

(RESEARCH ARTICLE)



Analysis of electric vehicles

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Abstract

Electric vehicles (EVs) are gaining popularity as a result of a number of causes, including lower prices and have gained concern due to changing climatic conditions. This study focuses on changes to be brought in electrical vehicle considering the recent trends in battery technology, new techniques for charging the vehicles and provides new opportunities for research. More specifically, an examination of the global market condition for electric vehicles (EVs) and their future prospects is conducted. Battery being one of the most important parts of electric vehicles, the paper provides a comprehensive overview of various technologies of batteries. We also go over many EV charging standards that are available, as well as the pros and cons of each.

Keywords: Electric; Cheaper; Combustion; Gasoline; Energy

1. Introduction

Vehicle that is operated using electric motors by the use of energy which is stored in them in form of rechargeable batteries is known as an electric vehicle.

The electric cars were produced in 1880's for the very first time and became popular in late nineteenth and twentieth century. Due to cheaper gasoline vehicles, electric vehicle usage has been declining over the years. Electric vehicles became popular again because of the technology used in them which stores energy in the form of batteries.

Electric vehicles are of more use to this generation because of many reasons most popular of it being the use of cheaper technology which means the usage of batteries to store energy and run the vehicle using that energy only.

A battery driven electric car is a vehicle that uses many motors combined together to perform a particular function and that motors used are only electric motors which make the use of energy stored in battery elements on which the vehicle operates.

On comparing electric cars or electric vehicles with combustion engines stored internally (ICE) electric cars are quieter, have no combustion engines and have no emissions.

Electric cars operate on electrical engines and not on internal combustion engine, so they are more ecofriendly and do not produce toxic gasses or smoke and release it in the environment. Electric vehicles are better than hybrid cars also as they can run on batteries by using the energy stored in them and do not produce gas and release it in the atmosphere so in turn helps us contribute to a green environment.

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Figure 1 An Electric Vehicle

2. Working principle of electric vehicles

In the car, once accelerator is pressed by the user, the action of the controller is required by the car which performs the work of taking in the electrical energy and providing the regulated energy from the inverters used in the car which are installed in it. The controller said is used by the inverter of the car to provide a specific quantity of electrical energy to the motor depending on the pressure applied on the accelerator.

Electrical energy is converted to mechanical energy by used of motor. Wheels turn by rotation of motor rotor which in turn rotates the wheels and in the end the car turns. Working discussed above refers to the type of BEV (battery electric vehicle).

2.1 Electric car classification`

Battery driven vehicles which are electric

Combination of internal combustion engine and motor

Fuel cell driven Electric Vehicle

2.2 Battery Driven Electric Vehicle

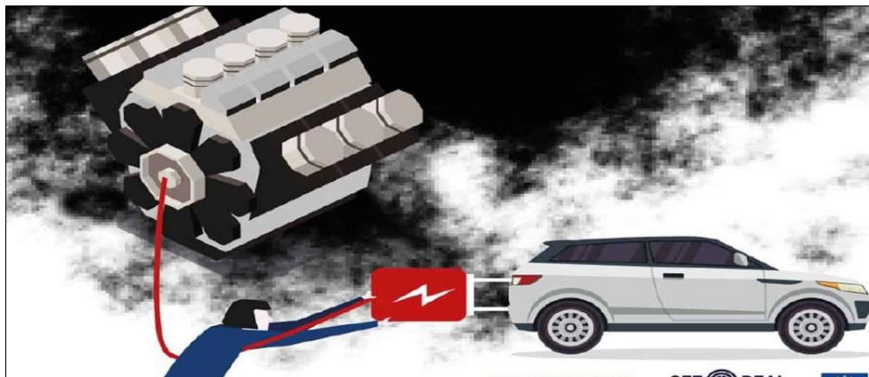


Figure 2 BEV type Vehicle

A Battery Driven Electric Vehicle (BEV), is a type of vehicle that runs entirely on electricity. No internal combustion engine (ICE) is present in battery driven electric vehicles. Battery pack stores the electricity which can be charged by connecting directly to the grid. Battery pack provides power to the electric motors present in the electric car which drives the electric car.

3. Working Principles of BEV

Transmission of power from DC battery to AC is required for the electric motor.

When the accelerator is pressed it sends the signal to controller which in turn change the frequency of AC current generated from the inverter to motor so as to adjust the speed of the vehicle.

The motor connects by a gear and in turn makes the rotation of the wheels.

Transformation of motor to accelerator is done which in turn generates power to deliver it back to battery when the car decelerates.

3.1 Kinds of Battery Driven Electric Vehicles

Volkswagen e-Golf, Tesla Model 3, BMW i3, Chevy Bolt, Chevy Spark, Nissan LEAF, Ford Focus Electric, Hyundai Ioniq, Karma Revera, Kia Soul, Mitsubishi i-MiEV, Tesla X, Toyota Rav4.

3.1.1 Combination of internal combustion engine and motor (Hybrid)

The term "standard hybrid" or "parallel hybrid" refers to this sort of hybrid vehicle. An ICE and an electric motor are both present in a HEV. Internal combustion engines (gasoline and other types of fuels) provide energy to the internal combustion engine, while batteries provide power to the motor. The car is driven by the gearbox through the wheels by the rotation from gas and electricity both.

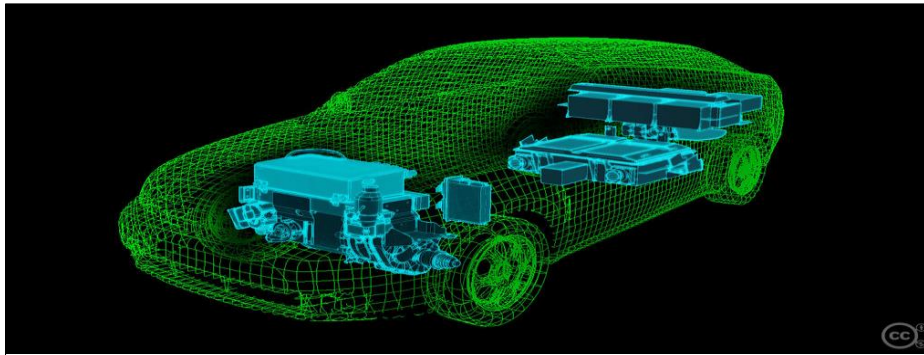


Figure 3 Hybrid Battery Driven Vehicle

Distinction between HEV and BEV and PHEV is that HEV batteries can only be charged by ICE, wheel motion, or a combination of both. The recharging of the battery cannot be done from the grid because there is no charging port.

4. Working principles of HEV

Like a typical car, gas is delivered to the engine from fuel.

It contains a battery pack that powers an electricity driven motor.

The engine and the electricity driven motor both can do the transmission in one single instance.

4.1 Kinds of HEV

Honda Civic (Hybrid), Toyota Prius Hybrid, Honda Civic Hybrid, Toyota Camry Hybrid are examples of HEVs.

4.2 Plug in HEV

It is hybrid vehicle which includes an internal combustion engine and an electricity driven motor. A variation of fuel choices is there for electricity driven vehicles. This vehicle runs on a battery which is rechargeable with fuel. Battery can be recharged using electricity from a station outside.

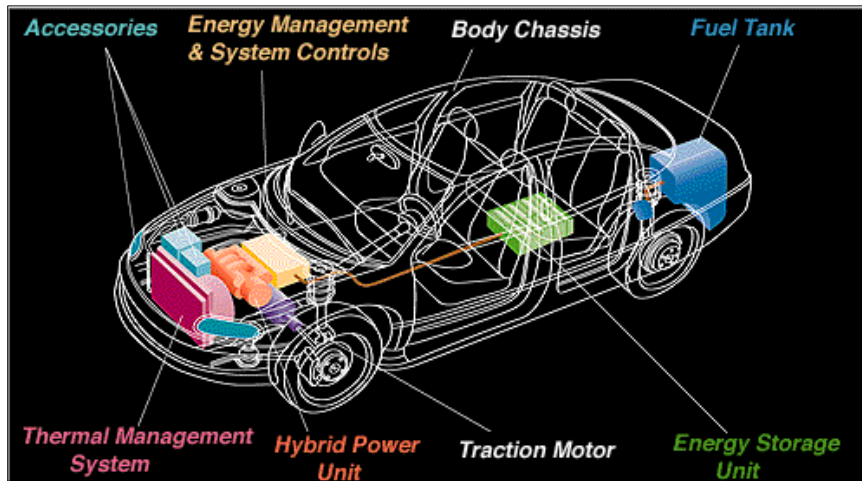


Figure 4 Plug in Hybrid Electric Vehicle

In most cases, PHEVs can operate in two types of modes:

All-electric mode, is a mode where car's energy is supplied entirely by the motor and battery.

Hybrid Mode: This mode uses both electricity and gasoline.

5. Working principles of PHEV

Mostly plug in hybrid electricity driven vehicle can cover approximately 112.654 kilometers solely on power.

PHEVs start from an all-electric mode and are powered by energy until the battery is depleted. Over the speed of 96.561-112.654 kilometers/hour vehicles change to hybrid mode only. Once the inverter battery is depleted, car switches to a standard no plug in hybrid mode.

Batteries can be charged by the process of applying brakes again and again or through internal combustion. Electricity driven motor performs the work of a generator when brakes are applied, converting the form of energy into electricity which is required to recharge the battery. Car performance can be enhanced by employing small engines.

5.1 Illustrations of PHEVs

Mercedes C350e, Mercedes S550e, Mercedes GLE550e, Mini Cooper SE Countryman, Audi A3 E-Tron, BMW 330e, BMW i8, BMW X5 xdrive40e, Fiat 500e, Hyundai Sonata, Kia Optima, Porsche Panamera S E-hybrid, Volvo XC90 T8.

5.1.1 Fuel Cell Electric Vehicle (HEV)

Fuel Cell Driven Electric Vehicles, also known as fuel driven vehicles are electricity driven vehicles that utilize "fuel cell technology" for generating electricity required for running the vehicle. The chemically generated energy of gasoline is instantly turned into electrically generated energy in these types of vehicles.

6. Working principles of FCEV

When appeared differently in relation to an electric vehicle, the functioning norm of a fuel driven electric vehicle is one of a kind. Because the fuel driven electric vehicle creates electricity required for running the vehicle on its own, it is a form of electric vehicle.

6.1 FCEV Case Studies

Hyundai Nexa, Toyota Mirai, Hyundai Tucson FCEV, Riversimple Rasa, Honda Clarity Fuel Cell

6.1.1 Advantages of electric car

- They are more environmentally friendly.

- Use of such resources which are renewable include electricity, unlike non-renewable resources which include gasoline.
- Lower maintenance is required for electric cars.
- More quieter gas driven automobiles.
- Owners of these vehicles get tax benefits.
- Electricity driven vehicles have their own highway lanes in some areas.

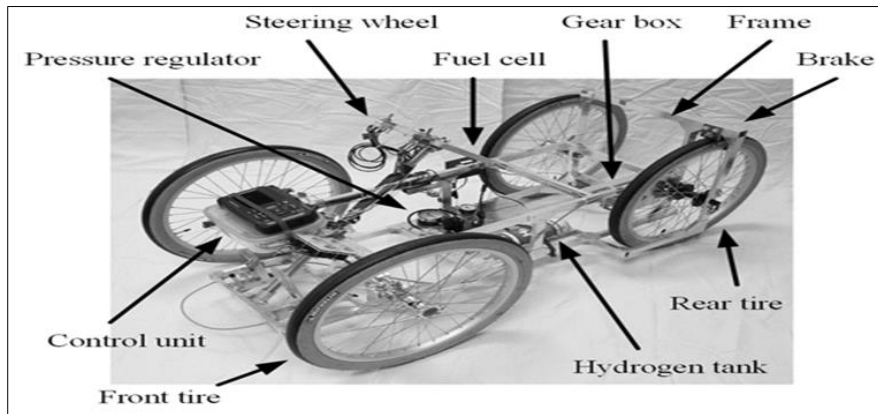


Figure 6 Fuel Cell Electric Vehicle type

6.1.2 Disadvantages of electric car

- The range of electric vehicles is less as compared to gas driven vehicles.
- Longer recharge times are required to charge the battery again.
- Electric vehicles are expensive as compared to gas driven vehicles.
- Charging station to charge the battery again are difficult to find sometimes.
- Electric cars aren't more in number so fewer models are available in the market.

7. Conclusion

We examined the numerous types of EVs, the technology utilized, the advantages over internal combustion engine vehicles, the evolution of sales over the last few years, as well as the various charging techniques and future technologies in this article. We also went over the specifics of the most important research problems and possibilities. The range of the vehicle is defined by the batteries present in the electric vehicle. We looked at a variety of batteries based on these characteristics. We also discussed emerging technologies such as graphene, which could be used in the future, which is believed to be a solution that allows for the storage of more energy and charge in a shorter time frame. This type of technology could also aid electric vehicles. reaching higher ranges, which makes it acceptable among users.

Batteries which have large storage capacity allow us to use fastest and powerful modes of charging and advanced modes of charging which are wireless. Another issue that could be considered is that establishment of some unique connector is to be done that can be utilized worldwide.

Deployment of automobiles which are electric will be aided. The electric vehicle (EV) will play a critical role in the future. future Smart Cities, as well as having a variety of charging schemes that may adapt to the needs of the consumers. Special attention will be paid to your requirements. As a result, future BMS should take into account the new circumstances that have been established as a result of new batteries and Smart City standards.

Compliance with ethical standards

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Disclosure of Conflict of interest

No conflict of interest was found during the entire duration of research for this research paper.

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