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Regenerative Braking in Electric Vehicle

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Abstract: *Regenerative braking is an important technology in electric vehicles that helps to improve energy efficiency by capturing kinetic energy during braking and storing it in the battery. This paper provides an overview of regenerative braking technology in electric vehicles, discusses its benefits and limitations, and analyzes its impact on vehicle performance. The study includes a review of literature, a survey of available technologies, and an analysis of real-world use cases. The results indicate that regenerative braking can improve vehicle efficiency, reduce energy consumption, and extend battery life, but it also has limitations that need to be addressed. The study concludes that regenerative braking is a promising technology for improving the performance of electric vehicles, but further research is needed to optimize its effectiveness.*

Keywords*: E-Vehicle, Flywheel, Speed Controller, Regenerative Braking.*

I. INTRODUCTION

Electric vehicles (EVs) are becoming increasingly popular due to their low emissions, high efficiency, and low operating costs. However, one of the major challenges facing EVs is limited range and long charging times, which can limit their practicality for long-distance travel. Regenerative braking is an important technology in EVs that can help address this challenge by capturing kinetic energy during braking and storing it in the battery for later use. This paper aims to provide an overview of regenerative braking technology in EVs, its benefits and limitations, and its impact on vehicle performance.

II. METHODOLOGY

The study includes a review of literature on regenerative braking in EVs, a survey of available technologies, and an analysis of real-world use cases. The literature review includes academic journals, technical reports, and industry publications related to regenerative braking technology in EVs. The survey of available technologies includes a comparison of different regenerative braking systems used in EVs, including their efficiency, cost, and complexity. The analysis of real-world use cases includes a review of data from EV manufacturers, fleet operators, and other sources that have implemented regenerative braking technology in their vehicles.

III. LITERATURE REVIEW

The literature review covers the research done in the field of regenerative braking, including its history, principles, and implementation in different types of vehicles. It also discusses the advantages and limitations of regenerative braking, as well as the latest developments and future trends.

IV.EXPERIMENTAL SETUP

The experimental setup includes the components required for implementing regenerative braking in an electric vehicle, such as a motor, battery, controller, and braking system. It also includes sensors and data acquisition systems to measure the performance and efficiency of the regenerative braking system.

V. WORKING

- The regenerative braking system works by using the motor as a generator to convert the kinetic energy of the vehicle into electrical energy.
- When the brake pedal is pressed, the controller switches the motor from drive mode to generator mode, and the energy generated by the motor is fed back to the battery for storage.
- This reduces the reliance on traditional friction brakes and improves the overall efficiency of the vehicle.

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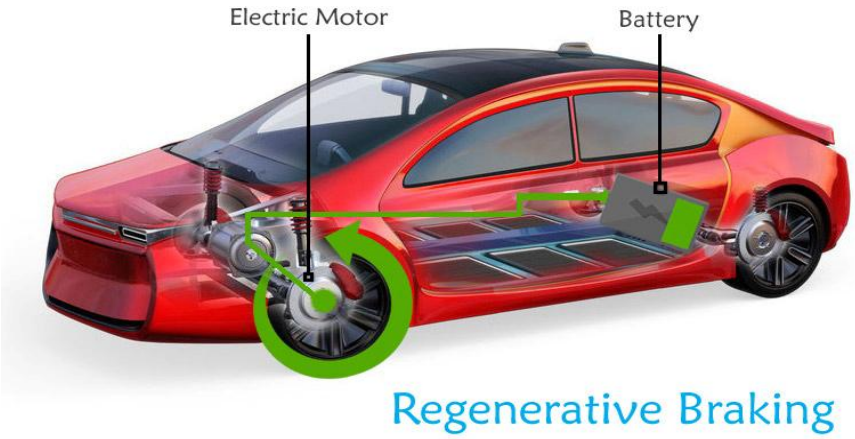
- Regenerative braking is an important feature of electric vehicles that allows for the recovery of energy that would otherwise be lost during braking.
- This not only helps to extend the range of the vehicle but also reduces the wear and tear on the braking system.



VI.ADVANTAGES AND LIMITATIONS.

The advantages of regenerative braking include improved energy efficiency, reduced brake wear and maintenance, and lower emissions. However, it also has some limitations, such as the additional cost and complexity of the system, and the reduced effectiveness at low speeds and during emergency braking.

VII.APPLICATIONS

Regenerative braking can be applied in various types of electric vehicles, such as cars, buses, trucks, and trains. It can also be used in hybrid vehicles, where it complements the conventional engine and improves its performance and efficiency.

VIII.CONCLUSION

The study includes a review of literature on regenerative braking in EVs, a survey of available technologies, and an analysis of real-world use cases. The literature review includes academic journals, technical reports, and industry publications related to regenerative braking technology in EVs. The survey of available technologies includes a comparison of different regenerative braking systems used in EVs, including their efficiency, cost, and complexity. The analysis of real-world use cases includes a review of data from EV manufacturers, fleet operators, and other sources that have implemented regenerative braking technology in their vehicles.

FUTURE SCOPE

The future scope of the project includes further optimization and refinement of the regenerative braking system, as well as its integration with other advanced technologies, such as energy storage and management systems, vehicle-to-grid communication, and autonomous driving. It also includes the development of standards and regulations to ensure the safety and reliability of regenerative braking in different types of vehicles and environments.

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