

# Solar Powered Electric Tricycle for Physically Challenged Person

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**Abstract**— Solar plays a vital role in our day to day life. We have developed the solar tricycle especially for handicapped person. In this paper it is discussed that how solar tricycle will help to reduce the effort of handicapped person. All the designs specification considered after analyzing the problems from the handicapped person. Comfort of the person in the tricycle is an important and we have given importance to it. The main content of the tricycle is Solar PV panel, Brushless PMDC motor, Charge controller and battery. This paper will discuss about the main idea of this project and to get a larger picture on what is the problem in the current technologies, what that I want to achieve in this project and the area that will cover on this project. This paper is divided into some categories that are project background to describe the reasons to do this project, problem statement to inform about the problem or weakness of the existing technology, objective to make sure what actually this project must achieve and scope of this project to specify what will be used in this project.

**Index Terms** — Solar, Tricycle, Design, PMDC motor.

## I. INTRODUCTION

Electric vehicles, which use 100% electric power, use electric motors instead of an internal combustion engine to provide motive force. Solar-powered vehicles (SPVs) use photovoltaic (PV) cells to convert sunlight into electricity. The electricity goes either directly to an electric motor powering the vehicle, or to a special storage battery. PV cells produce electricity only when the sun is shining. Without sunlight, a solar powered car depends on electricity stored in its batteries. Since the 1970s, inventors, government, and industry have helped to develop solar-powered cars, boats, bicycles and even airplanes. In state of using car or motorcycle that are costly, people will be prefer to used tricycle as their vehicle. There several types of tricycle that can be chosen such as paddle tricycle, motorized tricycle and

electric tricycle. But there are some weaknesses about that type of tricycle. To overcome the weakness this project will develop a better tricycle. Because of India is located in the topic of Capricorn area, this project will make used the energy of the sun that rarely used in India to generate the tricycle. As what had been mention earlier, there are several types of tricycle that can be categories that is paddle tricycle, motorized tricycle, and electric tricycle. The weakness of the tricycle make people do not like to used tricycle. First, pedal tricycle needs a lot of energy to pedal the tricycle. The user will surely be tired after used the tricycle. This will not suitable to use because user will be tired when they are in the work and will lost their concentration while working next, motorize tricycle that used fuel as it prime mover. The tricycle use fuel that is costly. Motorize tricycle will make pollution that can be very bad for our environment especially in this period that global warming happen to the earth. Lastly, electric tricycle that generate by battery can be only be sufficient for about an hour. The user needs to find power supply to recharge the battery or else they need to paddle the tricycle that used more energy compare to the normal tricycle because of the weight.

## II. OBJECTIVES

To overcome the problem and the weakness, this project need to do some research and studying to develop better technology. To make it success there are several thing that we need to know such as what will be the prime mover, how to stored it and the advantages of this new vehicle. In that case, these are the list of the objective to be conduct before continue to proceed on this project:

To develop a vehicle that uses renewable energy, environmentally friendly and cheap.

To develop an electrical tricycle that can charge the battery when it is not in used.

To develop low speed tricycle, but for a longer distance.

### Organization of the project

All type of physically handicapped persons are lived and they are using manual operated tricycle. After watching the most weakness physical handicapped person difficult to operate the tricycle. We think on the tricycle how would become easily operated by the aged person. In this way the Idea comes in our mind. Basically in India tricycle mostly used only the handicapped person. But in foreign country tricycle as the handicapped person is used as well as the non handicapped person is used.

### Scope of Hybrid solar tricycle

To convert the solar energy to the electrical energy by using solar cells, then Converting this electrical energy to mechanical energy by using dc motor to run the tricycle beside the human paddling.

- To find the alternative of fuel.
- To maintain the ecological balance.
- To form the economical tricycle.
- There is a need for a green energy.

### III. LITERATURE REVIEW AND THEORY

In order to perform this project, literature review has been made from various sources like journal, books, article and others. This chapter includes all important studies which have been done previously by other research work. It is importance to do the literature review before doing the project because we can implement if there are information that related to this project. The most important thing before starting the project we must clearly understand about the topic that we want to do. So by doing the literature review we can gain knowledge to make sure we fully understand and can complete the project. A review of the article was performed to identify studies that relevant to the topic. The search to find material that related to the topic is categories as solar panel, solar charger, battery, motor, electric tricycle and speed control.

### IV. DESIGN AND DESCRIPTION

The title of the project may be lead, because it going to be easy fabricating a full sized solar tricycle. It is not only difficult but also very costly. So it is better to do this as a project which includes lots of study and then a demonstration of how the solar energy can be converted and stored in batteries and then how it can be used to run the vehicle. May be with the staffs permission you may be able to use your college's water heater solar panel if there is any. The project includes lots of calculations on how much energy can be stored, how fast the energy can be stored, how maximum efficiency can be achieved etc.

The solar powering system of the tricycle consists of:

1. Solar Array which collects solar energy and converts it to electrical energy
2. Power trackers to achieve the proper voltage to be stored in batteries.
3. Batteries to stir power.
4. Motor controller which adjusts the power input to the motor.
5. An electric motor which drives the vehicle

### Specifications:

**Solar panel:** 12 volt, 75 W= 2Nos.

**Motor:**, brushless dc motor, 24 volt, Maximum load current is. Power rating is 250 W, 300rpm.

**Battery:** 12 V- 2 Nos.

**Charging time:** 6 hr

**Maximum speed:** 33 km/hr

**Frame:** Steel in parts with high strength requirements.

**Wheels:** Front 20 x 1.75. Rear 23 x 2.00.

**Tyres:** Front 23 x 2.50. Rear 20 x 2.00 / 2.25 moped strength.

**Size:** Length 2.3 M. Width - 1.2 M.

**Weight:** Chassis 98 Kg.

**Load Capacity:** 90 kg

**Handlebars:** Maxims Design.

### WORKING:

Solar panels transfer energy to 12 volt deep cell batteries located on the bike's frame just below the chair. From there, a small brushless dc motor between the front wheel hubs powers the bike. The whole system is on a continuous feedback loop, enabling the bike to partially recharge while in use thus extending the bike's range. A dc motor located in front wheel is controlled by the speed controller and throttle. The rider can switch from pedal power to solar power easily, and when not in use, the solar panels continue to recharge the batteries. The motor's maximum is 250 w. Table 1 shows comparison of solar vehicle with conventional vehicle and Table 2 shows the approximate cost of materials and components of the rickshaw.

### Result and discussion

Diameter of the back wheel = 26 inches

Diameter of the front wheel = 23 inches

RPM of brushless dc motor = 300

**Table 1: Comparison of solar vehicle and normal vehicle**

Sl. No	Parameter	Solar Vehicle	Conventional Vehicle
1	Cost	High	Low
2	Human Effort	Less	More
3	Speed	More	Less
4	Electricity	Yes	No
5	Handling	Easy	Hard
6	Comfort	Good	Bad
7	Fuel Alternative	Yes	Not always
8	Pollution	No	No

**Table 2: Cost of Materials**

Sl. No	Component	Unit Cost	Quantity	Total Cost
1	Tricycle	2000	1	2000
2	Solar Panel	15000	1	15000
3	DC Motor	8000	1	8000
4	Motor Controller	2500	1	2500
5	Wires			500

6	Battery 24V 75 ah	5000	2	10000
7	Fabrication			4000
	Total			42000

## V. ADVANTAGES & DISADVANTAGES

### A. Advantages

1. Solar energy creates absolutely no pollution. This is perhaps the most important advantage that makes solar energy so much more practical than oil. Oil burning releases harmful greenhouses gases, carcinogens and carbon dioxide into our precious air.
2. Solar energy is a completely renewable resource. This means that even when we cannot make use of the sun's power because of nighttime or cloudy and stormy days, we can always rely on the sun showing up the very next day as a constant and consistent power source.
3. Solar panels and solar lighting may seem quite expensive when you first purchase it, but in the long run you will find yourself saving quite a great deal of money. After all, it does not cost anything to harness the power of the sun. Unfortunately, paying for oil is an expensive prospect and the cost is still rising consistently. Why pay for expensive energy when you can harness it freely?
4. Solar powered panels and products are typically extremely easy to install. Wires, cords and power sources are not needed at all, making this an easy prospect to employ.
5. Solar power technology is improving consistently over time, as people begin to understand all of the benefits offered by this incredible technology. As our oil reserves decline, it is important for us to turn to alternative sources for energy.
6. Oil, which is what most people currently use to power their homes, is not a renewable resource. This means that as soon as the oil is gone, it is gone forever and we will no longer have power or energy. Very little maintenance is required to keep solar cells running. There are no moving parts in a solar cell, which makes it impossible to really hurt them. Solar cells tend to last a good long time with only an annual cleaning to worry about.
7. Solar cells make absolutely no noise at all. They do not make a single peep while extracting useful energy from the sun. On the other hand, the giant machines utilized for pumping oil are extremely noisy and therefore very impractical.
8. Because an SPV has few moving parts, service requirements are less than for conventional cars.
9. Since there is no internal combustion engine and no combustion takes place, there are no emissions.
10. Electric vehicles are very quiet. Noise comes only from the electric motors
11. Because SPV energy is 100% solar derived, no refueling, in a generic sense, is required. SPV's rely on solar power, and the only requirement is that they must be operated in sunshine.
12. Added emissions are not produced by power plants, since SPV's do not rely on utility-generated electricity.
13. Efficient vehicles have traveled a mile on less energy than a 100-watt light bulb consumes in one hour. (For a gasoline-powered car to achieve comparable efficiency, it would need to get 500 miles per gallon.)

### B. Disadvantages

1. Initial purchase price is high.
2. Storage batteries will need to be replaced after about 3-5 years.
3. Can't carry more than one passenger.
4. Slow speed comparing with other ways of transportation
5. Although solar energy is an unlimited resource, it is not always available when it's needed—the sun must be shining.
6. SPV's that have a built-on PV array differ from conventional vehicles (and most electric vehicles) in size, weight, and shape. The car must be efficiently designed. Lightweight structural materials, such as aluminum or lightweight composites, and low friction components improve performance. They are usually built to carry very little – only one or two people.
7. Some SPV's use no batteries; others use lightweight silver-zinc batteries. These batteries are expensive and need to be recycled after only a few charging cycles. Nickel-metal-hydride batteries may last up to 100,000 miles, but significantly increase the weight of the vehicle. (Lithium ion battery use is possible, but very expensive.)
8. A large amount of surface area is needed on the car to be used solely for solar power PV cells. State-of-the art PV cells are only about 20 percent efficient.
9. The primary safety concern with the development of a prototype vehicle, or vehicle altered by hobbyists – as the majority of SPVs are – is that of design and an ability to adequately test the vehicle. If meant for road use, the final design must be road worthy. Proper attention must be paid to all aspects of vehicle design, including steering, suspension, breaks, protection for the driver, proper seatbelts and seating, properly secured motors and batteries, and adequate chassis strength and durability. All prototypes and modified vehicles must be properly tested before operating on-road.
10. As with all electric vehicles, lethal levels of electricity may be present in the battery pack, so it should be treated with caution and respect

## VI. APPLICATIONS

1. Travel for free with the power of the sun.
2. Provides free, 'green' transportation for short distances (<10 miles), thus it must never plug into a wall socket, or emit any pollutants.
3. Charges while at work
4. Is cheap, simple, and low maintenance.
5. Draws attention to the practical

## VII. CONCLUSION

We can say our project can be a success considering the changes we had to make in the spring once we actually found out how the hybrid solar tricycle was for. We can achieve our five aims, and we believe that we have a system that will be effective in providing mobility for persons who have disabilities. One of the major lessons we have learned is that designing an appropriate technology is a huge challenge. Appropriate is more than just availability for replication, it considers longevity, reliability, and efficiency.

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