

Design of New Concept of Charging In Electric Bicycle

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Abstract— In this project one new development in the world of electric bicycle to save energy, time and the fuel cost which is increasing day by day. The bicycle has gone from being an old fashioned recreational product to a less polluting means of transport and a compact ultra-light personal mobility tool. Electric bicycle will be used to support an individual public transport in worldwide electric bicycle building a block of future of pollution free transportation system. The cost of battery gets plummeting day by day. The wind mill starts to generate electricity when the bicycle starts to run and the electricity gets stored in the battery with the help of charge controller to control the output of charging current of battery.

Keywords— *bldc motor, electric bicycle, battery, small wind-mill, controller.*

I. INTRODUCTION

In addition to conventional charging of batteries we used alternative option of wind-driven generators to charge batteries. A small generator with turbine is mounted in back side of electric bicycle. When the bicycle starts to run with the help of mechanical pedaling then due to speed of bicycle or air pressure the wind turbine start to rotate and this wind turbine generates the electricity and charges the battery. With the help of charge controller the constant charging current is given to the battery as the variation in the speed of wind mill the output of current gets vary so to avoid it the charge controller is used. Brushless DC motor is used for the displacement of the electric bicycle as it gets good efficiency as compared to induction motor.

II. LITERATURE REVIEW

The literature review contains the brief discussion of sum designing of new concept of charging in Electric bicycle. As per we know that energy efficient motors are the need of electric vehicles. BLDC Motors are more efficient than as compare to the Induction motor. In Electric vehicle efficiency of the motor is major parameter which to be considered .We are using BLDC motor in place of induction motor which is mostly used in electric vehicles. BLDC motor is proposed which is capable of producing high-torque density. In Three phase Dual rotor BLDC machines inner stator and outer rotor are controlled independently so the copper loss in BLDC is reduced. So by reducing the copper loss efficiency of the vehicle gets increased. The first effort to make an electric bike was made at the beginning of 20th century. Today we can find a great variety of e-bike available worldwide. E-bike use rechargeable batteries and the lighter varieties can travel up to 25 to 30 km/h. E-bike is a mean of transportation very useful in the busy cities and they can also be used by anybody for a low price. In order to propel an electric vehicle you need an electrical machine with high power density, high torque, high efficiency, high reliability and robustness. Usually the electric motor used in an electric bike is a brushless DC motor.

This paper describes a technical solution for usage of two different energy storage source one is a battery and second is an ultracapacitor. In the world of mobility increasing the number of vehicles in the day to day life the prices of fuel getting increase

For IC engines. So instead of using IC engines the electric vehicle is a better alternative for the individual used of bicycle. Batteries and supercapacitor stores the energy. By the variation in load as peak demand and fluctuation batteries are not capable. So instead of batteries supercapacitor is an alternative way which drives the peak of power required by the load. For that electric bicycle we should know the power consumption so first step for it is that the calculation of the power consumption.

Chemical energy is stored in the batteries. Batteries are more efficient compare to the internal combustion engine. The chemical energy stored in battery is converted into electrical energy for traction motor and for various purpose. Energy stored in battery is dependent on battery voltage and the amount of charge stored within a key parameter in electric vehicle is the state of charge. The state of charge is a measure of the residual capacity of a battery. Depth of discharge is the percentage of battery capacity to which the battery is discharge specific energy means how much energy can be stored per unit mass of battery. Energy density means how much electrical energy can be stored per cubic meter of battery volume. Specific power means how much power can be supplied per kilogram of battery. Energy efficiency this is the important quantity indicates the energy conversion efficiency of battery.

There are various technologies for energy storage. Lead acid battery is the earliest and the most widely used in automotive applications. It gives the starting 'cranking amps' to the automotives starter motor. This batteries can last a long time if charged & discharged properly. Nickel metal hydride battery is the new type high capacitive battery. It have more advantage as compare to lead acid battery. Such as environmental friendly, high specific energy and energy density and long life cycle. Lithium ion battery alternatively move into and out of host lattices during charging and discharging cycles. This type of battery can be made with very high energy density. They do not have memory effect that causes other rechargeable batteries to lose their maximum charge level when repeatedly recharged.

In this paper report on a small scale wind turbine coupled to a mechanical shaft to a generator. The device we propose is made of a typical axial turbine to convert the wind energy into a mechanical energy into electricity. We may find in the state of the art some small scale electromagnetic wind turbines. Wind mills are clearly the most mature technology for "large scale" applications (KW-MW). The wind mill is composed of rotating part called rotor, and a fixed part called stator the most common turbines are horizontal axis wind turbine (HAWT). Which have the benefit of being highly efficient and the main drawback having to be pointed in the direction of wind. In the majority of cases, the electromechanical converter is electromagnetic and uses electromagnets or permanent magnets. They presented the first electrostatic wind mill exploiting in electret-base converter. Research is currently underway to improve the harvester's aero dynamics by replacing the current stator by lateral electrodes, and to increase the output powers by reducing the air gap.

In this paper report on drives used in electrical vehicle and hybrid electric vehicle there are discuss on types of electric vehicle, types of motor used in electric and hybrid electric vehicle, converters used in electric and hybrid vehicle. in this paper gone through the study of different motor derives and also have compared different motors used in EV and HEV and the owing lots of advantages of BLDC motor over other motors is good solution for EV and HEV today but there is scope of designing a new induction motor with higher starting torque and good efficiency.

III. ELECTRIC BICYCLE SYSTEM

By studying that papers are suggested that to used energy sources i.e. small wind turbine to charge batteries. In old method to charge the battery to use electricity which are to be given by the grid. So that the cost of electricity bill will also increases and extra time required to charge the battery of electric bicycle. So instead of this we have developed a new era of technology in charging of batteries of electric bicycle. Which's discussed in below block diagram of electric bicycle.

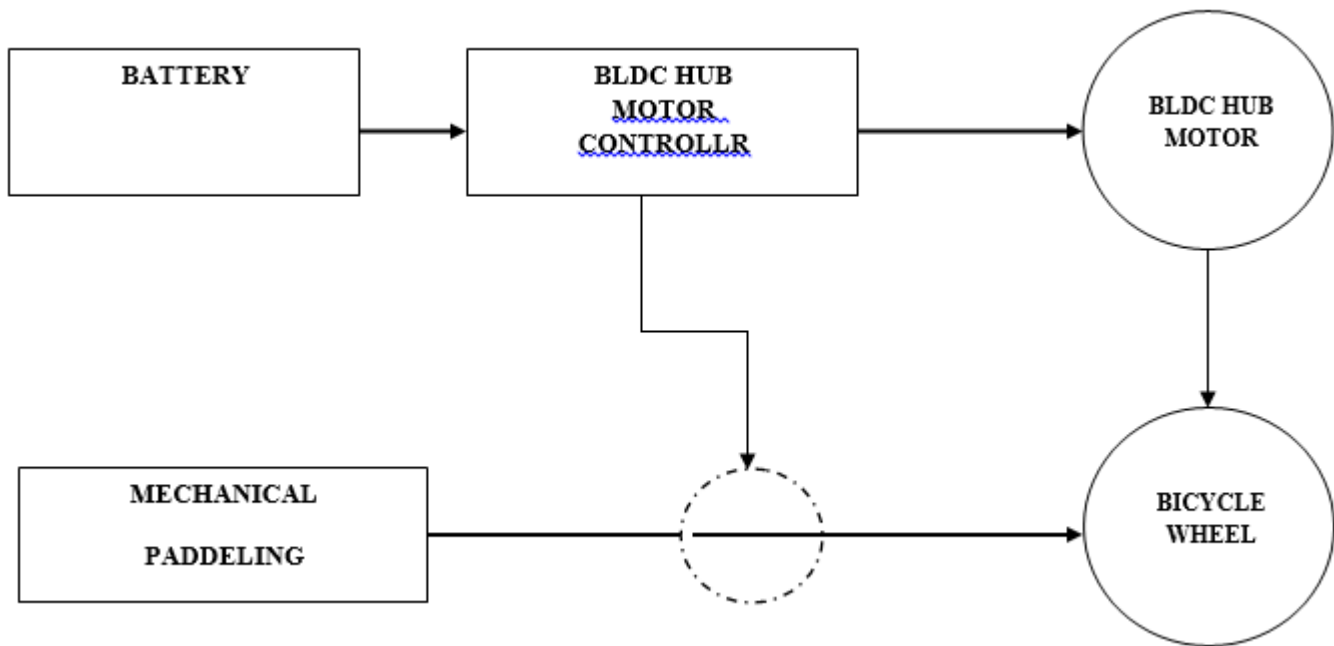


FIGURE 1: Block diagram of electric bicycle

3.1 Battery: - electrochemical batteries more commonly referred to as “batteries” are electrochemical devices that convert electrical energy into potential chemical energy during charging, and convert chemical energy into electric energy during discharging. A “battery” is composed of several cell stacked together and it generates electrical energy by storing of charge.

3.2 Controller: - the controller is used to connect the bldc hub motor to battery supply. The battery generates the constant dc supply. Bldc hub motor are required three phase shifted output to generates the rotating torque. Controller converts the dc output supplied to the battery and generates the phase shifted output. This conversion is possible with the help of semiconducting device mainly its MOSFET, IGBT, GTO, SCR etc. this are switching device used to control the output speed of an BLDC HUB motor.

3.3 Accelerator: - accelerator used to give feedback to the controller. By accelerating we can control the speed of an BLDC HUB motor. Accelerator is give command to the controller to set an firing angle of an switching device. By increasing or decreasing the speed by changing the firing angle of an semi-conducting switching. the change of firing angle command is given by the accelerator.

3.4 BLDC HUB motor:- BLDC HUB motor is most popular and efficient motor used in electric bicycle. BLDC HUB motor consist of stator and rotor. Stator consist of three phases connected to the controller output. Rotor consist of permanent magnet north and south poles. The stator winding creating of rotating magnetic field and rotates in between stator and rotor air gap. The rotor magnet attracts the stator rotating magnetic field and rotor starts rotating. The speed of an bldc hub motor are controlled by the controller of bldc hub motor.

3.5 Mechanical peddling:- This will be used in emergency situation. When battery of an electric bicycle are fully discharge or some fault are occur in bldc hub motor then we can used the mechanical peddling.

IV. WORKING OF CHARGING SYSTEM

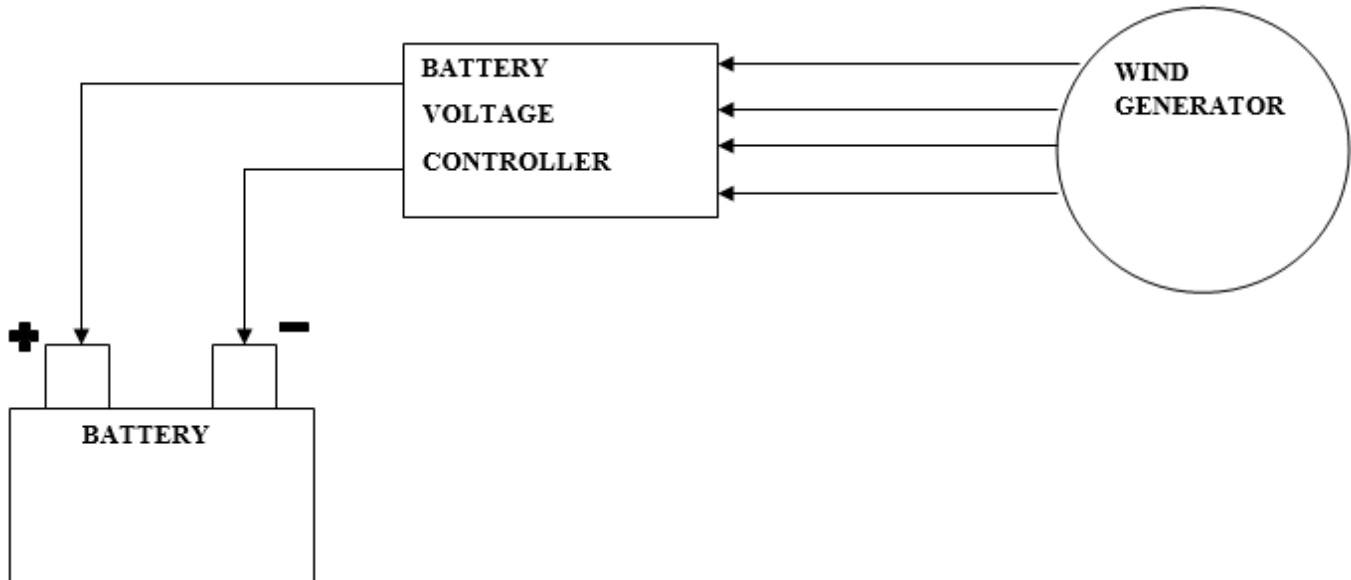


FIGURE 2: Block diagram of electric charging system

4.1 Wind generator:- there is concept using small wind generator for charging the bicycle battery. The wind generator is work on the principle of energy conversion. It generates the electrical power with the help of wind energy. One generator is inserted on wind generator. Generator contains two parts one is stator and other is rotor. Stator consist of permanent magnet and rotor consist of copper windings. The stationary flux are generated by the permanent magnet and rotor cut this stationary flux and according to faradays law of electromagnetic induction it generates the DC output voltage. This output voltage we use to charge the battery of electric bicycle.

4.2 Charge Controller:- the charge controller is used to control the charging voltage and current required to charge the battery. Because of the output power generated by wind turbine is not constant. There are some variation in output voltage according to wind speed and also depends on power supply. To provide the constant power to charge the battery and also decide the charging time of battery. There are many types of controller are available in market to control the output power which is to be generated by wind mill.

V. CONCLUSION

Several new technologies are implemented today and some are to be evaluated to increase the efficiency of EV & HEV. In this paper we have gone through the study of different types of components are to be used in electric bicycle and the owing lots of advantages of BLDC motor over other IM and SRM. We use to charge the battery of electric bicycle by using wind generator so that charging time is reduced and when bicycle is running wind generator charge the battery and battery give electric supply to the motor.

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