INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact Factor: 6.078
(Volume 9, Issue 2 - V9I2-1223)
Available online at: https://www.ijariit.com

Pedelec-power assist bicycle

S. Priyanka
spriyanka0830@gmail.com
Kuppam Engineering College, Kuppam, Andhra Pradesh

S. Tharun
tharunmani97@gmail.com
Kuppam Engineering College, Kuppam, Andhra Pradesh

M. Aswath
aswatharya143@gmail.com
Kuppam Engineering College, Kuppam, Andhra Pradesh

A. Archana
archuanbu92@gmail.com
Kuppam Engineering College, Kuppam, Andhra Pradesh

ABSTRACT

In India, like developing countries, is highly dependent on a suitable, flexible, and economical or budget transport system. In India, with this technological upgrade, the number of people using two wheelers is gradually increasing, in 2016, the maximum use of two wheelers in India was 31%, but now it is around 55% and more. The gradual increase in this consumption is now suffering from the cost of fuel and the lack of power, which is limited and cannot be generated. The enormous use of these vehicles leads to environmental impacts as well as carbon emissions. So, in this article, we try to offer a solution to the above problems through our project, which is the "PEDELEC-Power Assist Bike". In this project, we design a bicycle that is a traditional electric booster (EPB) using a proportional booster strategy. The ratio is usually set to 1:1, meaning the motor will provide the same amount of assistance as the amount of human torque. The main goal of this project is to design a motor and generator set with dual charge and discharge batteries with suitable controllers that will provide sustainable energy and also a smaller battery capacity will help us travel longer distances.

Keywords: *EPB, Pedelec, Battery, Bicycle*

I. INTRODUCTION

Transport is one of the main ones causes of air pollution, climate change, and urban noise problems. Actually, it is responsible for about 1/5 of the damage caused by the greenhouse effect, CO2 emissions, human health and 1/3 of worldwide energy consumption. Almost 70%. The Indian population lives in rural India. Their contribution to the Indian economy is still the most important of our village's areas are not as developed and the main reason is scarcity good travel and transport device. Even if they find a mode traffic, must face the effects of rising fuel prices and it is also difficult to get the fuel in easily extremely rural areas. The development of electric bikes, or e-bike, is a critical component increasing the use of electric bicycles. The motor, battery and control system are three basic components an electric bike. These components are put on a traditional bicycle with pedal support, which combines use with power provided by an electric motor. In compared to a regular bicycle, those are booster wheels which can travel longer distances, providing greater mobility and physical limitations, steps slopes and lack time. The proposed system is modified as many fruitful steps to create rural India as self-sufficient sustainability. Electric bikes can reduce air pollution, stimulated higher density in cities. The idea of designing an engine come assemble the alternator into the gearbox bicycle. In addition to these economic and effects on the environment.

II. LITERATURE SURVEY

De La Iglesias, et.al. [4] [2018] proposed a "increasing the intensity over time of an electric Assist Bike based on the user and route:

The bike become the Gym", where the application of the car Bike with electric pedal assist system (PAS) improves the pedaling power. Cyclists can do more and higher levels of physical activity. However, this system does not provide a system that will create a different service in the individual, including the profile of the road, the required power and the skill level of the user, and the new driving, the system gives them to the users. The higher the score, the higher the value of the score, the higher the average user on road bike, the more energy is needed for the user to build up a high speed again, and the users gradually do more physical exercise, therefore improving. and strengthen the body.

K. S Shivani Gowda, et-at [2020] proposed a "Review and Redesign of Pedal Energy- Solar Power Augmented Hybrid Bicycle" Global warming is mainly caused by emissions from cars. The rise in oil prices has created a great need to find alternatives. The electric car uses renewable solar energy for electricity and passenger transport power and as backup power when there is no sun. The running costs of this e-bike are low. Plan for a loop speed of 12 to 15 km/h. The plan makes it easier to rebuild hybrid bikes compared to converting conventional bikes to hybrids with car-based two-stroke engines.

Ilyas Hussain, et-at. [2] [2018] proposed a "fabrication of self-charging Electric Bike". When the battery is completely discharged, it is connected to the DC motor/generator at the rear wheel of the bicycle to charge the battery. But the system does not provide a generator, the main problem is in the battery charging area.

N. C. D. Silva, et-at [3] [2021] proposed a "Study on Smart Electric Bicycle with weight minimized power pack" . The introduction of energy efficient transportation, including the use of electric vehicles, provides economic opportunities in society with many impacts on jobs, employment, quality of life and health. Among them, electric bicycles (e-bikes) are popular all over the world due to their light weight, design and being cheaper than other electric vehicles. Many smart e-bike solutions were proposed as an important part of supporting e-bikes but could not advance this application due to the weight of the bike. The e-bike program creates an electric assisted bike that includes accessories, a power pack and a cycling computer that controls the motor using physiological data and the Data bike sensor. This study presents fatigue detection results based on heart rate, heart rate variability, cycling speed data and terrain data to assist riders. Electric bikes are optimized for weight and use a computer to control them mechanically.

III. SYSTEM-DESIGN COMPONENENTS

Specifications of Components

s.no	Name of the component	Ranges
1.	Motor	12-24v 3-6A
2.	Controller	48v,100w
3.	Generator	350w,10A
4.	Batteries	36v,12A

Table 1: Specifications of components

The above table is given as a specification of the components and its ranges These technological components are used in this project to get better driving with less weight.

Battery

Modern lithium-ion batteries offer a very good cycle life, are safe in a controlled environment and have a great power ratio. That's why we used li-ion batteries for e-bicycle.

BLDC Motor

The generator converts electricity from the battery into an electric motor to move the wheels. It is combined on the rear or front wheel of the bicycle. BLDC motors for e-bikes are usually hundreds of watts and the battery voltage is usually 36V or 48V.

Controller

The motor controller converts the input DC voltage into three-phase AC current for the motor windings. Batteries, motors, pedal assist etc. connects things. It is a small computer that acts as the heart of an e-bike and controls the entire bike.

IV. BLOCK DIAGRAM AND WORKING

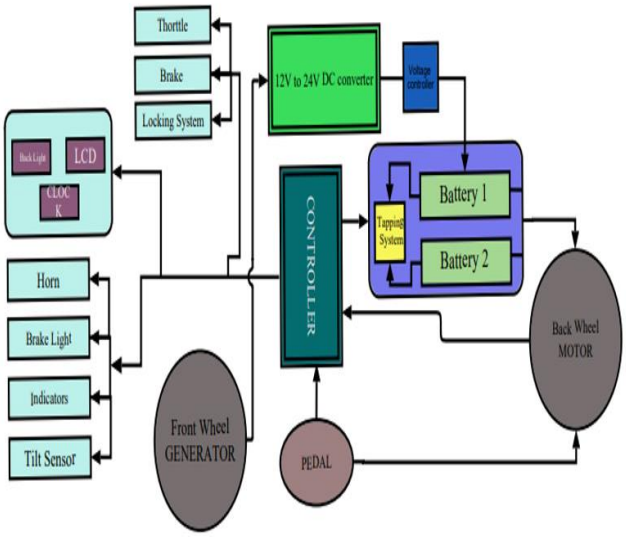

Figure 1: Block Diagram of proposed

Fig.1 explains the proposed block diagram of our project with major components are motor, generator, battery, and controller. In our project we chosen BLDC motor as a primary source for driving the vehicle, which is rated at 350 watts, 36volts, 15amps based on our application. The controller design of the e-bike can best be described as the brain of the bike, the e-bike controller understands the rider's commands (on the LCD screen) and pedaling movement and redistributes energy from the battery to the motor. The dual battery system place major role in our project i.e., one battery connected to that generator that is fixed at wheel that generates power as an input charging of battery and this battery output power goes through another battery input charge and this battery discharge the power to the motor. So, for one battery charging discharging may get damage easily for this we proposed dual battery system and its management system.

V. DESIGN COMPUTATION OF THE E-BICYCLE

Speed Calculation (No Load)

Quantity of teeth on smaller sprocket t1 =14
Quantity of teeth on larger sprocket t2=37
speed on smaller sprocket: N1 = 2800 RPM
Taking reduction ratio is 6
N1=2800/6= 460RPM
Speed of the wheel of EV: N2=460*14/37=174RPM
Speed of EV=speed of the wheel of EV x circumference of the wheel of EV
EV=174 x 1758= 335996mm/min=25km/hr

Computation of essential power to drive the E- bicycle:

The total load on the E-bike is as follows:
wheel of the Net vehicle weight = 10 kgs
Average human weight = 80 kgs
Average luggage weight = 5 kgs
Battery + motor weight = 5kgs
Total weight = 100 kgs = 100x 9.81 = 981N
To find reaction on each wheel:
The total load, which is equally distributed on both wheels of the e-bike
Force (Frw) = 981/2 = 490.5 N

Where reaction the one rear and front wheel are as follows:
Rfw = 0.2 x 490.5 = 98.1 N
To get the torque on each wheel of the e-bike:
Total torque= torque on the front wheel of the E-bicycle + torque on the rear wheel of the E-bicycle.
T= Tfw + Trw
To determine the torque on the front wheel of an e-bike:
T1 = R x D/2 = 98.1x (56 x 10)/2 = 30 Nm
Total torque on wheel = T1 + T2 = 60Nm

To compute the power on the BLDC motor of the E- Bike
= 2 x pi x N x T /60
= 2 x 3.14 x 174 x30/60 = 500 W

Battery Capacity Calculation
500 W EV is run for 1 hour, watt- hours = 500 x 1= 500 watt- hours and the efficiency of the battery is 85%.
Watt- hours = 500/0.85 = 588 watt- hours.
Ampere hour (at 48V) = 588/48 = 12Ah.

VI. PROTOTYPE MODEL AND RESULT ANALYSIS

Figure 2: Prototype of Proposed system

The electric bicycle is made of mild steel which gives it enough power. The rider would not be afraid while riding due to the basic construction of the frame. Since the rider's center of gravity is closer to the seat tube, he or she can handle the bicycle with less effort and the bicycle weight was reduced to less than ten kilograms.

Figure 3: Prototype of Proposed system

Fig.2, Fig 3 represents the final prototype model of the planned E-Bicycle, as well as its dimensions.

VII. CONCLUSION

This article successfully illustrated the concept computation of electric bicycle with over standing provides a low cost and convenient

form of private mobility and is thus an attractive alternative to public transit or regular bicycle. 70% users had switched from public transport and bicycle. It could also reach speeds of up to 50kmph. Riders should be able to ride the E-bicycle without experiencing any pain in their bodies and should be able to sit comfortably when travelling. Depending on the weight of the E- bicycle, it can be increased to a higher power level.

VIII. ACKNOWLEDGEMENT

We kindly thank our College Management, Department, Head of Department and our Project Guide who made us to take up with idea to build an innovative and reliable prototype useful for all individuals domestically and industrial wise.

IX. REFERENCES

[1] D. Bucher, R. Buffat, A. Froe melt, and M. Raubal, "Energy and greenhouse gas em ission reduction potentials resulting from different commuter electric bicycle adoption scenarios in Switzerland," Renewable and Sustainable Energy Reviews, vol. 114, Article ID 109298, 2019.

[2] S. Katoch, Rahul, and R.K. Bindal, "Design and implementation of smart electric bike eco-friendly," International Journal of Innovative Technology and Exploring Engineering, vol .8, no. 6s4,2019.

[3] P. Sivakumar, and V. Rajasekaran, "Investigation of intelligent controllers for variable speed PFC buck- boost rectifier fed BLDC motor driven," Journal of Electrical Engineering, vol. 17, no. 4, pp. 459-471, 2017.

[4] C. Kiefer and F. Behrendt, "Smart E-bike monitoring system: real-time open source and open hardware GPS assistance and sensor data for electrically- assisted bicycle," IET Intelligent Transport Systems, vol. 10, pp. 1-10, 2015.

[5] N. Pavan Kumar Reddy and K. V. S. S. Vishnu Prasanth, "Next generation electric bike," in proceedings of the IEE International Conference On power, Control, Signals and instrumentation Engineering, pp. 2280-2286, Chennai, India, September 2017.

[6] M. Sathya Prakash. (2016) "Design and fabrication of self-charging electric vehicle", IJPCSC, 8(1), 51-55.

[7] Thomas, D.; K lo n a r i, V.; Vallee, F. loa ki midis, C.S. Implementation of e-bike sharing system: The effect on low voltage network using PV and smart charging stations. In Proceedings of the International Conference on Renewable Energy Research and Applications (ICRERA), Palermo, Italy, 22-25 November 2015; pp. 572-577.

BIOGRAPHY

	**S Priyanka** Student, Kuppam Engineering College, Chittoor, Andhra Pradesh, India
	**S Tharun** Student, Kuppam Engineering College, Chittoor, Andhra Pradesh, India

	**M Aswath** Student, Kuppam Engineering College, Chittoor, Andhra Pradesh, India
	**A Archana** Assistant Professor, Kuppam Engineering College, Chittoor, Andhra Pradesh, India

