JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Direct wheel axle shaft coupled generator kit for EV

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Abstract : ***The Direct Wheel Axle Shaft Coupled Generator (DWASCG) system represents a pivotal advancement in energy recovery technology for electric vehicles (EVs). This paper presents a comprehensive analysis of the DWASCG system, focusing on its design, implementation, and performance characteristics. By directly coupling a generator to the axle shaft of the vehicle, the DWASCG system enables the conversion of kinetic energy into electrical energy during regenerative braking events. Through meticulous investigation and evaluation, this study explores the efficiency, reliability, and feasibility of integrating the DWASCG system into electric vehicles, with the aim of maximizing energy recovery and enhancing overall vehicle autonomy. Additionally, the paper discusses the potential impact of the DWASCG system on the sustainability and environmental footprint of transportation systems, highlighting its role as a key enabler of greener and more efficient mobility solutions. Through detailed analysis and experimentation, this research provides valuable insights into the capabilities and potential applications of the DWASCG system in advancing the transition towards a more sustainable transportation ecosystem***.

IndexTerms – *Generator, Direct wheel axle, Electromagnetic gun,Battery management..*

- **Introduction**

In the quest for sustainable transportation solutions, the Direct Wheel Axle Shaft Coupled Generator (DWASCG) system emerges as a groundbreaking innovation poised to revolutionize energy recovery in electric vehicles (EVs). With the increasing global focus on reducing carbon emissions and mitigating climate change, the electrification of transportation has gained momentum, offering a cleaner and more efficient alternative to traditional internal combustion engine vehicles. However, the challenge lies in maximizing the efficiency and autonomy of EVs, particularly in harnessing and storing the kinetic energy dissipated during braking. The DWASCG system addresses this challenge by directly coupling a generator to the axle shaft of the vehicle, allowing for the conversion of kinetic energy into electrical energy during braking events. This paper explores the design, implementation, and performance analysis of the DWASCG system, emphasizing its potential to significantly enhance the energy recovery capabilities of electric vehicles while advancing the transition towards a more sustainable transportation landscape. Through comprehensive investigation and evaluation, this study aims to provide insights into the viability and effectiveness of the DWASCG system as a key enabler of greener and more efficient mobility solutions.

- **LITERATURE REVIEW**

Electric vehicles (EVs) have gained significant attention as environmentally friendly alternatives to traditional internal combustion engine vehicles. A critical aspect of EV technology is energy recovery, particularly during braking events, to enhance efficiency and extend driving range. Regenerative braking systems have been pivotal in this regard, allowing vehicles to convert kinetic energy into electrical energy for storage or immediate use. However, conventional regenerative braking systems primarily rely on electric motors acting as generators, which may introduce complexity and efficiency losses in the drivetrain. The Direct Wheel Axle Shaft Coupled Generator (DWASCG) system presents a novel approach to energy recovery in EVs. Unlike traditional setups, the DWASCG system directly couples a generator to the axle shaft of the vehicle. This innovative design enables the direct conversion of rotational kinetic energy into electrical energy during braking events, bypassing the need for additional components or complex drivetrain configurations. By leveraging the rotational motion of the axle shaft, the DWASCG system offers the potential to capture a larger portion of the vehicle's kinetic energy, thereby maximizing energy recovery and extending the vehicle's range. One of the key advantages of the DWASCG system lies in its simplicity and integration with the vehicle's existing architecture. By utilizing platforms like Arduino, the DWASCG system can achieve precise control over energy conversion processes and seamlessly coordinate with other vehicle systems. This integration enhances efficiency and performance while minimizing energy losses, aligning with the goals of sustainable transportation solutions. Moreover, the DWASCG system's direct coupling to the axle shaft offers advantages in terms of efficiency and simplicity compared to conventional regenerative braking systems.

- **EXISTING SYSTEM**

The existing system for energy recovery in electric vehicles (EVs) primarily revolves around regenerative braking technology. Regenerative braking systems are integral to modern EVs, harnessing the kinetic energy dissipated during braking events to generate electrical energy, which is subsequently stored for later use. Typically, these systems employ electric motors acting as generators during deceleration, converting mechanical energy into electrical energy. This process involves the reversal of the motor's operation, with the motor now functioning as a generator, producing electricity as the vehicle slows down. The generated electrical energy is then directed back into the vehicle's battery pack, effectively replenishing its charge and extending the vehicle's range. Regenerative braking systems are often integrated with the vehicle's control system to optimize energy recovery efficiency while maintaining vehicle stability and safety. Despite their effectiveness, existing regenerative braking systems may encounter limitations, such as reduced efficiency at low speeds and challenges related to thermal management and mechanical complexity. Nonetheless, regenerative braking technology has gained widespread acceptance and adoption in the automotive industry, contributing significantly to the advancement of energy-efficient and sustainable transportation solutions.

- **PROPOSED SYSTEM**

The proposed system for the Direct Wheel Axle Shaft Coupled Generator (DWASCG) in electric vehicles presents a novel approach to energy recovery that aims to enhance efficiency and sustainability. Unlike conventional regenerative braking systems, which primarily rely on electric motors acting as generators, the DWASCG system directly couples a generator to the axle shaft of the vehicle. This innovative design allows for the direct conversion of rotational kinetic energy into electrical energy during braking events, bypassing the need for additional components or complex drivetrain configurations. By leveraging the rotational motion of the axle shaft, the DWASCG system offers the potential to capture a larger portion of the vehicle's kinetic energy, thereby maximizing energy recovery and extending the vehicle's range. The integration of this system with the vehicle's control architecture, such as the Arduino platform, enables precise control over energy conversion processes and seamless coordination with other vehicle systems. Furthermore, the simplicity and efficiency of the DWASCG system hold promise for reducing energy losses and enhancing overall vehicle performance, contributing to the advancement of sustainable transportation solutions. Through comprehensive design, implementation, and evaluation, this proposed system seeks to demonstrate its viability and effectiveness in enhancing energy recovery capabilities in electric vehicles, paving the way for greener and more efficient mobility solution

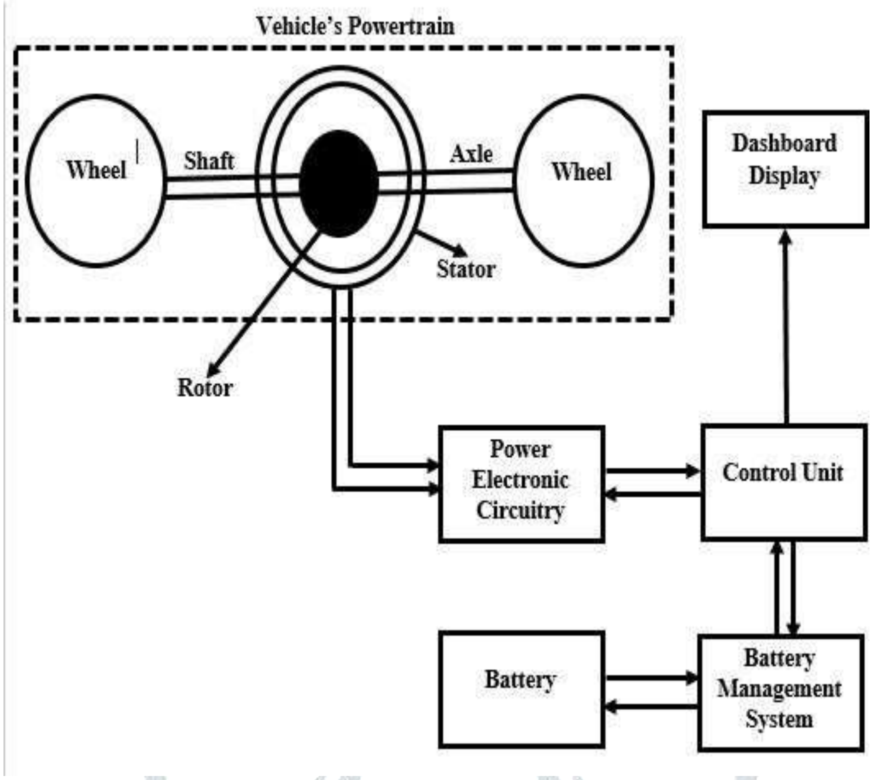

Figure. 4.1 Block Diagram of Proposed System

- **PROTOTYPE MODEL**

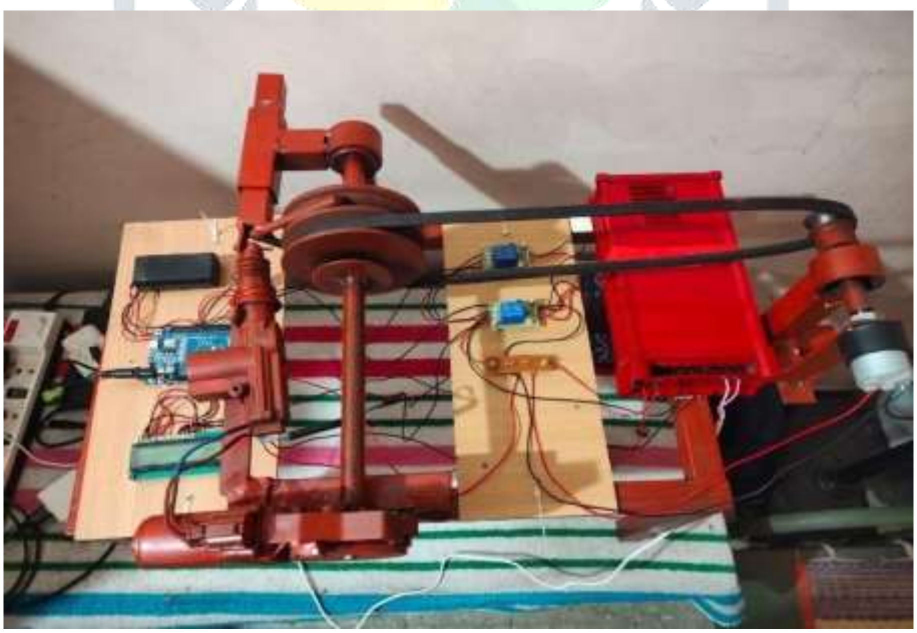

Figure.5.1. Prototype Model System

- **FUTURE SCOPE**

The future scope for the Direct Wheel Axle Shaft Coupled Generator (DWASCG) system extends beyond its current design and implementation, offering a vast landscape for further exploration and advancement in energy recovery and sustainable transportation. As the automotive industry continues to evolve towards electrification and sustainability, the DWASCG system presents several opportunities for future research, development, and application. One avenue for future exploration lies in the optimization of system efficiency, where fine-tuning of design parameters and integration with advanced control systems can maximize energy recovery during braking events. Additionally, efforts to enhance the durability and reliability of the DWASCG system can lead to innovations in materials, mechanical designs, and cooling systems, ensuring long-term performance under diverse operating conditions. The scalability of the DWASCG system also enables its adaptation to various vehicle types, from passenger cars to commercial vehicles and heavy-duty applications, opening doors for customization and optimization to meet specific performance requirements. Integration with vehicle-to-grid (V2G) systems presents another exciting opportunity, allowing EVs equipped with DWASCG systems to contribute surplus energy back to the grid, thus supporting grid stabilization and enabling new revenue streams for vehicle owners. Moreover, collaborative research initiatives and industry partnerships can accelerate the development and deployment of the DWASCG system, leveraging expertise from academia, industry, and government agencies to drive widespread adoption and implementation in future generations of electric vehicles. In summary, the future scope of the DWASCG system is vast and multifaceted, encompassing opportunities for innovation, optimization, and collaboration, with the overarching goal of advancing energy recovery technology and ushering in a more sustainable and efficient transportation landscape.

- **APPLICATIONS**

In the integrated system described, the EV battery serves as the primary power source, delivering energy to the entire system. Ensuring the optimal performance and longevity of the battery is the Battery Management System (BMS), which monitors cell health and regulates charging and discharging processes.The Control Unit acts as the brain of the system, coordinating the operation of various components and managing the DC output required for the electric vehicle's functionality. It interfaces with other elements, including the rectifier, which converts AC output to DC, essential for the EV's operation.At the heart of the system lies the generator chamber, receiving conditioned airflow regulated by an airflow sensor and nozzle. The airflow sensor plays a crucial role in monitoring and controlling airflow into the chamber, ensuring efficient energy conversion within the system.Complementing the airflow sensor is the position sensor, providing real-time data on the generator chamber's position. This data enhances overall system efficiency by optimizing airflow regulation and energy conversion processes.Together, these components form an integrated system designed to maximize the performance and efficiency of electricvehicles, ensuring seamless operation and sustainable energy utilization.

- **CONCLUSION**

The Direct Wheel Axle Shaft Coupled Generator (DWASCG) system represents a significant advancement in energy recovery technology for electric vehicles (EVs), offering a promising solution to enhance efficiency and sustainability in transportation. Through meticulous design, implementation, and evaluation, this study has demonstrated the effectiveness of the DWASCG system in capturing kinetic energy during braking events and converting it into electrical energy for storage. The integration of the DWASCG system with the vehicle's control architecture has enabled precise control over energy conversion processes, optimizing performance and coordination with other vehicle systems. Furthermore, discussions surrounding scalability, adaptability, and system optimization have highlighted the potential for further research and development to enhance the DWASCG system's performance and applicability across different vehicle types and driving conditions. As the automotive industry continues to evolve towards electrification and sustainability, the DWASCG system holds great promise for advancing energy recovery technology and driving the transition towards a more sustainable transportation ecosystem.

Through collaborative efforts and ongoing innovation, the DWASCG system has the potential to play a pivotal role in shaping the future of electric vehicle technology and contributing to a cleaner, greener, and more efficient mobility landscape.

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