



**SRI RAAJA RAAJAN COLLEGE OF ENGINEERING AND TECHNOLOGY**

AMARAVATHIPUTHUR, KARAUKUDI – 630 301

*Department of Electrical and Electronics Engineering*

**FUNDED PROJECT REPORT**

Start date	End date	Duration	Number of students involved
04.01.2021	14.05.2021	4.5 months	4

**SOLAR BIKE**

**Submitted by**

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**Client Detail:**

**Green Planet Environmental Solutions, Tiruchirapalli.**

**Introduction**

Global warming is one of the major problems the world has been facing due to pollution and other factors that lead to the increase of carbon dioxide in the atmosphere. People have been looking for many solutions to help decrease this problem and to avoid causing more damage to the earth. A huge factor that has been playing a large role in causing pollution and therefore increasing the effect of global warming is car exhaust as recorded in 2004 (IPCC 2007, p 29). People have been looking for alternatives to this problem which lead them to focusing on studying and learning different ways to create environment friendly methods of transportation. As people are becoming more aware of the negative effect climate change has towards our planet, electrical bikes have been increasing in popularity. Many people are using it as their main form of transport as it is very convenient and does not contribute to global warming. Specifically, in countries where one of their main sources of transport is bikes, China for instance has been selling 9 out of every 10 electrical bikes are sold (Navigant Research, 2014).

Solar Powered Bike is an alternative to many non-environment friendly form of transportation and its design is approached from the electrical bike. We will be mainly focusing on how to efficiently create a solar powered bike which allows you to travel the longest distance possible by properly utilizing energy generated from the sun. As well as improving and creating new technology designs for our bike. We will be also testing and implementing sun trackers on our bike to allow us to utilize the greatest amount of solar energy which will allow us to gain the maximum amount of sunlight wherever the sun is faced.





**Components :**

- Solar panel
- BLDC motor
- Battery
- Motor control
- Speedometer
- Battery indicator
- Flywheel

**Functional Requirements**

Solar powered motorcycle system will perform several functionalities to achieve the expected outcome as follows:

1. Receive energy from the sun and store it in a rechargeable battery
2. Rotate the sun tracker to follow the sun and light intensity.
3. Rotate the solar panel in different directions
4. Detect sunlight intensity and collect the required power.
5. Move the bike based connecting and disconnecting the circuit using the stored energy in the battery.

**Electrical Design**

A crystalline silicon solar cell has an open voltage ( $V_{oc}$ ) of about 0.5-0.6 V when fully irradiated and generates short-circuit current ( $I_{sc}$ ) proportional to the incoming irradiance. To get a useful voltage in a PV system, several cells are thus connected in series and usually mounted in a rigid glass-framed panel. To further increase the voltage, several panels can be series connected and to increase the current, they can be parallel connected.

In this way it is possible to configure the amount of series and parallel connections to get a desired voltage and current. To prevent current to flow in the wrong direction, e.g. from a battery to a solar panel or from one panel to another in a parallel configuration, a blocking diode is usually added on each panel. A diode works in such a way that when it is forward biased (typically about 0.7-1 V) it conducts and when a negative voltage is applied, it acts like a circuit breaker.

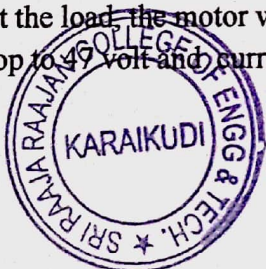
An example of operation is if an 18 V solar panel is connected to a 12 V battery. During the day, the voltage of the solar panel exceeds the voltage of the battery, and current will thus flow into the battery. On the night however, the solar panel's open voltage will be 0 V and current will thus flow from the battery to the solar panel instead, not only draining the battery but potentially also damaging the solar panel. By adding a diode between the panel and the battery, it is possible to prevent current to flow in the wrong direction night-time while still enabling battery charging daytime.

**Power Calculations:**

Power Calculations are needed to find the range of solar panel and battery specifications.

$V_{oc}$  ,  $V_{sc}$  ,  $I_{oc}$  ,  $I_{sc}$  values place an major role in selecting the solar panel for our motor bike

We conduct the load test and the performance test on the vehicle was conducted, when the vehicle run without the load the motor will consume 4 ampere and the load increases to 50 kgs then the voltage will drop to 49 volt and current will increases to 15 ampere.





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The average milage of the vehicle with load is upto 110 kms. The time taken for charging the vehicle is 6hrs, while using 48 volt 6 amp charger.

## SPECIFICATIONS

### MOTOR:

- Rated Output Power - 750W
- Rated Voltage - 48V DC
- Speed after Reduction - 480 RPM
- Rated Speed - 2800 RPM
- Gear Ratio - 1:6

### SOLAR PANEL:

- Full Load Current - 20A
- Output Power - 20 Watts
- Operating Voltage - 24 Volt
- A+ Grade, anti PID Poly Crystalline cells
- Cell Conversion efficiency > 32%

### ADVANTAGES:

- Renewable energy source
- Reduces the use of fossil fuels
- Technological development
- Reduces air and noise pollution
- Low maintenance cost





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**QUOTATION**

S.NO	ITEMS	QTY	UNIT PRICE	AMOUNT
1.	Solar panel	2	4600	9200
2.	BLDC motor	1	6000	6000
3.	Battery	1	2000	2000
4.	Motor control	1	3600	3600
5.	Battery indicator	1	550	550
6.	Flywheel	1	400	400
7.	Old Bike	1	18000	18000
TOTAL				39,750

This project was funded by Green Planet Environmental Solutions (GPES) with whom the institution has signed Memorandum of Understanding (MoU) for the academic year 2019-2020. Prof.P.Manishankar, Vice-chancellor, Bharathidasan University launched the solar bike and appreciated the students for their innovative approach in bringing the solar-bike.





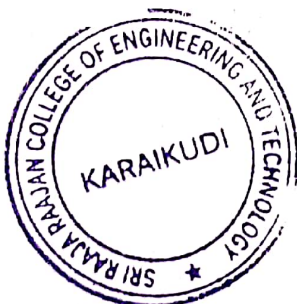
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**FINAL PRODUCT- SOLAR BIKE**



**SOLAR BIKE DEMONSTRATION**



*[Signature]*

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## ABSTRACT

Since the fuel prices not only in India but throughout the world is increasing day by day thus there is a tremendous need to search for an alternative to conserve these natural resources. Thus a solar bike is that provides that alternative by harnessing solar energy to charge the battery and thus provide required voltage to run the motor. Since India is blessed with nine months of sunny climate thus concept of solar bike is very friendly in India. Solar bike combines the use of solar energy as that runs through to charge the battery to run the bike. Thus solar bike can become a very vital alternative to the fuel automobile thus its manufacturing is essential.

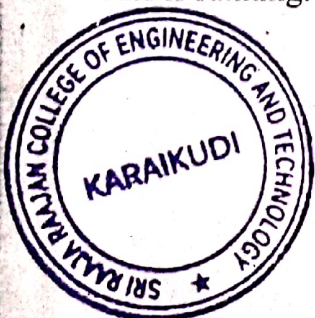


# CHAPTER 1

## INTRODUCTION

One of the largest sources of air pollution in urban areas is transportation. Air pollutants have numerous impacts on human health, the climate, ecosystems, and the built environment. European and worldwide authorities support emission-free mobility and consider it necessary for the development of their national sustainable strategies. Since 2000, governments have been promoting bikes as an alternative mode of transportation to replace private car, especially in urban areas where the terrain and the road network allow it. Bikes could contribute to the reduction of air pollution, traffic congestion, noise emission, and energy consumption, allowing at the same time a healthier lifestyle for users. In addition to this, the bike constitutes one of the most accessible and cheapest transportation modes (e.g., there is no extra cost for taxes, no driving license, parking costs or high service maintenance costs, as in the case of cars). Many cities have promoted cycling, especially by implementing bike-sharing programs for public use. An alternative of the conventional bike is the Solar bike. The term Solar Bike refers to all two-wheeled Bike

Solar bike is developed to reduce the pollution caused by conventional bikes. To develop a low cost application for rural and remote area where fuels are not available to drive two wheelers so that they can run this bike on renewable solar energy. The solar energy from the sun is free of cost and is used to drive the motor. When there is no sunlight the batteries are used to run the bike. The solar bike is different from others bike. The PV panel save more power and give the bike required range. The solar panel will be charged while bike is running.



## CHAPTER 3

### COMPONENTS DESIGN AND FABRICATION

#### BLDC MOTOR

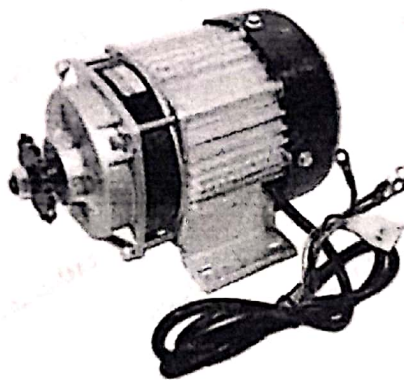
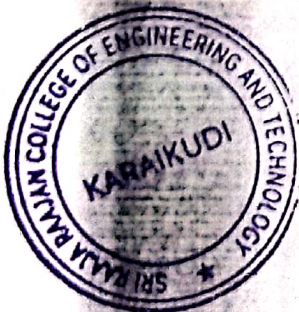


Fig3.1: BLDC motor

We have used 48 volt 750 watt BLDC geared motor for our project. It has a gear box for speed reduction. The motor have a maximum rpm of 3000 per minute and the gearbox ratio of 6:1 and it has an maximum torque of 13.4A. Motor Specifications: Rated Operating Voltage: 48V Rated Power: 750W Load Current: 4.0A No Load Speed: 500 RPM Rated Speed: 400 RPM Efficiency: 80%

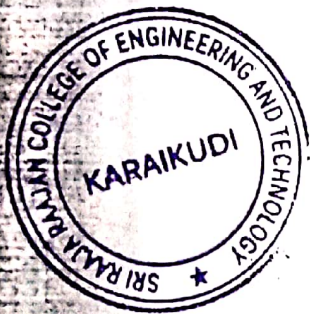




## MOTOR'S SPECIFICATION

Maximum voltage	48 volt
Maximum current	15 amp
Maximum power	750 watt
Motor rpm	300rpm
Output shaft rpm	400rpm
Maximum torque	102kg-cm

Brushless DC motors (BLDC motors) are quite different to drive compared to brushed DC motors. With a brushed DC motor you simply apply a voltage or pulse width modulated voltage and the motor will start turning (if possible) and increase speed with reducing torque until the torque/speed match the load. A brushless motor will have three sets of windings connected in a star configuration (sometimes called Y configuration) or delta configuration.



## CHAPTER 6

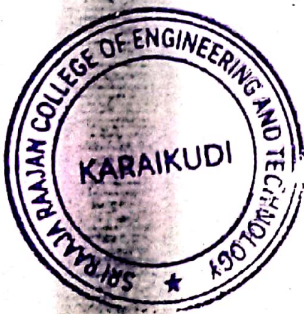
### RESULTS AND DISCUSSION

We have done the load test and the performance test on the vehicle when the vehicle was run without the load the motor will consume the current of 4 ampere and the load will be increase to 50 kgs then the voltage will drop to the 47 volt and the ampere will increase to the 15 amp and the average mileage of the vehicle with 50 k load is up to 110 kilometers

And the load will be increase to the 100kgs the voltage will be decrease to the 45.5 volt and the ampere will be increase to the 16 amp and the vehicle maximum speed will be reach to 47 km/hr and the range of the vehicle will be 98 kilometer

The load will be increase to 150 kgs the volt meter reading will be drop to 45 volt and the ampere will be increase to 16.5 amp and the maximum speed of the vehicle is reach up to 46 km/hr and the range of the vehicle is 95 kilometer

The time taken for charging the vehicle from 0-100 is 6hrs and 24 minutes while using the 48 volt 6amp charger using of the 15 amp charger the charging time will be decrease to 2hr56minutes for fully charge



## CHAPTER 7

### CONCLUSION

It is very much suitable for young, aged, handicap people and caters the need of economically poor class of Society. Oil and gas operations could release many tons of harmful pollutants into the air and discharge dangerous chemicals into the water, thereby degrading the clean air and water.

Oil pollution can have a devastating effect on the water environment; it spreads over the surface in a thin layer that stops oxygen getting to the plants and animals that live in the water. Oil pollution: harms animals and insects. So This Solar bike is becoming a vital alternative to the fuel automobile and so Solar Bike Manufacturing is essential.



A handwritten signature in black ink, appearing to be 'M. S. Srinivasan'.

**PRINCIPAL**

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