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REVIEW ON ELECTRIC VEHICLES

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Abstract:

The adoption of electric vehicles (EVs) has increased rapidly over the past decade, driven by advances in technology, environmental concerns, and government policies. This paper provides a comprehensive review of the current state of EVs, including their technological advancements, market trends, and future prospects. We first examine the components of EVs, including batteries, motors, and charging infrastructure, and discuss the advancements that have made EVs more reliable, efficient, and affordable. We then provide an overview of the global EV market, including sales figures, market share, and government policies that have incentivized adoption. Finally, we analyse the future prospects of EVs, including emerging technologies and potential barriers to widespread adoption.

Introduction

Fossil fuels are the most commonly and widely used fuels all over the world. In the very short period of time since then – just over 200 years –humans have consumed an incredible amount of them, leaving fossil fuels all but gone and the climate seriously impacted. The fuel reserves are finite and the rate at which the world is consuming fossil fuels is not standing still. Globally, the consumption of oil points to the equivalent of over 11 billion tonnes every year. Crude oil reserves are vanishing at the rate of 4 billion tons a year. If this gets carried on at this rate, without any increase for our growing population or aspirations, our known oil deposits will last until 2060. People need to switch to green energy . Switching to green energy is the single biggest thing we . Green energy can be sourced from all the renewable sources such as wind, the sun, tides, and the earth and so on. Production of electricity and efficient usage determines the credibility of the future growth of industrial sector, transportation and survival.

Electric vehicles (EVs) are becoming an increasingly popular alternative to traditional gasoline-powered cars due to a variety of factors, including environmental concerns, advances in technology, and government policies. EVs are powered by electric motors and rely on rechargeable batteries for energy storage. Compared to traditional gasoline-powered cars, EVs emit significantly less greenhouse gases, making them an attractive option for environmentally conscious consumers.

Motors are another critical component of EVs, and recent advancements in motor technology have led to increased efficiency and performance. Permanent magnet motors, which are commonly used in EVs, have become more affordable and efficient, allowing for increased power output and longer driving ranges.

Charging infrastructure has also improved significantly, with more public charging stations available and faster charging times. The development of fast-charging technologies has reduced charging times from hours to minutes, making EVs more convenient and practical for everyday use.

Technological Advances in EVs:

Recent technological advances have made EVs more reliable, efficient, and affordable. Batteries, which are a critical component of EVs, have improved in terms of energy density, charge time, and cost. Lithium-ion batteries, which are currently the most common type of EV battery, have seen significant improvements in energy density, allowing for longer driving ranges. Additionally, new battery chemistries, such as solid-state batteries, offer even higher energy densities and fast charging.

ELECTRIC VS HYBRID VEHICLES

A vehicle is a hybrid, if it utilizes more than one form of onboard energy to achieve propulsion. A hybrid will have a internal combustion engine , as well as electric motors and battery pack. So far, installing both in the same vehicle has proven to be prohibitively expensive. The motor coupled with generator is to generate electricity to recharge the battery as it absorbs a portion of the vehicle's momentum when slowing or coasting downhill. Normal cars waste all of their excess momentum as heat in the brakes. Operating the vehicle on electric power alone is possible if the hybrid system has enough electrical capacity. Plug-in hybrids began appearing in the market at the end of 2020. It provides a way to plug the battery into an electrical outlet for recharging while parked. The benefit of the plug-in hybrid is its ability to travel in all-electric mode for most short trips, reserving the gasoline engine for longer drives.

Classification of Hybrid and Electric Drive Vehicles

• Micro Hybrid Gasoline/Diesel driven engines .

• Mild Hybrid engines in which the electric motor supports the combustion engines using regenerative braking.

• Full Hybrid engines in which the electric motor supports the combustion process. It is possible to drive exclusively using electricity alone.

• Emission-free vehicles that do not release exhaust gases into the environment during operation are also called “zero-emission vehicles”.

• Battery-powered vehicles that are moved exclusively by an electric drive are also called “battery electric vehicles” (BEV). The energy required to run the vehicle is supplied by a high-voltage battery that is charged externally.

• Electric vehicles with fuel cells in which the energy for operation is produced by a fuel cell.

The Main Components of an Electric Vehicle

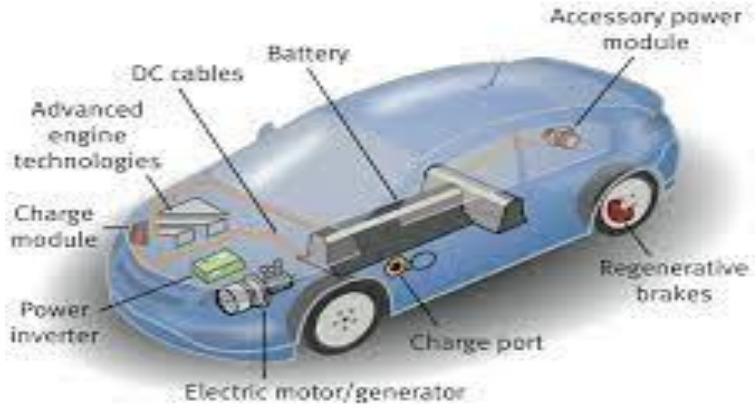
The electric vehicle drive system includes:

• High-voltage battery with control unit for battery regulation and charger.

• Electric motor/generator with electronic control and cooling system.

• Transmission including the differential.

• Brake system.



1. Battery Technology

Improvements in battery technology over the past six years have been impressive. Today's battery cells have higher energy densities and are much less expensive on a per kWh basis than they were just a few years ago. Lithium-ion (Li-ion) cells enjoy the bulk of investment, and remain the preferred technology for LG Chem, Panasonic, and Samsung, the three largest producers. Lithium-metal technologies with much higher energy densities are in development, but currently lack the production scale and established supply chain advantages of Li-ion. Verifiable information on battery costs is difficult to obtain, which can apply to the cost of individual cells, the battery pack, or the battery pack once installed in the vehicle itself, or indeed the final cost to the consumer once any manufacturer markup is applied.

2.Fuel Cell Vehicles

Fuel cell vehicles (FCVs) have the potential to significantly reduce our dependence on foreign oil and lower harmful emissions that contribute to climate change. FCVs run on hydrogen gas rather than gasoline and emit no harmful tailpipe emissions. The Fuel cell has the following constituents. The Power control unit governs the flow of electricity. The Electric motor propels the vehicle more quietly, smoothly, and efficiently than an internal combustion engine and requires less maintenance. The Fuel Cell Stack converts hydrogen gas and oxygen into electricity to power the electric motor. The High-Output Battery stores energy generated from regenerative braking and provides supplemental power to the electric motor. The Hydrogen Storage Tank stores hydrogen gas compressed at extremely high pressure to increase driving range. FCVs look like conventional vehicles, but use cutting edge technologies. The heart of the FCV is the Fuel Cell Stack. The stack converts hydrogen gas stored onboard with oxygen from the air into electricity, which powers the vehicle's electric motor.

3.Torque Development Comparison

The electric drive motor will reach its maximum torque as early as the first revolution. It does not need a start-up phase to reach idling speed. Once a specific rpm figure has reached, the available torque falls as the revolutions increase. This motor speed is approximately 14,000 rpm. These characteristics of an electric drive motor mean that a complex transmission is not required. The internal-combustion engine requires an idling speed to produce a torque. The available torque increases as the engine speed increases. In addition, this characteristic of the internal-combustion engine requires a transmission with several gear ratios. The torque is transferred to the transmission via clutch or torque converter.

Co2 Emissions

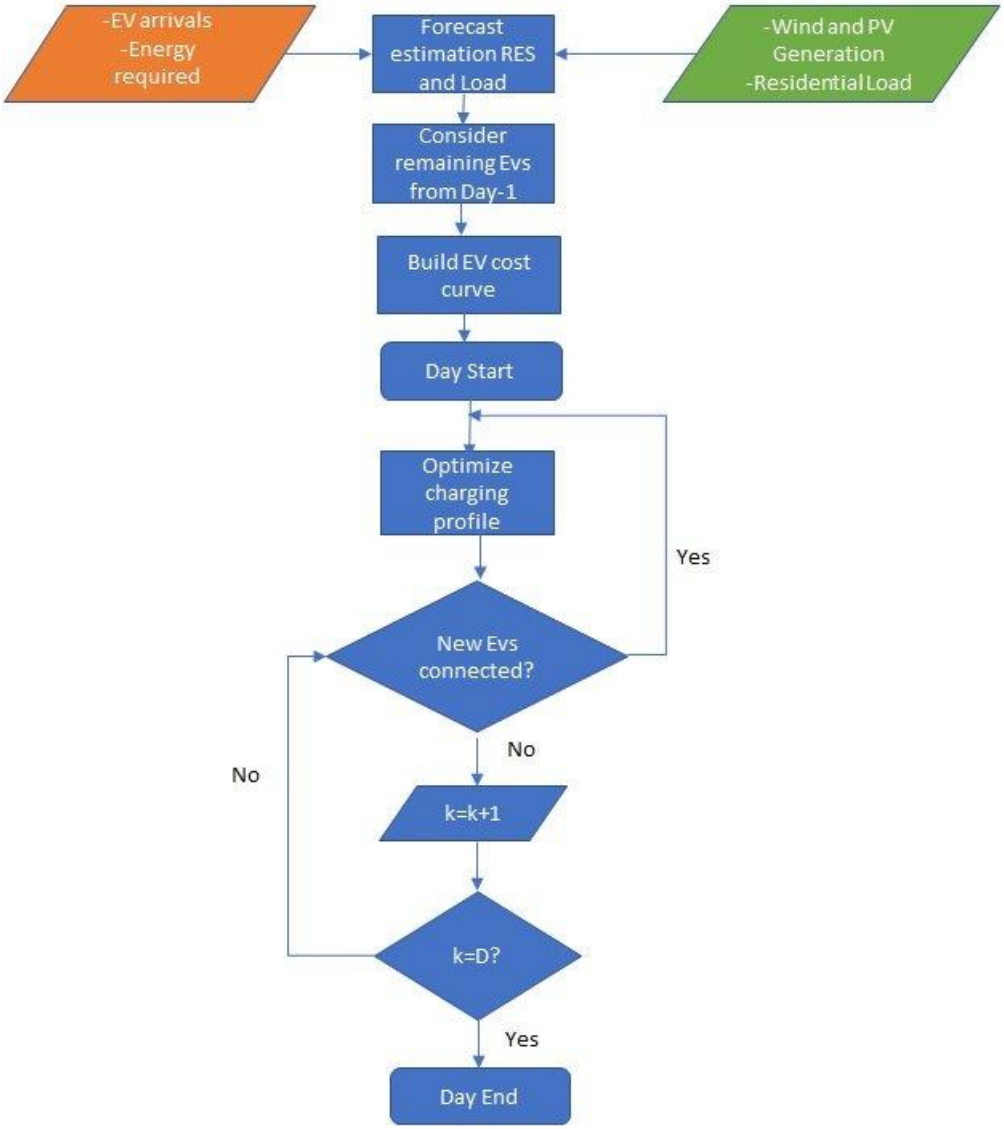
Before 2050, global warming should not exceed the value of 3.6° F (2°C) related to the earth's temperature from pre-industrial times. This goal can only be achieved by reducing CO2 emissions. The plan is to reduce the CO2 emissions per capita from the current 45 tons per year to 0.7 tons per year by 2050. Electric vehicles do not directly produce CO2emissions. However, the analysis of CO2 producers does not just evaluate the vehicle, but also the emissions that occur during the production of the electrical energy . In Germany in particular, electromobility is closely linked to the use of “clean electricity” . It can be assumed that today's electricity mixture causes lower CO2emissions per vehicle compared with vehicles with internal-combustion engines.

MAJOR DRAWBACKS OF ELECTRIC VEHICLES

The main disadvantages of electric car ownership concern range anxiety. It is the drawback that when the vehicle stops and there is no charging station nearby. The introduction of electric vehicles should not only aim at their popularity as a global concern, but should also point at the development of charging stations compulsorily. Another big disadvantage is that many drivers will have to install a charging station at home. Overall battery life is expected to be around a decade, and replacement battery packs can be costly. Finally, EV ownership doesn't eliminate fuel costs entirely. Generation of electricity also requires capital costs. All other car accessories viz. radio, car air conditioners, etc. use up electric power from batteries, which could drain quickly. The batteries that power these cars are a costly affair. While themselves being clean, there are toxic elements within batteries and which could spew toxic fumes. Batteries are what make these vehicles heavy. This is a disadvantage because weight puts pressure on batteries and they drain out faster.

Market Trends in EVs:

The global EV market has experienced rapid growth in recent years, with sales increasing from just a few thousand units in 2010 to over 3 million units in 2020. China is currently the largest market for EVs, followed by Europe and the United States. Government policies, such as tax incentives and subsidies, have played a significant role in incentivizing EV adoption. In addition, stricter emissions regulations in many countries have forced automakers to develop more EVs to meet their emissions targets.



Future Prospects of EVs:

The future of EVs looks promising, with continued technological advancements expected to improve battery performance, driving ranges, and charging times. Additionally, emerging technologies, such as solid-state batteries and wireless charging, have the potential to revolutionize the EV industry. However, there are still potential barriers to widespread adoption, such as high upfront costs, limited charging infrastructure, and range anxiety. These challenges will need to be addressed through continued investment in research and development, government policies that incentivize adoption, and increased public education and awareness.

Conclusion:

EVs have come a long way in a short amount of time, with significant technological advancements and a rapidly growing global market. Despite the challenges that still need to be addressed, the future looks bright for EVs, with continued innovation and investment expected to drive further growth and adoption. As the world shifts towards a more sustainable future, EVs are likely to play a significant role in reducing greenhouse gas emissions and creating a cleaner, more sustainable transportation system.

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