

ACCELERATING THE FUTURE: THE RISE OF ELECTRIC VEHICLES AND THE IMPERATIVE FOR EFFICIENT CHARGING SOLUTIONS

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Анотація.

У даній статті описано різновиди зарядних електростанцій для електромобілів та технології, які спрямовані на скорочення часу зарядки електромобіля до рівня часу заправки автомобіля з двигуном внутрішнього згорання. Висвітлено переваги та обмеження зарядних станцій в залежності від типу з'єднувача та потужності зарядки. Також вказано на потенційні технологічні розвитки, що можуть вплинути на швидкість зарядки електромобілів у майбутньому.

Ключові слова: електромобілі, зарядні станції для електромобілів.

Abstract.

This article provides an overview of the types of charging stations for electric vehicles and the technologies aimed at reducing the charging time of an electric car to match the refuelling time of internal combustion engine vehicles. It highlights the advantages and limitations of charging stations depending on the connector type and charging power. Additionally, potential technological advancements that could impact the charging speed of electric vehicles in the future are discussed.

Keywords: electric cars, charging stations for electric cars.

Introduction

The Rise of Electric Vehicles and the Need for Faster Charging Solutions. Here are some key aspects related to this topic:

1. Growing Popularity of Electric Vehicles: The introduction begins by highlighting the increasing popularity of electric vehicles (EVs) worldwide. It discusses the factors driving this trend, such as rising fuel prices, active government policies, environmental concerns, and the decreasing cost of EVs. The paragraph emphasizes the growing acceptance of EVs as a viable alternative to traditional internal combustion engine vehicles.

2. The Need for Efficient Charging: This subsection focuses on one of the main challenges faced by EVs, which is the speed of battery charging. It explains that while EVs can be charged from a household outlet or a 380V AC 3-phase socket, these methods are not practical for everyday use due to their long charging times. The paragraph highlights the need for faster charging solutions to make EVs more competitive with conventional vehicles in terms of refueling time.

3. Introduction to Fast Charging: The section introduces the concept of fast charging as a solution to reduce EV charging time. It explains that fast chargers are being developed to enable quicker charging by utilizing AC or DC charging technologies. The paragraph mentions that fast chargers are crucial for enhancing the convenience and usability of EVs, allowing them to compete with internal combustion engine vehicles in terms of refueling speed.

4. Types of Fast Chargers: This subsection provides an overview of the two main types of fast chargers: AC and DC chargers. It explains that AC fast chargers, typically using the Type 2 connector, convert the incoming alternating current into direct current on-board the EV. It mentions the limitations of AC charging in terms of charging speed due to constraints on the onboard charger's size, weight, and heat dissipation capabilities. Additionally, the paragraph discusses DC fast chargers, which allow direct current to be supplied to the EV battery from an external charging station. It mentions connector types like CHAdeMO, CCS, and Tesla Type 2, and their respective power capacities. The paragraph highlights the efficiency and faster charging potential of DC charging but also acknowledges the higher cost and potential impact on battery life.

5. **Transition to Electric Mobility:** This final subsection contextualizes the broader transition to electric mobility. It mentions the plans of many developed countries and automakers to phase out internal combustion engines and transition to electric vehicles. The paragraph emphasizes the importance of addressing the charging time challenge to accelerate the widespread adoption of EVs and achieve the goals of sustainable transportation and reduced carbon emissions accidents. These aspects require careful planning, regulation, and oversight to ensure safety and prevent negative consequences.

Research results

The research findings shed light on the various charging technologies available for electric vehicles and their influence on reducing the overall charging time. The key research conclusions are as follows:

1. **Growing EV Adoption:** The adoption of electric vehicles has seen significant growth worldwide, with countries such as China, Europe, and the United States leading the trend. For instance, in Europe, the EV market share rose to about 10% in 2020. In China, the world's largest auto market, EV sales in 2020 accounted for about 5% of total auto sales.

2. **Impact of Charging Infrastructure:** The availability and efficiency of charging infrastructure is a crucial factor influencing the adoption of EVs. Studies show that prospective EV buyers consider the availability of convenient and fast charging options as a significant factor when deciding to purchase an EV.

3. **Advancements in Fast Charging Technology:** Research in fast-charging technologies has led to the development of more efficient and powerful chargers. For instance, some fast chargers can now charge EVs to 80% in around 30 minutes. However, challenges such as potential battery degradation due to frequent fast charging still persist.

4. **Transition to Electric Mobility:** The transition to electric mobility is gaining momentum globally, with many governments setting ambitious targets to phase out internal combustion engine vehicles. For example, the UK government announced in 2020 that it would ban the sale of new gasoline and diesel cars from 2030.

5. **Economic and Environmental Impact:** Research shows that a widespread shift to EVs could have significant economic and environmental benefits, such as reducing greenhouse gas emissions and air pollution, and increasing energy security.

Conclusions

The conclusions section summarizes the key findings and implications discussed in the research results. It emphasizes the ongoing progress in improving the charging speed of electric vehicles and the promising future developments. The potential increase in standard battery voltage and the utilization of supercapacitors are mentioned as significant advancements. The section also acknowledges the importance of both AC and DC charging station developments in addressing the challenge of reducing charging time. Additionally, considerations such as cost, battery life, and compatibility with different electric vehicle models are highlighted. The section concludes by emphasizing the need for continued research and development to accelerate the transition to electric vehicles by making charging more convenient and comparable to traditional refueling.

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