© 2017 IJSRST | Volume 3 | Issue 2 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X

National Conference on Advances in Engineering and Applied Science (NCAEAS)
16th February 2017
In association with
International Journal of Scientific Research in Science and Technology

Eco Friendly E-BIKE

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ABSTRACT

As we all know the fuel prices especially the petrol is raising steadily day by day. Again the pollution due to vehicles in metro cities & urban areas is increasing continuously. To overcome these problems, an effort is being made to search some other alternative sources of energy for the vehicles. Again, it is also not affordable to purchase vehicles (mopeds, scooters or motorcycles) for all the class of society..The system we implemented is a hybrid electric bike. The project has a number of benefits to both the team members as well as external benefits through increasing awareness of alternative transportation modes. Despite the environmental friendliness of the project or the projected benefits of more people relying on non-polluting modes of transport, the main reason we selected the project was for the level of interaction between us, the engineers, and our product. Designing a transportation vehicle requires consideration of mechanical objectives, electrical objectives, safety criteria, comfort, user friendliness as well as an array of other objectives which may conflict under various Circumstances.

Keywords: E-Bike, Dc Motor, Solar Panel, Lead Acid Battery, Motor Controller.

I. INTRODUCTION

Increasing demand for non-polluting mechanized transportation has revived the interest in the use of electric power for personal transportation and also reduced reliance on automobiles. A low cost alternative to an automobile is a E- BIKE. However, the use of E-BIKE has been limited to very short trips or as a recreational activity. This report describes the design of an electric assisted E- BIKE that will extend the range of a typical rider.

The system consists of three source of power. The human effort of the rider pedaling the bicycle, and electric motor running off a 12-volt lithium ion battery, and a solar panel that can charge the battery when there is adequate sunlight. The power module is controlled by a microprocessor, so that one can operate the bicycle at a preset speed (cruise control). The power control module on the motor will reverse the current in the motor if the speed of the bicycle is more than the desired speed.

This current reversal charges the battery, and thus provides regeneration not only when braking as well as when going downhill, or when the rider pedals harder than the set speed. The final system has features that will appeal to a broad spectrum of users. Those who ride the bicycle for exercise can do so either by disabling the electric assistance, or if they chose, by exerting more effort to generate electric power and charge the battery.

Those, who would otherwise not use the bicycle to move around the city, can do so, confidant that there will be power assistance when they grow tired, or when facing an uphill climb. The constant speed operation will also provide a sense of comfort, especially when coming down steep slopes.

II. METHODS AND MATERIAL

A. E-BIKE

The fig.1 shows block diagram of E-BIKE. The E-BIKE consist of following components (Fig.1) - DC

motor, solar panel, lead acid battery, Motor controller, Charger. The motor is a conventional Dc motor. Motor was connected to rear wheel of E-BIKE. Control operation of done by using the Motor Controller. The supply is given to Dc Motor through Controller by which we can control the operation of Motor.

By using the solar panel charge the battery in case battery is totally dry. Also small size Dc Generator is installed rear wheel of E-BIKE for the Mobile Charger.

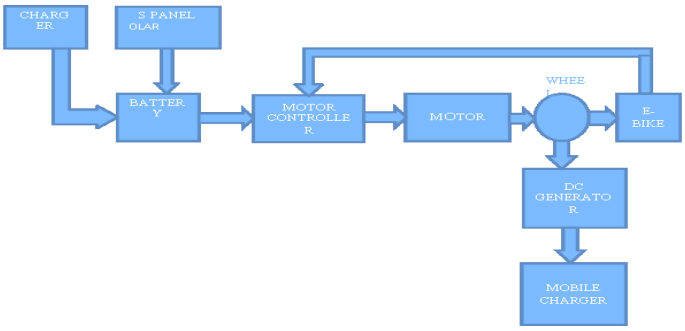

Figure 1. Block Diagram of E-BIKE

B. DC MOTOR

In this E-bike DC motor was used with gear head. By using gear head we can increase the torque of motor. DC gear head motor generates high torque at low speed, which is highly efficient and which is connected to rear wheel through drive chain.
This means they are very reliable and have a long life. The main characteristic of DC Machines is that they may be controlled to give wide variable speed power speed ranges.

Table 1 : Specifications of DC gear head Motor

Type Of Motor	Dc gear head Motor
Design Of Motor	Dc Series Motor
Power Rating	350 watt
Rated Voltage	24 Volt
Weight	5 Kg
Efficiency (%)	>80
Noise(db)	<65

Figure 2. DC gear head Motor

C. SOLAR PANEL

As the title suggests the bicycle is operated by solar energy. The lead acid battery is charged with solar energy with the help of a solar cell. Solar cells convert the energy of sunlight directly into electricity through the use of the photovoltaic effect. The photovoltaic effect involves the creation of a voltage into an electro-magnetic radiation. The photoelectric and photovoltaic effects are related to sunlight, but are different in that electrons are ejected from a material's surface upon exposure to radiation of sufficient energy in photoelectric, and generated electrons are transferred to different bands of valence to conduction within the material, resulting in the build-up of voltage between two electrodes in photovoltaic.

Solar cells are electrically connected and fabricated as a module with a sheet of glass on top to allow light to pass and protect the semiconductor from the weather. To obtain a desired peak DC voltage we will add solar cells in series, and to obtain a desired peak current, the solar cells are put in parallel position.

Figure 3. Solar Panel

Table 2: Solar Panel

Maximum Power (Watt)	20
Charging Current (Amp)	2
Open Circuit Voltage (V)	21.6
Max Power Voltage (V)	17
Short Circuit Current	1.316
Power Measured at Standard Test Condition	1000W per m2 at 250C
Lifespan	25 years
Size	500mm × 338mm. × 35mm

D. LEAD ACID BATTERY

Lead acid batteries (Fig.4) are one of the most popular types of battery in electronics. Although slightly lower in energy density than lithium metal, lead acid is safe, provided certain precautions are met when charging and discharging. This have a many advantages over other conventional types of batteries, the lead acid battery is the optimum choice for a solar assisted bicycle. Current supplied from battery indicates the flow of energy from the battery and is measured in amperes (or Amps). The higher the current flow faster the battery will discharge. A battery is rated in ampere-hours (abbreviated Ah) and this is called the battery capacity. (This project revolves around supplying and utilizing energy within a high voltage battery.

It demands for a battery with longer running hours, lighter weight with respect to its high output voltage and higher energy density. Among all the existing rechargeable battery systems, the lead acid cell technology is the most efficient and practical choice for the desired application. The battery chosen for this project was a high capacity lead acid battery pack designed specifically for vehicles. Plastic casing is provided to house the internal components of the battery.

Figure 4. Lead Acid Battery

Table 3. Specifications of lead acid Battery

Number of Batteries	Two Batteries connected in series
Voltage	24 v
Amp-Hour Rating	24 Ah
Standby Battery Voltage	40 v
Charging Time	7-8 Hours
Weight	10 kg
Safety	Good
Cycle Life (no. Of cycles)	400
Operating Temperature ^{0}c	10-60

E. MOTOR CONTROLLER

The Arduino Uno is a microcontroller board based on the ATmega328 . It has 14 digital Input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

It contains everything needed to Support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC Adapter or battery to get started.The Uno differs from all preceding boards in that it does not use the FTDI USB-to- serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

The Arduino Uno has a resettable polyfuse that protects your computer's USB ports from shorts andovercurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the

fuse will automatically break the connection until the short or overload is removed.

Table 4. Specification of Motor Controller

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per	I/O Pin 40 mA
DC Current for	3.3V Pin 50 mA
Flash Memory	32 KB of which 0.5 KB used by bootloader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

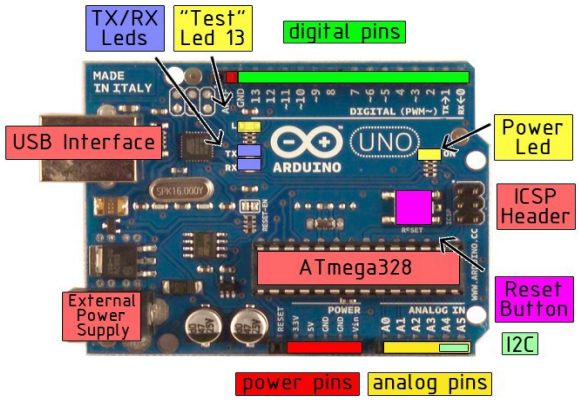

Figure 5. Arduino Uno Controller

III. RESULTS AND DISCUSSION

Parameter	E- BIKE	Moped
Max. Speed Limit (km/h)	20-25	45-50
Drivers pedalling requirement	YES	No
Initial unit cost	25000	50000
Operating cost for 40 km traveling in Rs.	Nil	45
Weight	80	80 kg
Max. Traveling distance at a stretch in km	50 km	150km
fuel used per 100 km	Nil	2 L
Charging (oil- filling) time	7-8 Hr	Not applicable
Type of energy used	-	Petrol
Driving noise (dB)	<65	65- 70
Driver's license required	NO	Yes
Age Limit	Longer	Yes, over 18
Engine size	NOT APPLICABLE	100-125 cc

IV. CONCLUSION

E-BIKE is modification of existing bike and driven by Battery and solar energy. It is suitable for both city and country roads, that are made of cement, asphalt, or mud. This bicycle is cheaper, simpler in construction & can be widely used for short distance travelling especially by school children, college students, office goers, villagers, postmen etc. It is very much suitable for young, aged, handicap people and caters the need of economically poor class of society. It can be operated throughout the year free of cost. The most important feature of this bicycle is that it does not consume valuable fossil fuels thereby saving crores of foreign currencies.

Advantages of E- bike.

1) Run on Rechargeable Batteries.
2) Running Cost is 0.70Rs/Km.
3) Noise Free.
4) Pollution Free.
5) Require Fewer Compared as Compared to Petrol Vehicles.
6) Ideal city Ride Range is 40 Km.
7) Afforable Price.
8) Carring Capacity 75-100 kgs.
9) Fewer Mechanical Componets & Lower Maintence.

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