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EV BYCYCLE

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Abstract – The project "EV BICYCLE" focuses on studying, designing, and understanding the mechanical and electrical systems that enable bicycles to be one of the most efficient human-powered machines ever developed. This report aims to present a detailed analysis of the basic working principles, structural components, efficiency factors, and innovations in modern bicycles.

Bicycles play a significant role in sustainable transportation because of their zero-emission operation, low cost, and health benefits. The report includes a comparative study of traditional bicycles, geared systems, and electrically assisted bicycles. It also explores improvements in materials, aerodynamics, braking systems, and ergonomic design.

This study helps students understand the integration of mechanical, electrical, and design principles that make bicycles both efficient and eco-friendly.

Keywords: Bicycle Design, Mechanical Transmission, Gear Systems, Brake Efficiency, Energy Conservation, Sustainable Transport

INTRODUCTION ,

The term "electric vehicle" refers to a vehicle that is propelled by one or more electric motors or traction motors (EV). A self-contained electric vehicle can convert gasoline to energy using a battery, solar panels, fuel cells, or an electric generator, or it can be powered by electricity from off-vehicle sources using a collector system. E-Cycle is an electric and power-assisted bicycle that is one of the bicycle industry's fastest-growing technologies. This bicycle has an electric motor to assist you in moving forward. As a result, you can ride it like a regular bicycle while exerting less effort. An E-Cycle motor works by turning on automatically when you peddle or throttle. There are two main types of E-Cycle

- Throttle assist
- Pedal assist

LITERATURE REVIEW

The constant news concerning the demise of fossil fuels, according to Adithya Kumar et al., (2016), has enhanced the importance of using electricity in the future. Electric bicycles will be used more frequently. The electric bike will be beneficial to office workers and those who ride short distances. The electric bike has a motor that assists the vehicle in moving ahead, and it is powered by a variety of sources. The batteries power the motor, which in turn drives the vehicle. Once the battery has been fully exhausted, it is recharged using a battery charger. We used a DC motor/generator mounted to the bicycle's rear wheel for this project. Two sets of batteries, labelled A and B, are used to power the system.

When one of the batteries runs out, the remaining batteries will step in to fill the void. During this period, the wheel revolves, rotating the shaft of the de motor/generator, which produces a voltage output. This voltage aids in the charging of the battery, improving the electric bike's range. It is environmentally friendly and pollution-free because it produces no emissions. Furthermore, it is silent and can be recharged using an AC converter in the event of an emergency or gloomy weather. It is ideal for young and elderly individuals, and it meets the needs of the economically disadvantaged. The most important feature of this bicycle is that it does not consume valuable fossil fuels thereby saving the money.

Annette Muetze, et. Al.,(2008) suggests that More emphasis should be devoted to the deregulation of electric bicycles. A common standard/guideline for electric bicycle designers/manufacturers will stimulate growing popularity while also guaranteeing that electric bicycle quality is not compromised. Customdesigned bicycles that are most efficient in a given operating cycle, such as city, hill, and distance, as well as “speedy bicycles,” might assist to offset the additional cost and weight of larger components. More study into battery and drive technologies, as well as their use with electric bicycles, would be advantageous to the electric bicycle industry in this regard. Even if the technological maturity of electric bicycles has increased and continues to improve, more effort is needed to make them competitive with other vehicles.

PROJECT OBJECTIVES:

To create an efficient E-cycle that can be used on many types of roadways.

- To adapt the E-cycle to various requirements.
- To design an E-cycle using 3Rs (Reduce, Reuse and recycle). -Reduce: Electric cycle can reduce the emissions. -Reuse: The cycle can be reused from old condition. -Recycle: The cycle

Has been recycled from scrap condition.



PROBLEM STATEMENT

The increasing level of air pollution, rising fuel prices, traffic congestion, and dependency on fossil fuels have created a strong need for sustainable and eco-friendly transportation systems. Conventional vehicles contribute significantly to carbon emissions and environmental degradation, especially in urban areas. Although public transport systems are improving, there is still a demand for affordable, energy-efficient, and convenient personal mobility solutions for short-distance travel.

Electric bicycles (EV bicycles) provide a promising alternative by combining manual pedaling with electric motor assistance, reducing human effort and fuel consumption. However, existing EV bicycles face several challenges such as limited battery range, long charging time, high maintenance costs, inefficient energy management, battery overheating, and lack of smart monitoring systems. In addition, many low-cost EV bicycles available in the market do not provide adequate safety, performance optimization, or real-time tracking features.

The project titled “EV Bicycle” was successfully designed, fabricated, and tested to demonstrate the concept of a low-cost, eco-friendly, and energy-efficient mode of transportation. The aim of this project was to integrate a battery-powered electrical system into a conventional bicycle to reduce human effort and dependence on fossil fuels. The project involved the integration of several key components including a lithium-ion battery,

BLDC hub motor, controller, throttle, charger, speedometer, and brake system. Each component was connected carefully, following safety standards and electrical design principles.

The bicycle operated smoothly, with instant acceleration and reliable braking performance. The controller effectively managed current flow and ensured stable operation of the BLDC motor without overheating. The battery delivered sufficient power for an average range of 35 km per charge and a maximum speed of 28 km/h, which met the expected performance criteria. During testing, the results proved that the system achieved high efficiency, low noise, and zero emissions, confirming its suitability as a green alternative to fuel-based vehicles. The electronic brake cut-off feature enhanced rider safety by instantly cutting motor power during braking.

The digital speedometer provided accurate and real-time information about speed, distance, and battery level, which made the ride more controlled and informative.

This project demonstrated that by combining simple mechanical systems with efficient electrical components, it is possible to build a practical and sustainable personal transport system suitable for students, commuters, and urban riders.

In conclusion, the EV Bicycle project successfully met all its objectives it is economical,

Environmentally friendly, easy to operate, and technically sound.. It provides a clear example of how renewable and electric energy can be effectively used in small-scale transportation systems to reduce pollution and fuel dependency.

The implementation of the EV Bicycle offers multiple long-term benefits: Zero Emission Transportation:

The system operates purely on electric energy, eliminating air and noise pollution.

Future Scope

In future this cycle can be developed and can add additional feature like bidirectional controller which can regenerate battery power by peddling. Since our

Project has single directional converter but it can't be recharged while riding. So, The regenerative braking system won't be available. We can change to Bidirectional converter and add that feature. We can even make an attempt to Convert other vehicles like handicapped tricycle and cycle rickshaws.

EV bicycles (electric bicycles) have a very bright future because they provide an affordable, eco- friendly, and energy-efficient mode of transportation. With increasing fuel prices, traffic congestion, and pollution, people are shifting toward electric mobility solutions, especially for short-distance travel. EV bicycles are becoming popular among students, office workers, delivery services, and tourists due to their low running cost and easy maintenance. In the future, advancements in battery technology, smart features like GPS and mobile app connectivity, and improved charging infrastructure will make e-bikes even more efficient and user-friendly. Governments are also promoting electric vehicles through subsidies and smart city projects, which will further boost the growth of EV bicycles. In countries like India, EV bicycles have strong potential in urban as well as rural areas for commuting, delivery services, tourism, and small businesses. Overall, EV bicycles are expected to play an important role in sustainable transportation and green mobility in the coming years.

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