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Implementation of E-Bicycle with Smart Display

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Abstract: *Based on growing demand of electrical energy, environmental concern and exhaustion of fossil the need of eco-friendly power generation using renewable energy resources got invoked and these are getting utilized in different sectors. In this paper, implementation of electrical assisted bicycle and its display unit is designed which indicates basic parameters of electrical assisted bicycle. The energy to the bicycle is provided by rechargeable battery packs and for charging a solar power is used. This system reduces the efforts of pedaling to the user. In this system a 24 volt, 250 watt motor kit and A display screen made with TFT (thin-film transistor) display is used. Solar panel used is 37watt 17.60 volt dc power supply and for better charging in less time higher rating of solar panel can be used. DC-DC boost converter is used for step up voltage from solar panel.*

Keywords: Electric Bike, DC-DC Converter Solar Photovoltaic Module, DC Geared Motor, Lithium Ion Batteries.

I. INTRODUCTION

Electrical Assisted bicycle is one of different types of electric vehicles which is based on basic cycle to which motor and other accessories are fitted. Based on recent studies electric bicycles began to play major role due to less efforts, and simple option for travel and transport problems in rural areas. The main reason for implementation is to reduce the efforts of pedaling for long distances. This is the best technical application for future generation. This bicycle is battery operated which is economical, low maintenance cost and less pollution. Bicycle is also incorporated with solar photovoltaic panel for charging the battery during day time when not in use. The advantages of e-bicycles are existing from both atmosphere and in energy saving cases, especially in urban transport.

II. REQUIREMENTS OF E-BICYCLE

The basic requirements of e bicycle are dc motor, rechargeable battery and controller.

2.1 DC Motor

DC Motor is attached with gear as shown in Fig.1. The motor speed is calculated as rotations of the shaft per minute which is known as RPM. The advantages of gear arrangement are it increases the torque and reduces the speed.

Fig.1. Geared DC motor

2.2 Rechargeable Battery

Lithium-ion battery is used in this implementation which is rechargeable battery of 24 volts and 7.5AH as shown in figure. These batteries have high energy density and low self-discharge. These batteries have heating issues and lead to explosions and fires when it get damaged.

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Fig.2. Rechargeable Battery

2.3 Controller

The basic function of Controller is to receive inputs from different parameters like speed, acceleration etc and determines and sends the desired signal to them as shown in figure. It supplies voltage to the external modules like headlight; horn etc with the help of battery power.

The pulse width modulation gives pulses to the driver base on input from accelerator or throttle. This driver controls the power switches such as MOSFET to control the output speed of the motor. Voltage protection (VP) is to protect battery when the voltage is lower than controller set value during this PWM circuit turns off pulses to the output. Current protection (CP) limits higher current and protects controller, battery and motor.

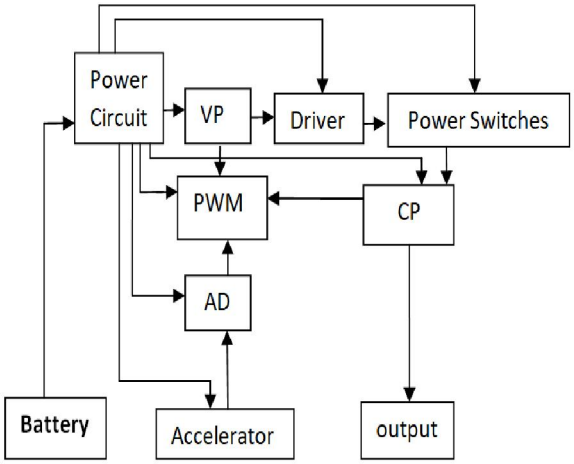

Fig.3. Block Diagram of Controller

2.4 Display System

The display system displays the monitored values such as voltage, current, temperature and speed as shown in Fig.5 The priority of displaying values of e-bicycle can be modified as per user convenience.

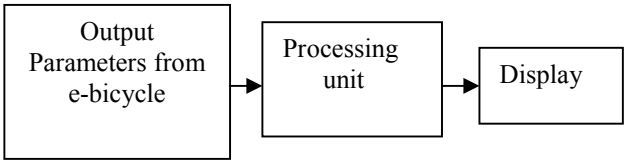

Fig.4. Block diagram of Display System

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III. RESULTS

Fig. 5. Testing of display for e-bicycle

Fig. 6. Solar panel setup

37W Solar panel is placed on top of the e-bicycle by using two supportive stands mounted on e-bicycle as shown in Fig.6 Since the solar panel output is unstable a dc-dc converter type boost is used for desired stable voltage output. DC-DC boost converter module steps up the input voltage ranging from 10V to 32V to output voltage ranging from 12V to 35V at up to 150W output.

Fig.7. e-bicycle rear side assembly

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The motor, controller used is 24V dc, 250 watt and battery is lithium ion of 24V and 7.5AH as shown in Fig.7 and experimental setup is shown in Fig.8

Fig.8. Experimental Setup

IV. CONCLUSION

Electric Vehicles are future trend due to increase in consumption of non-renewable resources. In this paper e-bicycle setup is carried out and display unit is designed to provide details of basic parameters of e-bicycle. Solar panel is incorporated with dc-dc boost converter which is useful for battery charging. The motor and battery can be changed or assembled with other specifications based on the requirement such as load, speed, distance coverage and battery discharging time.

ACKNOWLEDGMENT

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