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# A Study about Electric Vehicles for the Future Transportation

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***Abstract--*** Because of the negative effects of gasoline engines on the atmosphere and people, the automobile industry has shifted to electric vehicles. This article describes the operation of an electric vehicle and compares it to internal combustion engines and hybrid vehicles Growing environmental problems are one of the major challenges that our world is facing. Pollution everywhere, greenhouse gas emissions, overuse of natural resources, and the list goes on. It is now our responsibility to lend our support to environmentally friendly initiatives. Electric cars are automobiles that run on renewable energy, reducing greenhouse gas emissions, air pollution, and noise pollution while also conserving natural resources such as oil, diesel, and gas for other uses and future needs. Electric vehicles have the same smooth ride and comfort as conventional vehicles powered by internal combustion engines. The study outlines some of the benefits and drawbacks of electric vehicles. A brief future view of the technology is also given. [1]

Figure 1

Source: https://yourstory.com/2021/04/niti-aayog-suggests-government-provide-incentives-ev-fame/amp

## I. INTRODUCTION

Alternative fuel vehicles were required in the 1960s and 1970s to alleviate the problems of internal combustion engine exhaust emissions and to minimise reliance on imported foreign crude oil. Many attempts to manufacture practical electric vehicles occurred and continue to occur between 1960 and the present.

The aim of this report is to identify the technology that goes into making an electric vehicle and to demonstrate why an electric motor is superior to an internal combustion engine. It explains why the electric vehicle has grown so quickly and why it is now a necessity for a better future. The study goes into the most critical components of an electric or hybrid vehicle. It contrasts electric vehicles with hybrids and internal combustion engines. It also covers the electric vehicle's future.

The cumulative effect of the electric car benefits people in the long run. Electric cars are ninety-seven percent cleaner than gasoline-powered vehicles, with no tailpipe pollution that can release particulate matter into the air. Particulate matter, which includes carcinogens released into the atmosphere by gasoline-powered vehicles, "can aggravate asthma symptoms and irritate respiratory systems"

The paper starts with an overview of the electric vehicle's past, including output lows and highs as well as the reasons for transition. The following section gives a technical overview of an electric vehicle, including its components, functions, and operation theory.. The hybrid car is described in the following section, which includes sections, their functions, and the theory of operation. I then compare the internal combustion engine, hybrid engine, and electric engine in terms of power, speed, acceleration, maintenance, mileage, and cost based on this knowledge. The paper ends with sections on the benefits and drawbacks of electric vehicles, as well as their potential prospects. [2]

## II. ELECTRIC VEHICLE (EV) HISTORY

Robert Anderson, who invented the first crude electric carriage, designed the first electric vehicle (EV) in Scotland between 1832 and 1839, the exact year is unknown. America did not pay attention to the electric vehicle until 1895, when A.L. Ryker designed an electric tricycle and William Morrison built a six-passenger waggon.. The Electric Phaeton, which was more like an electrified horseless carriage and surrey, was developed by Wood in 1902. "The Phaeton had an 18-mile range, a top speed of 14 mph, and a $2,000 price tag."

In the 1920s, the use and development of electric vehicles began to decline. A better road infrastructure, lower fuel prices due to the discovery of Texas crude oil, the invention of the electric starter, and mass development of internal combustion engine vehicles are all factors

contributing to the decrease in production.. "In 1912, an electric roadster sold for $1,750, while a diesel car sold for $650," according to the History of Electric Vehicles. Electric motors had all but vanished by 1935.

Electric cars resurfaced in the 1960s and 1970s as internal combustion vehicles created an unhealthy atmosphere for americans at the time

## III. DESCRIPTION OF AN ELECTRIC VEHICLE

Rather than a gasoline engine, the electric vehicle (EV) is driven by an electric motor that is powered by rechargeable battery packs. The car does not appear to be electric from the outside. Electric cars are usually produced by converting a gasoline-powered vehicle. The fact that the car is virtually silent is sometimes the only indication that it is electric.[3]

Under the hood, the electric car has:

1. An electric motor.
2. A controller.
3. A rechargeable battery.

The controller provides power to the electric motor, and the controller is powered by a rechargeable battery.

The electric vehicle works on the theory of electricity and current. To fuel the electric motor, it uses a battery pack (batteries). The motor then rotates a transmission, which turns the wheels, using the power (voltage) obtained from the batteries.

Four main parts make up the electric vehicle: the potentiometer, batteries, direct current (DC) controller, and motor


Figure 2:

Source:
https://www.google.com/url?sa=i&url=https%3A%2F%2Ftechpotal.com%2Felectric-vehicles-are-the-future-of-transportation%2F&psig=AOvVaw06WiKzFM3UmX3cy34PJuVx&ust=1620638099824000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCKi4_fmhvPACFQAAAAAdAAAAABAO

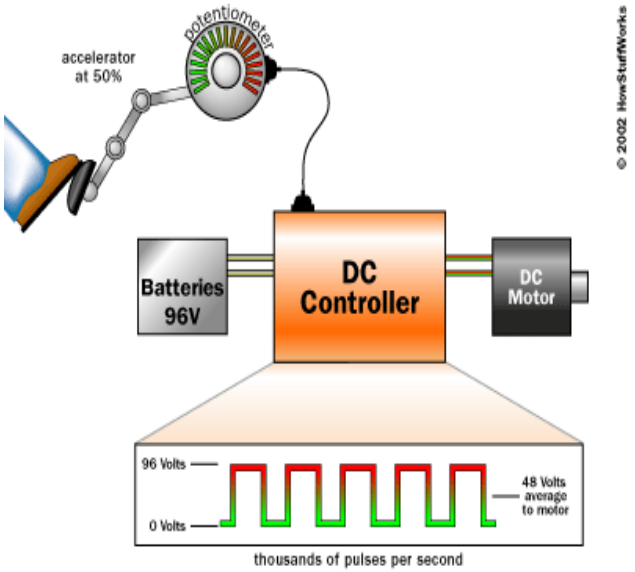


Figure 3:

Source:
https://www.google.com/url?sa=i&url=https%3A%2F%2Fauto.howstuffworks.com%2Felectric-car2.htm&psig=AOvVaw3qBS7FT_HIQ2reuBteGmo6&ust=1621684506564000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCLDd_qKD3PACFQAAAAAdAAAAABAD

## IV. DESCRIPTION OF PARTS AND THEIR FUNCTIONS

**Potentiometer** is a type of control device. It has a circular shape and is connected to the accelerator pedal by a cable. The potentiometer, also known as a variable resistor, sends a signal to the controller that tells it how much power it should deliver.

**Batteries** are a must. The controller is driven by the batteries. Leadacid, lithium ion, and nickel-metal hydride batteries are the three types of batteries. The voltage of batteries varies (power).

**DC (Direct Current) Controller** The controller transfers energy from the batteries to the motor. When the car is stopped, the controller can produce zero power, maximum power (when the driver depresses the accelerator pedal), or any power level in between. The controller takes in 144 volts direct current and applies it to the motor in a balanced manner if the battery pack contains twelve 12-volt batteries wired in series to produce 144 volts.

The controller reads the settings of the two potentiometers on the accelerator pedal and adjusts the power accordingly. When the accelerator pedal is half-depressed, the controller pulses the power such that it is on 25% of the time and off 75% of the time. The controller will not work if the signals from both potentiometers are not identical.

**Motor.**There is a motor. The controller provides power to the engine, which spins a transmission. The transmission

then drives the vehicle forward by turning the wheels. [4]

## V. THEORY OF OPERATION FOR EV

As the driver presses the pedal, the potentiometer activates and sends a signal to the controller, telling it how much power it can produce. For protection, there are two potentiometers. The controller reads the potentiometers to determine the position of the accelerator pedal, controls the power accordingly, and draws power from the batteries to drive the motor.The controller provides power (voltage) to the motor, which is used to rotate the transmission. The transmission then drives the car forward or backward by turning the wheels.

When the driver depresses the accelerator pedal all the way, the controller sends the motor the maximum battery voltage. The controller sends zero volts to the motor when the driver takes his or her foot off the accelerator. The controller chops the battery voltage thousands of times per second for every setting in between to produce an average voltage somewhere between 0 and maximum battery pack voltage.

## VI. COMPARISON OF COMBUSTION ENGINE, AND ELECTRIC

Table 1 compares the performance, speed, acceleration, maintenance, mileage, and cost of internal combustion engines and electric vehicles now that a basic understanding of how they work has been developed. The abbreviations are as follows: ICE (internal combustion engine) and EV (electric vehicle) (electric vehicle).

Table 1: Comparison between the ICE and EV

| | **ICE** | **EV** |
|---|---|---|
| **Efficiency** | Converts 20% of the energy stored in gasoline to power the vehicle. | Converts 75% of the chemical energy from the batteries to power the wheels |
| **Speed (average top speed)** | 124 miles per hour (mph) | 30-95 mph |
| | **ICE** | **EV** |
| **Acceleration (on average)** | 0-60 mph in 8.4 seconds | 0-60 mph in 4-6 seconds |
| **Maintenance** | Wheels/tires<br>Engine<br>Fuel/gas<br>Bodywork/paint<br>Electrical<br>Lights<br>Dash/instrument warning lights | Does not require as much maintenance because it does not use a gasoline engine. No requirements to take it to the Department of<br>Environmental Quality for an emissions inspection |
| **Mileage** | Can go over 300 miles before refueling. Typically get 19.8 miles per gallon (mpg). | Can only go about 100 to 200 miles before recharging |
| **Cost (on average)** | $14,000 to $17,000. | Extensive range, $6,000 to<br>$100,000 |

## VII. ADVANTAGES AND DISADVANTAGES OF THE EV

The rechargeable battery is the most significant obstacle that EVs face. Most EVs have a range of 100–200 miles before needing to be recharged, and it can take four to eight hours to completely recharge the battery pack. Battery packs are bulky, costly, and take up a lot of room in vehicles. Overall, the electric car offers more benefits than drawbacks. There are no tailpipe pollutants, which mean less global pollution and less obese people. The advantages and drawbacks of the EV are summarized in Table 2.

Table 2: Advantages and Disadvantages of the EV

| **Advantages** | **Disadvantages** |
|---|---|
| Fuel can be harnessed from any source of electricity, which is available in most homes and businesses. | Limited in the distance that can be driven before the complete failure of the battery. |

| | |
|---|---|
| It reduces hydrocarbon and carbon monoxide, responsible for many environmental problems, by 98%. | Accessories, such as air conditioning and radios drain the battery. |
| Also reduces pollution. | Heavier car due to the electric motors, batteries, chargers, and controllers. |
| | |
| Does not produce emissions. Important in urban cities, where cleaner air is much needed. | More expensive because of cost of the parts. |

## VIII. EMISSIONS

Electric cars are ninety-seven percent cleaner than gasoline-powered vehicles, with no tailpipe pollution that can release particulate matter into the air.

### *A. Global Warming: Ozone Layer*

Carbon dioxide emissions into the atmosphere, also known as global warming, deplete the Earth's ozone layer, which is what is happening right now. Electric cars are safe because they use half the amount of components that a diesel-powered car does, including gasoline and oil.

### *B. Affected People: Sickness*

Particulate matter, or carcinogens emitted into the environment by gasoline-powered vehicles, "can aggravate asthma and irritate respiratory systems," according to the report. Internal combustion engines emit carbon dioxide into the atmosphere, which depletes the ozone layer, which absorbs 97% to 99% of the sun's high-frequency ultraviolet light.. "Every one percent reduction in the earth's ozone shield is expected to increase the amount of UV light exposure to the lower atmosphere by two percent," according to Ozone Layer. The sun's ultraviolet radiation is particularly dangerous to life on Earth. UV light causes skin cancer by causing damage to the skin. It also causes harm to the eyes and marine life.

## IX. FUTURE OF THE EV

Lithium-ion phosphate (LiFePO4) batteries, which are becoming increasingly common in other countries, will almost certainly be used in future electric vehicles. Electric bikes and scooters use LiFePO4 batteries, which are rechargeable and powerful. This technology will most likely be adopted by electric vehicles in the future.

The increased use of super capacitors and ultra capacitors for storing and transmitting electrical charge is another technology that is likely for future electric cars. Many of these batteries are currently being used in hybrid car prototypes, but they are also likely to be used in future electric car markets.

The demand for potential electric cars would be wide open if developers can build vehicles with a range of 300 miles per charge, a charging time of five to ten minutes, and driver safety. Improved battery technologies are being developed by researchers in order to increase driving range while reducing recharging time, weight, and cost. The future of electric vehicles will be determined by these factors. [5]

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## CONCLUSION

The electric vehicle, as seen in this article, has several advantages and benefits over the internal combustion engine and hybrid vehicle. It is cleaner and more effective, but it has drawbacks as well. It is heavier, has a restricted range of travel before needing to be recharged, and is more expensive. The future of the electric vehicle is dependent on its battery. The future of electric vehicles looks bright if researchers can develop or discover the "super battery." As of today, each vehicle has its own distinguishing feature that makes it superior to the others. Only time and technical advancements will determine which vehicle will be the most successful in the future.