

DESIGN AND FABRICATION OF SOLAR POWERED TREADMILL E-BICYCLE

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ABSTRACT: For human being travelling has become vital. In order to sustain in this fast forward world he must travel from place to place. It is very important that time taking for travelling should be less, also it should be economical and easily available. With the fast depleting resources of petrol and diesel, there is need to find intermittent choice. The main aim of this review paper is to present the idea of harnessing the various energy and use it in today's existence of human life. The focus of this project is to perform power calculations and system design of this Electric Bike. This bike can be driven with the help of electricity or also with the help of solar energy. Therefore the manufacturing of such bike is indispensable.

Key Words: Solar Panel, Battery, Wiper Motor, Motor (permanent magnet DC motor).

1. INTRODUCTION:

Bicycles are one of the most ubiquitous forms of transportation in the world. Most children remember their first bike; with it came the chance to explore their world with more freedom than ever before. As we grow, however, bicycling becomes more than just a childhood rite of passage. Wind in our hair and feet on the pedals, we have several good reasons to climb on and take a trip. Much of the world uses bicycles as a primary form of daily transportation. What would take several hours of travel on foot becomes faster and more efficient on two wheels. Some cyclists take trips across entire states or cross-country solely on a bicycle. Reaching speeds of 15 miles or 30 km an hour is achievable by even beginning cyclists, while more experienced riders can reach speeds

equivalent to automobile travel. Not to be constrained by simple transportation, bicycles (stationary and otherwise) have helped people become healthier by losing excess weight and improving cardiovascular fitness. The exercise benefits of cycling are well known.

2. PROBLEMSTATEMENT:

Present modern day world, there are two main issues which are causing trouble for mankind is the global warming which is caused by extensive use of combustibles and automobiles even for short distances also. Due to this there is an immense effect on environment and also depletion of fuel sources. The second concern is that lot of people are now majorly suffering from novice health issues. This is because lack of proper exercise. So the new pioneering idea in modern transportation world and named as solar powered health bicycle which can make people walk while they ride.

3.METHODLOGY:

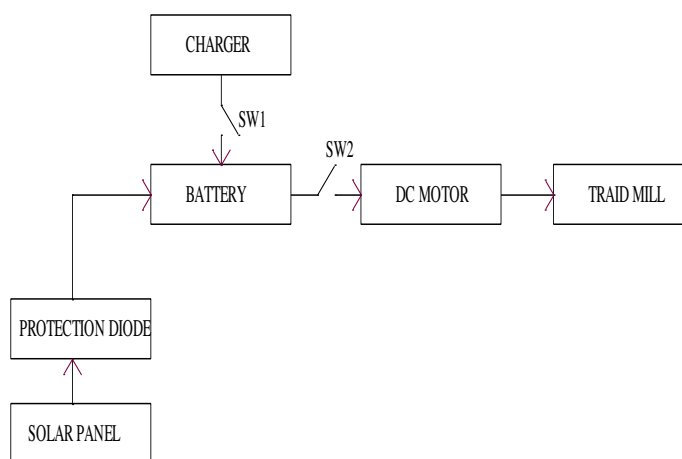


Fig: Working Model Block Diagram

A solar based electric bike with trade mill is an electric vehicle powered completely or significantly by direct solar energy. Usually, photovoltaic (PV) cells contained in solar panels convert the sun's energy directly into electric energy. Solar power may be also used to provide power for communications or controls or other auxiliary functions. In this project Rechargeable battery is used with long life for charging DC electric motor. Here electric motor convert's electrical energy into mechanical energy. Most electric motors operate through the interaction of magnetic fields and current-

carrying conductors to generate force The electricity generated by the solar panel is stored in the battery, enabling a rider to switch over the operation to hybrid mode anytime and control the speed of the bicycle using the accelerator Solar panels absorb UV light and convert it to clean electricity which is then used to recharge the bicycle's battery. Riding bicycles is already an eco-friendly way to commute.

4. System Implementation:

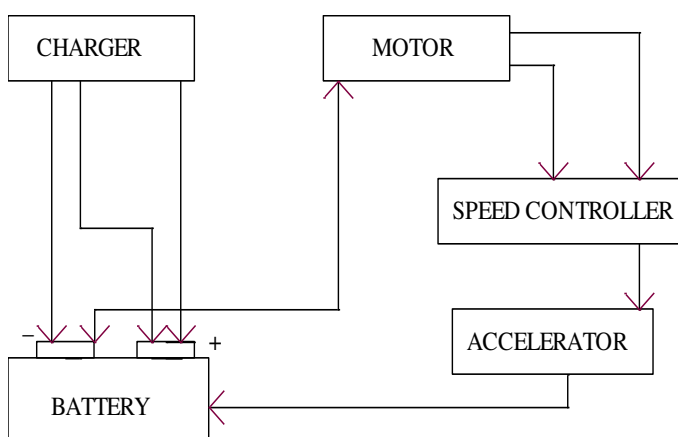


Fig. Circuit diagram

Solar energy is captured from the sun using solar panels mounted on the rear end of the bicycle. These panels are connected to a boost converter so as to boost the voltage to the required level. The arrangement is further connected to a battery. The battery is charged using this solar output as the entire power transfer is DC in this case. This battery is connected to a DC motor. The battery can also be charged using a wall charger in case of absence of sun. A brushless DC

motor is preferred here because of no maintenance, high efficiency, and low noise and also because of the absence of brushes we don't find sparking in a BLDC motor. A synchronized motor controller is used here for the working of the motor. Also a throttle is used here to increase the speed of the cycle. This accelerator is also directly connected to the motor controller which in turn controls the motor speed. The bicycle can also be run using mechanical pedaling in the absence of sun or when the battery is drained out.

Loads on Bicycle:

Table: solar module rating

| Parameter | Value |
|---------------------------------|-------|
| Maximum Power (Watt) | 100 |
| Optimum Operating voltage | 18.9V |
| Open Circuit Voltage Voc | 22.5V |
| Optimum Operating Current (Imp) | 5.29A |
| Short Circuit Current Isc | 5.75A |

Table: Specifications of Hub Motor

| Parameter | Corresponding factor/value |
|-------------------|----------------------------|
| Type of Motor | Hub motor |
| Design of Motor | BLDC (Brushless DC) |
| Power Rating | 350W |
| Rated Voltage (V) | 36 |
| Weight(kg) | 5 |
| Efficiency (%) | 80 |
| Torque | 12 N-m |
| Speed (rpm) | 328 |

Table: Specifications of Motor Controller

| Parameter | Values |
|------------------------------|--------|
| System voltage (V) | 36 |
| Rated current (A) | 27 |
| Under voltage protection (V) | 31.5 |
| Ambient temperature (°C) | 0-50 |

Table: Specifications of Battery

| Parameter | Corresponding factor/value |
|-----------------------------------|----------------------------|
| Type | Lead Acid |
| Number | three Batteries |
| Voltage | 36 V DC |
| Wattage | 350W |
| Rated speed | 3000 RPM |
| No load Speed | 3850RPM |
| Max. Continuous Discharge current | 15A |
| Max charge voltage | 40.6 V |
| connected in | Series |
| Amp-Hour Rating | 10 Ah |
| Discharge cutoff voltage | 15 V DC |

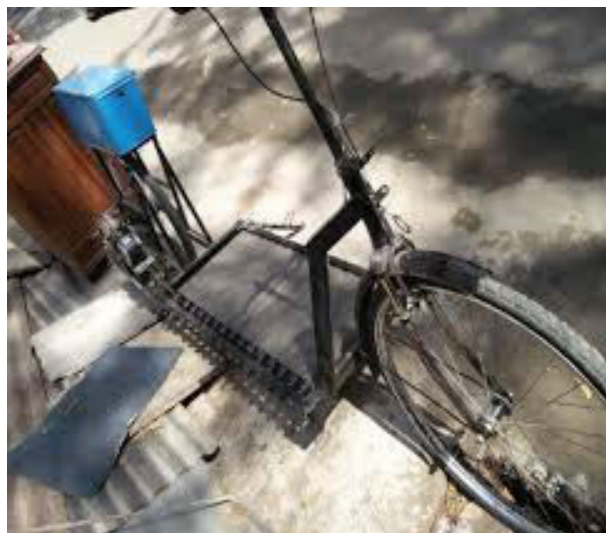
6. RESULTS:

- Commuting with low fatigue at a top speed of 24 kmph.
- Extends the riding range – 30kms on a single charge.Lesser maintenance cost.
- Normal pedaling is possible when not on power assist mode.
- Detachable battery can be taken inside the house for charging
- Solar panels keep charging the batteries for our continuous use.No gasoline - no oil - no tune-ups.
- The fan produce electricity and hence the battery is charged.
- No registration - no insurance – no driver's license

| Parameter | Corresponding factor/value |
|--------------------------|----------------------------|
| Torque | 32Nm |
| Speed | 3520RPM |
| No Load (rpm) | 290;250 |
| Full load (rpm) | 255;220 |
| Charging time | 8 hours |
| Discharging time | 10 minutes |
| Overall distance covered | 1.5 km |
| Load Capacity | 40Kg |

5. DESIGN CALCULATION:

| Sr. No. | Component | Material | Dimensions (mm) |
|---------|----------------|---------------------|-----------------|
| 1 | Chassis | Stainless steel 304 | 35 |
| 2 | Fork | Stainless steel 304 | 40 |
| 3 | Bicycle axle | SAE 1010 Steel | 10 |
| 4 | Handle | Cast Aluminium | 25 |
| 5 | Treadmill axle | Stainless steel | 12 |
| 6 | Roller | Mild steel | 20 |
| 7 | Side frame | Aluminium alloy | 70 30 |



7.CONCLUSION:

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. The most important feature of this bicycle is that it does not consume valuable fossil fuels thereby saving corers of foreign currencies. Running on treadmill is easier than running on an equivalently flat distance outdoors because the ground is smooth and there is no wind resistance. It is eco-friendly & pollution free, as it does not have any emissions. It's going to be a cheap alternative for the commuter. Most people, on their drive to work, go less than 40km. Its cleaner and you never have to buy gas or change the oil. This project is leading to a pollution free environment.

8.FUTURESCOPE:

To overcome this discharge problem we can generation of electricity by using dynamo generator. The mechanical energy generated by human due to walking on tread belt is converted to electrical energy by using dynamo generator.

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