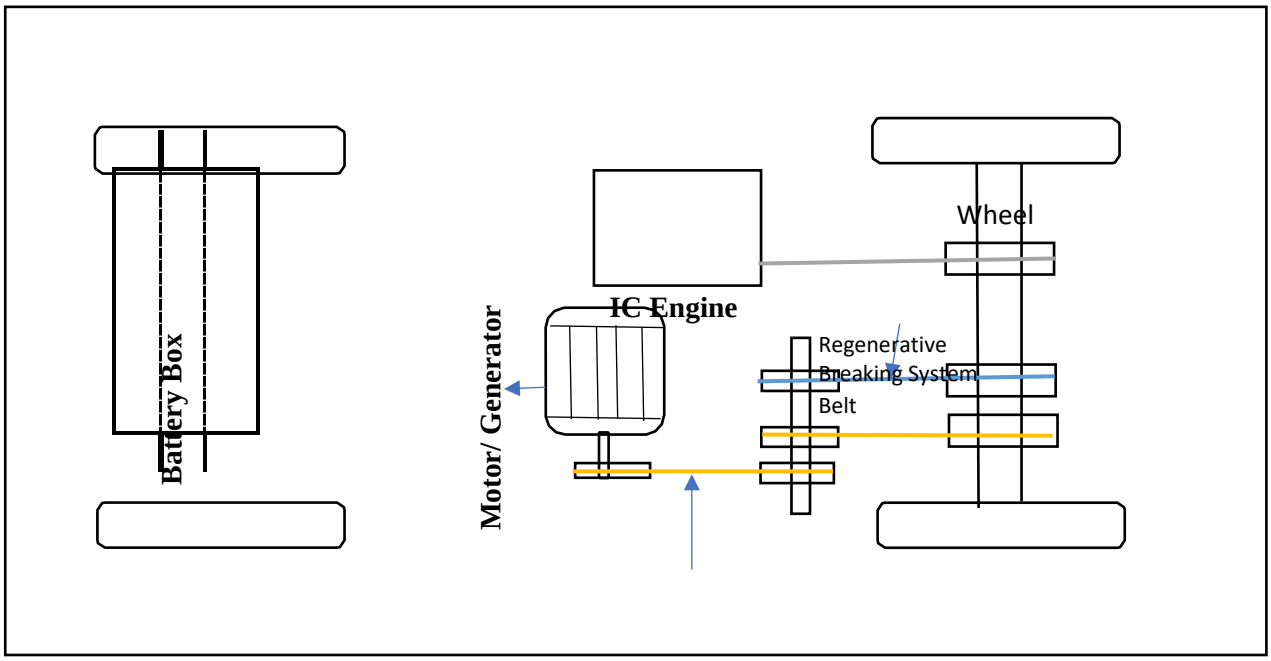

Diagram of Hybrid Vehicle

6. CONCLUSIONS

- In order to have a lesser dependency on the increased price of fuel and to operate a more environmentally friendly vehicle the technology of HEVs would more than help to satisfy these requirements.
- Hybrid Cars are definitely more environmentally friendly than internal combustionvehicles.
- Batteries are being engineered to have a long life.
- When hybrid cars become more widespread, battery recycling will becomeeconomically possible.
- Research into other energy sources such as fuel cells and renewable fuels make the future look brighter for hybrid cars.

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