

EV and its History

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Abstract

They are unlike conventional vehicles, which are powered by internal combustion engines, electric vehicles use electricity stored in rechargeable batteries or fuel cells to power the electric motor.

Electric vehicles have become increasingly popular in recent years due to their lower environmental impact and potential to reduce greenhouse gas emissions. They are also more efficient than traditional gasoline-powered vehicles and can save drivers money on fuel costs.

BEVs are powered solely by electricity and must be recharged using an external power source, such as a charging station or household outlet. PHEVs, on the other hand, have both an electric motor and a gasoline engine and can switch between electric and gasoline power depending on driving conditions.

Despite the advantages of electric vehicles, there are still some challenges to widespread adoption, such as the limited range of many models and the availability of charging infrastructure. However, advances in technology and increasing public awareness of the benefits of electric vehicles are expected to drive continued growth in this market in the coming years.

What is EV?

An electric vehicle (EV) is a type of vehicle that is powered by electricity stored in batteries or fuel cells, rather than by traditional internal combustion engines that burn gasoline or diesel fuel. EVs have electric motors that drive the wheels, and they can be recharged by plugging into an electrical outlet or charging station.

Electric vehicles (EVs) are a rapidly growing technology that offers a cleaner and more sustainable alternative to traditional gasoline and diesel-powered vehicles. EVs have electric motors that drive the wheels and are powered by electricity stored in batteries or fuel cells. EVs have several benefits, including lower emissions, lower operating costs, and a smoother, quieter driving experience. However, they may also have higher upfront costs and limited driving range, depending on the model and battery capacity.

Despite these challenges, the popularity of EVs is expected to continue to grow as governments around the world implement policies to reduce emissions and promote the adoption of electric vehicles.

Literature Review

History of EV

The first practical electric vehicle was developed by Thomas Davenport in 1835, which was a small locomotive powered by a DC motor and batteries.

In the late 1800s and early 1900s, electric vehicles gained popularity as an alternative to gasoline-powered vehicles, especially in cities where they were used for local transportation. During this time, electric vehicles were also used as taxis, delivery vehicles, and even in some early racing competitions.

However, the development of the internal combustion engine and the availability of cheap gasoline led to a decline in the popularity of electric vehicles in the early 1900s. Electric vehicles were still used for some niche applications, such as golf carts and some industrial vehicles, but they were not widely adopted as a means of transportation.

In the 1960s and 1970s, rising concerns about air pollution and oil dependence led to renewed interest in electric vehicles. During this time, several companies developed prototype electric vehicles, but they were still too expensive and had limited driving range, which made them impractical for most consumers.

In the 1990s and 2000s, improvements in battery technology and the development of hybrid electric vehicles (HEVs) and later plug-in hybrid electric vehicles (PHEVs) helped to increase the popularity of electric vehicles. Today, electric vehicles are becoming more mainstream, with many major automakers producing fully electric and hybrid electric models. Governments around the world are also promoting the adoption of electric vehicles through incentives and regulations, in an effort to reduce greenhouse gas emissions and improve air quality.

What was the first Electric Vehicle?

The first electric vehicle was developed in the early 19th century, with several inventors working on the concept. However, the first practical electric vehicle was developed by Thomas Davenport, an American inventor, in 1835. Davenport's electric vehicle was a small locomotive that ran on a circular electrified track. The following year, Robert Anderson, a Scottish inventor, developed a crude electric carriage that was powered by non-rechargeable primary cells.

In the late 1800s and early 1900s, electric vehicles became increasingly popular, with several automakers producing electric cars, trucks, and buses. One of the most famous electric vehicles of the era was the Baker Electric, produced by the Baker Motor Vehicle Company from 1899 to 1914. The Baker Electric was a luxury car that was popular with wealthy individuals, and it was known for its smooth ride and quiet operation.

However, the rise of the gasoline-powered internal combustion engine in the early 20th century led to a decline in the popularity of electric vehicles, and they remained a niche product for many years. It was only in recent years, with advances in battery technology and increasing concerns over climate change and air pollution, that electric vehicles have once again become a popular option for consumers.

However, the first electric vehicle that was practical for everyday use was developed by Thomas Davenport, an American inventor who built a small electric locomotive in 1835. Davenport's locomotive used a DC motor and batteries to provide power, and it was used to transport freight and passengers over a short distance. This was the first electric vehicle that was capable of sustained, practical use, and it laid the foundation for the development of electric vehicles in the following decades.

When and who created the first EV?

The history of electric vehicles dates back to the early 19th century, and there were several inventors who contributed to the development of the technology. However, the first practical electric vehicle is generally credited to Scottish inventor Robert Anderson, who built an electric carriage in 1832. Anderson's carriage was powered by non-rechargeable batteries, and it was mainly used for short demonstrations rather than practical transportation.

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In the following decades, other inventors and engineers continued to develop electric vehicles, including Gustave Trouvé, who built an electric tricycle in 1881, and Thomas Parker, who built an electric car in 1884. These early electric vehicles were mainly used for local transportation in cities, and they were favored by some people for their quiet operation and lack of pollution.

While these early electric vehicles were not widely adopted, they laid the foundation for the development of modern electric vehicles, which are becoming increasingly popular today as a cleaner and more sustainable alternative to traditional gasoline-powered vehicles.

History of EV in India

Electric vehicles (EVs) have a long history in India, dating back to the early 20th century. The first electric vehicle in India was introduced in 1898 by the Kolkata-based company, Jamshedpur Garage. However, it was only in the 1940s that EVs gained popularity, especially in the form of electric trams in Kolkata.

In the 1960s, the Indian government started to promote EVs as a solution to the country's growing air pollution problem. The government began subsidizing the production of electric scooters and bicycles, and several state-owned companies began manufacturing EVs.

In the 1990s, a number of private companies began producing EVs, including the Reva Electric Car Company, which was founded in 1994. Reva's electric car, the Reva-i, was introduced in 2001 and became one of the first commercially successful EVs in India. Reva was later acquired by Mahindra & Mahindra and is now known as Mahindra Electric.

In recent years, the Indian government has taken steps to promote the use of EVs as part of its efforts to reduce air pollution and greenhouse gas emissions. In 2013, the government launched the National Electric Mobility Mission Plan (NEMMP) with the goal of putting 6-7 million EVs on Indian roads by 2020. The government has also provided incentives for EV buyers and has launched a number of initiatives to develop the charging infrastructure for EVs.

Despite these efforts, EV adoption in India has been relatively slow. Challenges such as high upfront costs, limited driving range, and a lack of charging infrastructure have hindered the growth of the EV market. However, with advancements in technology and continued government support, the future of EVs in India looks promising.

Types of EV

There are several types of electric vehicles (EVs), each with different power-trains and characteristics. The main types of EVs are:

1. **Battery electric vehicles (BEVs):** These vehicles are powered solely by electricity stored in rechargeable battery packs. They have no gasoline engine, and they are charged by plugging them into an electric power source, such as a wall outlet or a public charging station. BEVs have zero tailpipe emissions and are the most environmentally friendly type of electric vehicle.
2. **Plug-in hybrid electric vehicles (PHEVs):** These vehicles have both an electric motor and a gasoline engine. They can be charged by plugging them into an electric power source, and they can also run on gasoline when the battery is depleted. PHEVs have lower emissions than conventional gasoline vehicles, but they are not as clean as BEVs.
3. **Hybrid electric vehicles (HEVs):** These vehicles also have both an electric motor and a gasoline engine, but they cannot be charged by plugging them into an electric power source. Instead, they use regenerative braking to recharge the battery while driving. HEVs have lower emissions than conventional gasoline vehicles, but they are not as clean as PHEVs or BEVs.
4. **Fuel cell electric vehicles (FCEVs):** These vehicles use hydrogen gas to produce electricity, which powers an electric motor. They emit only water vapor and have the potential to be a zero-emission alternative to gasoline vehicles. However, FCEVs are still relatively expensive and there are few refueling stations available.

Working Principle of an EV

The working principle of an electric vehicle (EV) is based on the use of an electric motor to drive the wheels, powered by energy stored in a battery pack. When the driver presses the accelerator pedal, the motor draws power from the battery and converts it into rotational force that drives the wheels.

The battery pack is charged by plugging the vehicle into an electric power source, such as a wall outlet or a public charging station. The battery pack stores energy in chemical form, which is then converted into electrical energy to power the motor.

In addition to the motor and battery pack, an EV also includes a controller, which manages the flow of power from the battery to the motor. The controller regulates the speed of the motor based on input from the accelerator pedal and other sensors, such as the speedometer and brake pedal.

The regenerative braking system is another key feature of an electric vehicle. When the driver applies the brakes, the motor acts as a generator and converts some of the kinetic energy of the vehicle into electrical energy, which is then stored in the battery pack. This process helps to extend the driving range of the vehicle and reduces wear on the brake pads.

Overall, the working principle of an electric vehicle is based on the use of an electric motor and battery pack to provide clean, efficient, and quiet propulsion.

Components of an EV

An electric vehicle (EV) has several components that work together to provide clean, efficient, and quiet transportation. The components are:

1. **Battery Pack:** The battery pack is the energy storage system of an EV, which stores electrical energy that is used to power the electric motor. The battery pack is usually made up of a series of lithium-ion cells, and it is located beneath the floor of the vehicle.
2. **Electric Motor:** The electric motor is the heart of an EV, which converts electrical energy from the battery into mechanical energy to power the wheels. The electric motor is usually located near the wheels, and it is connected to a transmission system that delivers power to the wheels.
3. **Controller:** The controller is an electronic device that manages the flow of power from the battery to the electric motor. The controller regulates the speed and torque of the motor based on input from the accelerator pedal and other sensors, such as the speedometer and brake pedal.
4. **Onboard Charger:** The onboard charger is a device that converts AC power from an external source, such as a wall outlet or a public charging station, into DC power that can be stored in the battery pack. The onboard charger is usually located near the battery pack.
5. **Regenerative Braking System:** The regenerative braking system is a feature that recaptures some of the kinetic energy of the vehicle when the brakes are applied, and converts it into electrical energy that is stored in the battery pack.
6. **Inverter:** The inverter is an electronic device that converts DC power from the battery pack into AC power that is used to drive the electric motor. The inverter is located near the electric motor.
7. **Thermal Management System:** The thermal management system is a feature that regulates the temperature of the battery pack and other components to ensure optimal performance and longevity.

How Electric Motor in EV operate?

An electric motor in an electric vehicle (EV) operates using the principle of electromagnetism. The motor contains a series of copper coils, which are surrounded by a magnetic field. When electrical energy is supplied to the coils, they become electromagnets and interact with the magnetic field to produce a rotational force.

The electric motor operates through a series of steps, which are as follows:

1. Electrical energy is supplied from the battery pack to the motor controller, which regulates the flow of electricity to the motor.
2. The motor controller converts the DC power from the battery pack into three-phase AC power, which is sent to the electric motor.
3. The AC power is delivered to the copper coils in the motor, which are arranged in a specific pattern. As the current flows through the coils, they create a magnetic field that interacts with the magnetic field in the motor.
4. The interaction between the magnetic fields causes the rotor, which is connected to the wheels of the EV, to rotate.
5. As the rotor rotates, it spins the wheels, which propel the vehicle forward.
6. The speed and torque of the motor are regulated by the motor controller, which adjusts the frequency and amplitude of the AC power to the motor.

Overall, the electric motor in an EV operates through the use of electrical energy, magnetic fields, and rotational forces, which work together to provide clean, efficient, and quiet propulsion.

How charging carried out in EV?

Charging an electric vehicle (EV) is a relatively simple process that can be done at home or at public charging stations. Here are the basic steps involved in charging an EV:

1. Plug in the charger: To charge an EV, you need to connect it to a charger. Most EVs come with a charging cable that can be plugged into a wall outlet or a dedicated charging station. Some EVs also support wireless charging.

2. Select the charging level: EV chargers come in different levels, depending on the amount of power they can deliver. Level 1 chargers typically deliver 120 volts and charge at a rate of about 4 to 5 miles of range per hour. Level 2 chargers deliver 240 volts and charge at a rate of about 25 miles of range per hour. DC fast chargers deliver high-power DC electricity directly to the battery and can charge an EV to 80% in as little as 20-30 minutes.
3. Start the charging process: Once the charger is plugged in and the charging level is selected, you can start the charging process. Most EVs have a charging port located in the front or rear of the vehicle, which can be opened with a button or lever.
4. Monitor the charging progress: During the charging process, you can monitor the progress on the dashboard display or on a mobile app. Some EVs also have features that allow you to schedule charging times, set charge limits, and track energy usage.
5. Unplug and go: Once the battery is fully charged or you have reached your desired charge level, you can unplug the charger and go. Some charging stations may require payment or a membership to use, while others may be free.

Features of an EV

Electric vehicles (EVs) have a range of features that make them attractive to drivers who want a clean, efficient, and sustainable mode of transportation. Here are some of the main features of an EV:

1. Electric motor: EVs are powered by an electric motor, which provides clean, efficient, and quiet propulsion. Electric motors have fewer moving parts than internal combustion engines, which makes them more reliable and requires less maintenance.
2. Battery pack: The battery pack is the heart of an EV and stores the electrical energy that powers the electric motor. EV batteries come in different sizes and capacities, and they can be charged using a variety of methods, including at home, at work, or at public charging stations.
3. Regenerative braking: EVs often use regenerative braking, which captures energy that would otherwise be lost during braking and uses it to recharge the battery. This helps extend the driving range of the vehicle and improves overall efficiency.
4. Energy efficiency: EVs are much more energy efficient than gasoline-powered vehicles. EVs convert about 60-70% of the electrical energy from the battery to power the wheels, while gasoline-powered vehicles convert only about 20% of the energy in gasoline to power the wheels.
5. Quiet operation: EVs are very quiet when in operation, which makes them ideal for urban environments and reduces noise pollution.

6. Zero emissions: EVs produce zero emissions at the tailpipe, which helps improve air quality and reduce greenhouse gas emissions.
7. Advanced technology: EVs often come with advanced features, such as regenerative braking, energy management systems, and smart connectivity, which help optimize energy usage, improve performance, and enhance the driving experience.

Advantages and Disadvantages

ADVANTAGES:

1. Environmentally friendly: EVs produce zero emissions at the tailpipe, which helps improve air quality and reduce greenhouse gas emissions. They are more environmentally friendly option for transportation.
2. Cost-effective: EVs have lower operating costs than gasoline-powered vehicles. Electricity is generally cheaper than gasoline, and EVs require less maintenance than gasoline-powered vehicles.
3. Energy efficient: EVs are much more energy efficient than gasoline-powered vehicles. EVs convert about 60-70% of the electrical energy to power the wheels, while gasoline-powered vehicles convert only 20% of the energy in gasoline to power the wheels.
4. Quiet and smooth: EVs are very quiet when in operation, which makes them ideal for urban environments and reduces noise pollution
5. Government incentives: Many governments offer incentives, such as tax credits and rebates, for EV buyers, which can help offset the higher upfront cost of purchasing an EV

DISADVANTAGES:

1. Limited range: EVs generally have a limited driving range compared to gasoline-powered vehicles. While the range is improving with new technology, it may still be a concern for some drivers.
2. Long charging times: EVs take longer to charge than gasoline-powered vehicles take to refuel. Even fast-charging options can take 30 minutes or more to reach an 80% charge.
3. Upfront cost: EVs are generally more expensive than gasoline-powered vehicles, although the cost is coming down with advancements in technology and increased production.
4. Charging infrastructure: The charging infrastructure for EVs is still developing, and it can be challenging to find charging stations in some areas.

5. Battery disposal: EV batteries have a limited lifespan and will eventually need to be replaced. Proper disposal of these batteries is still a concern.

Conclusion

Electric vehicles (EVs) have come a long way since their inception in the early 19th century, and they are now becoming increasingly popular as a solution to many of the challenges facing the transportation sector. With zero emissions at the tailpipe, lower operating costs, and a smoother driving experience, EVs offer many benefits over conventional gasoline-powered vehicles.

However, challenges such as limited range, long charging times, and a lack of charging infrastructure still exist, and these will need to be addressed for EVs to become a more viable option for the masses. Governments, automakers, and other stakeholders will need to work together to develop the necessary infrastructure and technologies to support the widespread adoption of EVs.

Despite these challenges, the future of electric vehicles looks promising, with advancements in battery technology, increased production, and continued government support driving growth in the industry. As we move towards a more sustainable future, EVs will play an increasingly important role in reducing greenhouse gas emissions and improving air quality, making them a key part of the transition to a cleaner and more efficient transportation system.

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