

# SOLAR BICYCLE

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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. Keeping this in mind, a search for some way to cater these economically poor people as well as to provide a solution for the environmental pollution was in progress.

Since the fuel prices not only in India but throughout the world are increasing day by day thus there is a tremendous need to search for an alternative to conserve these natural resources.

**KEY WORDS:** motor, solar panel, switch, bicycle, battery, dynamo

## 1 INTRODUCTION:

A method of upgrades a conventional electric powered bicycle over to Exercise Powered Electrical Bicycle that is powered by an electric motor which gets its supply from Dynamo. The Dynamo must be adjusted and installed with the bicycle without compromising riding comfort ability. The method employs a small electric motor that are easily connected and separated for ease of transport. A power collector is connected to there chargeable batteries for collecting renewable energy and converting such energy to electrical power that is delivered to the rechargeable batteries for recharging thereof. A rechargeable Battery is operable connected to inverter for providing electrical power to drive other ac purposes like as heating rod.

### 1.1 PROJECT BACKGROUND

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### 1.2 PROBLEM STATEMENT

There are several problems that occur during upgrades a conventional electric powered bicycle to Exercise Powered Electrical Bicycle. The specifications of dynamo must be sufficient to generate the electric energy

same as a conventional electric powered bicycle. The suitable connection of dynamo, rechargeable battery and inverter, heating rod with bicycle needed to make sure this project accomplish with more optimum energy use. The electric motor must to support the weight and size of the bicycle, size of dynamo and condition of the road surface.

### 1.3 PROJECT OBJECTIVE

The objectives of this project are:

- To upgrade a conventional electric powered bicycle to Exercise Powered Electrical Bicycle that can be used for leisurely rides.
- To design and develop Exercise Powered Electrical Bicycle which gets its supply by using conventional energy from dynamo.
- To study the connection between dynamo, rechargeable battery and inverter and heating rod.
- To compare the characteristics and performance between Exercise-Powered Electrical Bicycle and electric powered bicycle.

### 1.4 SOLUTION

- This project “solar bicycle” is very much useful, since it is provided with good quality of power sources and simple operating mechanism.
- This vehicle is easy to handle and no fuel cost to the other existing vehicles.

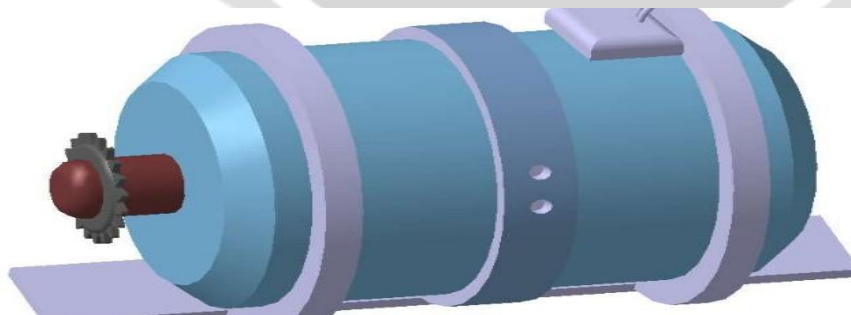
## 2. METHODOLOGY:

The solar assisted bicycle consist of following components hub motor, solar panel, voltage regulator, lead acid battery, motor controller, accelerator, bicycle.

## 3. DESCRIPTION OF EQUIPMENT PNEUMATIC CYLINDER:

### 3.1 Hub Motor

The hub motor is a conventional Dc motor. The rotor is outside the stator with the permanent magnets mounted on inside. The stator is mounted and fixed onto the axle and the hub will be made to rotate by alternating currents supplied through batteries. Hub motor generates high torque at low speed, which is highly efficient and which doesn't need sprockets, brackets and drive



**Fig 3.1. Specifications of Hub Motor**

### 3.2 Solar Cells/ Panels

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.

### 3.3 Voltage Regulator

It is essential to regulate the voltage output from the solar panel before it is supplied to the battery. A voltage regulator is a power converter with an output DC voltage greater than the input DC voltage. This is used to regulate an input voltage to a higher regulated voltage. The output of the solar panel is not always be stable due to fluctuations in intensity of sunlight, angular changes with respect to the direction of sunlight, as well as other environmental factors. This is the voltage regulator/Boost Converter comes into SAB. The output of the solar panel is the input of the boost converter, which then outputs into the battery for charging. Because the output of the solar panel will be varying constantly, we need a voltage regulator/boost converter that will take an input from a wide range of voltages and output a specific, constant voltage value. A voltage regulator/boost converter is a power converter that will take in a DC voltage and output a higher value DC voltage. Our voltage regulator/boost converter requires output of the solar panel, which can range from 0V to 27.2V, and output for charging of the battery. We were initially attracted to the SPV Instruments Module because it has the characteristics of taking in an input range of 9.6V to 13.2V and outputting 24V at a maximum of 2-3 amps .This SPV has an area of 2.5 square inches so it is also small in size, which makes it very feasible to be placed anywhere on the bicycle.

### 3.4 Lead Acid Battery

Lead acid batteries 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.

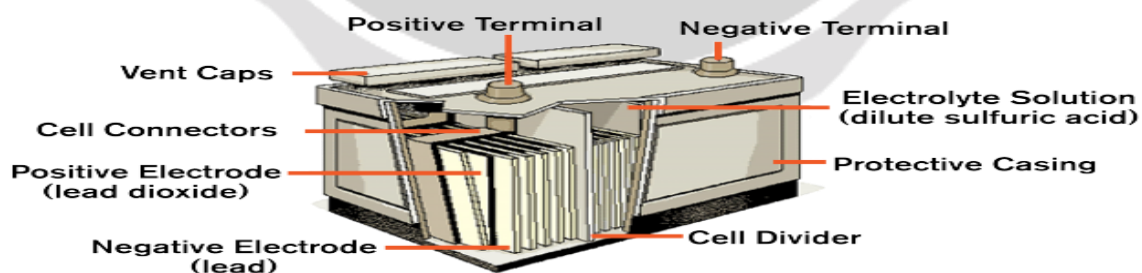


Fig 3.4. Specifications of lead acid Battery

### 3.5 Motor Controller

The motor controller is an important component of the system. It is essential to control the amount of power supplied and to drive the BLDC hub motor. The controller converts the DC voltage from battery to an alternating voltage with variable amplitude and frequency that drive the hub motor at different speeds. It basically consists of MOSFET transistors and small microprocessor that vary from detecting any malfunctions

with the motor hall sensors, the throttle, to protect functions against excessive current and under-voltage, which are ideal for protecting the system.

### 3.6 Accelerator/Throttle

The maximum speed of a bicycle is 30 mph. It is required to vary the speed depending upon the road conditions & traffic. Therefore an accelerator or a throttle is necessary. Throttle allows us to drive the motor from zero speed to full speed. The throttle is fitted on right side of the handle bar and is connected to controller. The throttle converts DC voltage from battery to an alternating voltage with variable amplitude and frequency that drives the hub motor at different speeds. It consists of MOSFET transistors and a small microprocessor. This throttle is technically referred to as a Hall Effect type. The throttle has three wires contains a black, red, and green. The supply voltage is via red and black wires and is usually around 4 volts. Green wire voltage increases as the throttle is turned.



Fig3.6.Specifications of Accelerator

### 3.7 Bicycle

The solar assisted bicycle is driven by DC motor fitted in front axle housing & operated by solar energy. The solar panel mounted on the carriage is charge the battery & which in turn drive the hub motor. When the bicycle is idle during the day, the solar panel will charge the battery. The system will make bicycle operate more efficiently the basic configuration of an solar bicycle drive consists of a controller that controls the power flow from the battery to the electric motor. This power flow acts in parallel with the power delivered by the rider via the pedal of the bike. The rider of an solar bicycle can choose to rely on the motor completely, pedal and use the motor at the same time or pedal only (use as a conventional bicycle).

This arrangement is replace the petrol engines, the gear box & the fuel tank in case of a two wheeler or chain sprockets, chains & gear shifting arrangement of a conventional bicycle being used by most common man

### 3.8 SOLAR PANEL

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (PV) module is a packaged; connect assembly of typically 6×10 solar cells. Solar Photovoltaic panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 365 watts. The efficiency of a module determines the area of a module given the same rated output an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few commercially available solar panels available that exceed 22% efficiency and reportedly also exceeding 24%. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array



of solar modules, a solar inverter, and sometimes a battery and/or solar tracker and interconnection wiring.



**Fig3.8.Solar panel**

#### **4. WORKING OF SOLAR BICYCLE**

A method of upgrading a conventional electric powered bicycle over to Solar-Powered Electrical Bicycle that is powered by an electric motor which gets its supply from photovoltaic (PV) panels. The PV panels must be mounted and installed at the bicycle without compromising riding comfort ability. The method employs a small electric motor that are easily connected and separated for ease of transport. A solar collector is connected to the rechargeable batteries for collecting solar energy and converting such energy to electrical power that is delivered to the rechargeable batteries for recharging thereof. A rechargeable battery is operable connected to DC motor for providing electrical power to drive the motor.



**Fig4.Solar bicycle**

#### **5. ADVANTAGE:**

- It is used for Travelling Purpose.
- For Charging Batteries.

- For Electricity Generation.
- It Can be Used as Health Tonic.
- Utilization of Renewable Energy.
- Less maintenance cost.
- Normal pedaling is possible when not on power assist mode.

## 6. CONCLUSION:

From a future energy system perspective, it is important to identify new ways of transport and generation of electricity and solar powered E-bike pools may just be such a case. E-bikes are an order of magnitude more energy efficient than car, bus or other heavy transport mode.

## 7. ACKNOWLEDGEMENT:

“Optimism Is The Faith That Leads To Achievement. Nothing Can Be Done Without Hope and Confidence - Helen Keller”

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