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A Study of Electric Bike - Future Needs

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Abstract: Modern world demands the high technology which can solve the current issues and future problems. Now-a-days Fossil fuel shortage is the main problem. Considering current rate of usage of fossil fuels will let its life up to next five decades only. Because of undesirable change in climate is the red indication for not to use more fossil fuel any more. Best alternative for the automobile fuels to provide the mobility & transportation to peoples is sustainable electrical bike. Future e-bike is the best technical application as a visionary solution for the better world, upcoming generation and environment. E-bike comprises the features like high mobility efficiency, compact, electrically powered, comfortable riding experience, light weight vehicle. E-bike is the most versatile current and future vehicle considering its advantages.

Keywords: Electric Bike, Electric Energy, Controller, Motor, Battery.

I. INTRODUCTION

Main reason to identify the need of finding and modifying E-Bike is to overcome the issue of the pollution because of vehicles in metro towns & urban zones is swelling uninterruptedly. Considering the all class of society it is not reasonable for all to purchase (scooters, mopeds or motorcycles). So, combining both issues, environmental progress supporting and economical affordable alternative would be the best solution. Typical parts of E-bike (Electric Bike) are Brushless DC Motor (Induction Motor), Throttle (Accelerator), Battery Storage (48 V), Chain Drive, Frame and other common bike parts. The electric bike is a new form of private transport has led to a new approach to mobility, especially in cities both for countries with large populations and for countries that are concerned about the environment. The research on the electric bike is relatively new, but today, nobody clearly knows where the efforts are being focused, nor what the main points of interest of the scientific community are. The objective of this manuscript is to detect how the worldwide research of the electric bike is being developed and especially around which scientific domains it is clustered. Finally, the main trends in this field can be identified.

The batteries of the electric bike can be recharged by connecting them to a plug. In addition, a typical electric bike needs 6–8 h to charge the battery and has a range of travel of 35 to 50 km at a speed of about 35 km/h (depending on rider weight). This means that, with a single battery charge, it would be enough to go to work, visit friends, and return home on a normal day, since statistics show that about half of the trips and procedures of a normal urban person are carried out within a distance of 50 km from his/her house, therefore within the reach of these bikes. Because of this need more development in the era of electric vehicle as per the distance concern. From an environmental point of view, for petrol car consumption in urban areas, the emissions are: HC (Hydrocarbons) 3.57 g/km, CO 3.15 g/km, CO₂ 1.82 g/km, and NO_x 2.29 g/km. Therefore, the electric bike, as an alternative means of transport to the car, shows that for every 100 km an average of 8.5 L of gasoline is saved, and this pollution would be avoided. The electrically assisted bikes are normally powered by rechargeable battery and their driving performance is influenced by battery capacity, motor power, road types, operation weight, control, and, particularly, by the management of the assisted power.

II. WORKING OF ELECTRIC BIKE

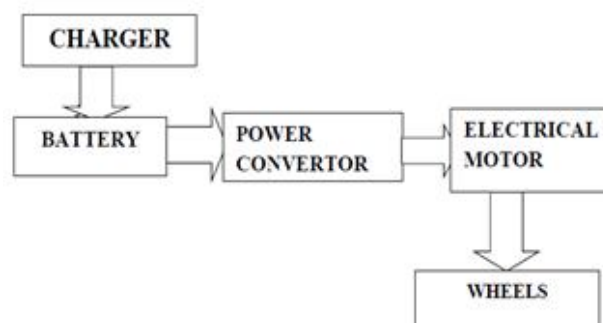


Fig1: Block Diagram of electric bike

The Fundamental working of electric bike is based on batteries which is charged by electric charger by using the batteries the power is supplied to electric motor with the help of power controller or convertor and then to the wheels. In electric bike electric energy is converted into mechanical work. For this studies of electric bike we have been used electric motor of 3000 rpm and batteries of 48 volt ,28 amp. The power of electric motor is 1.5 kW to run this motor we require 48V , 28A batteries. All batteries are connected in series combination.

III. SPECIFICATIONS OF ELECTRIC BIKE

A. Motor Specifications: 1.5kW BLDC

- 1) Voltage:48V
- 2) Rated Speed:3000rpm
- 3) Motor Weight:5.4kg
- 4) Rated Power:1500w

B. Motor Controller Specifications

- 1) Throttle Voltage:1V to 4.5V
- 2) Protection Class: IP 33
- 3) Operating Temperature: -50 to 175(Deg.C)
- 4) Maximum Power Dissipation:250w

C. Battery

- 1) 48 V 28 amp (12V 28amp *4 batteries connected in series)
- 2) Charge time 5-6 hours
- 3) Battery type : lead acid

IV. COMPONENTS USED IN ELECTRICAL BIKE

- 1) *Battery*: The battery is used to store electric energy and supply of stored energy whenever needed. As per the calculations and study of weight of vehicle as well as person sitting, we use 4 batteries of 12V 28amp each and connected in series will make total 48V 28amp output. For the convenient purpose we are using lead acid batteries for the performance.



Fig2: battery

- 2) *Electric Motor*: As per the calculation made, following are the specification of motor will used: The motor is having 1500 watt. Capacity with maximum 3000 rpm. Its specifications are as follows:

- a) *Current Rating*: 7.5 amp
- b) *Voltage Rating*: 48 Volts
- c) *Cooling*: Air – cooled
- d) *Bearing*: Single row ball



Fig3: Electric motor

- 3) *Controller*: The speed controller of an electric bike is an electronic circuit that not only controls the speed of an electric motor but also serves as a dynamic brake. This controller unit uses power from the battery pack and drives it to the hub motor. Different types of controllers are used for brushed and brushless motors. For adaptive e-bikes, a conversion kit is used and the controller is the main component of that kit.

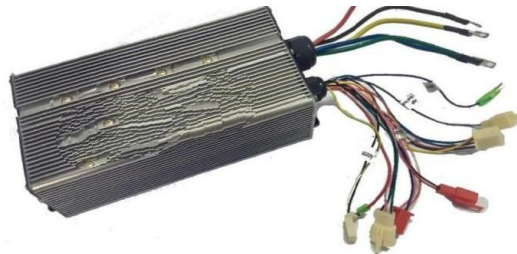


Fig4: Controller

- 4) *Sprocket*: Sprocket is used to transmit the rotary motion motions between two shafts. We used two sprockets with gear ratio 3:1.



Fig5: Sprocket

- 5) *Chain Drive*: A Chain is an array of links held together with each other with the help of steel pins. This type of arrangement makes a chain more enduring long lasting and better way of transmitting rotary motion from one gear to another. The major advantage of chain drive over traditional gear is that, the chain drive can transmit rotary motion with the help of two gears and a chain over a distance whereas in traditional many gears must be arranged in a mesh in order to transmit motion.

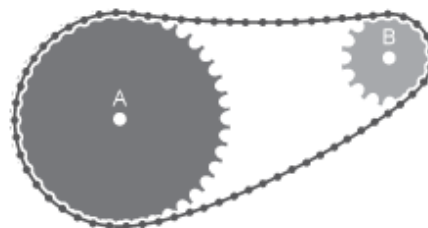


Fig6: Chain Drive



V. CONCLUSIONS

From the above study and we design and developed the new model of electric bike. With the defined power supply and calculation made for use of battery, sprocket design and motor is the way towards betterment of performance, comfortable, compact, high speed and efficient can be achieved.

In this study had provided several results and guidelines that can assist for improvements in the performance of electric bikes. Future developments in electric bike will concern the design of several control strategies like battery, motor and controller by means of hardware in the loop procedure.

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