IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Solar based E-Rickshaw: A Technical Review

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Abstract

Global efforts to reduce greenhouse gas emissions are needed to reduce the environmental problems caused by conventional internal combustion engine vehicles. Green and clean alternative modes of transport such as electric vehicles are needed instead of traditional vehicles. As a cheaper version of the tram, electric rickshaws (commonly known as electric rickshaws or tuk-tuks) are most popular in India. In this article, solar powered auto rickshaw (SPEA) is designed and developed for Indian conditions. The developed vehicle is thoroughly analyzed from a technical and economic point of view for its viability in the Indian market. SPEA's performance analysis resulted in an optimal charging rate of 2 kWh per day with an average solar irradiance of 325 W/m2 on a typical sunny day. Discharge characteristics are studied under different loading conditions. The car reaches a maximum speed of 21.69 km/h with a battery discharge rate of 296 W at a load of 90 kg and also reaches a maximum discharge rate of 540 W at a load of 390 kg with a maximum speed of 12.11 km / h. . SPEA's environmental analysis indicates that the annual CO2 emissions of 1777 kg, 1987 kg and 1938 kg respectively due to the use of compressed natural gas, liquefied petroleum gas and gasoline engines can be reduced with the help of of SPEA. In fact, it is common in developing countries that during traffic jams in congested areas of the city, these vehicles create huge pollution. This article focuses on solar powered rickshaws which can provide very quiet and pollution free transportation system for urban and rural areas of India. In addition, it is an energy efficient and economical Avery vehicle. The survey shows that trailers powered by solar panels and electric motor batteries have the potential to provide an attractive alternative to petrol and diesel-powered tricycles. Besides, they also provide large-scale jobs and extra income for cyclo pullers. Tractor puller

Introduction

E-Rickshaw is the most commonly used vehicle for the short distance throughout the world. A these E-Rickshaws having no pollution, no sound and easy to operate. In the conventional E-Rickshaw we have to charge the batteries and use after charged. But in this paper a hybrid system is used to run the E-Rickshaw by sola panel system. In regular E-Rickshaw you have to reload multiple times. It takes 6-7 hours to charge and second, the E-Rickshaw needs to be upright for this system. The above problem is solved by using an E-Rickshaw mounted solar panel. Using this technique, no charging time is required; No controller needed in solar E-Rickshaw. Have average savings from Rs60 to Rs70. In this way we are saving the environment, economy and time of charging of the country. In today's scenario, the pollution rate is increased gradually day by day and a large amount of pollution is caused by the contaminated air which is produced by the vehicle, the fuel is burnt automobiles and it exhausts polluted air in the atmosphere, which causes air pollution. alternate Path that we can use the Electric-vehicle instead of using diesel and petrol operated vehicles. The cost of gasoline and diesel is also growing day by day. So solar is the best method to overcome this problem and it is the only way to protect our environment from the harmful air. Solar is completely eco-friendly to our nature. Solar is a totally renewable source of energy and pollution-free. Solar energy is also called green energy. The predictable energy utilization via using renewable energy in India is mostly formed by utilizing thermal power plants. These coal power plants main cause of CO2 gas production resulting in superior result. A 500 MW coal-fired power plant can generate up to 1 kg/KWh of electrical energy. So, by using solar energy, we can reduce the consumption of natural resources like coal, water and other natural resources, so this is the best and most suitable method to save natural resources for our future. Solar power works only when the sun is out and we know the sun is a good source of energy to generate electricity from solar energy after seeing all these benefits we built the energy trailer 48V/355W solar will charge the battery from solar energy

E Rickshaw Base On Solar Energy Technical Review Overview In The System

Electric rickshaws or e-rickshaws are becoming increasingly popular in many parts of the world due to their low cost of operation, ease of use, and low carbon footprint. Solar-powered e-rickshaws are an innovative solution that combines the benefits of electric vehicles with the advantages of solar power.The technical overview of a solar-powered e-rickshaw system typically includes the following components:

Solar panels: The solar panels are used to generate electricity from the sun's rays. They are typically installed on the roof of the e-rickshaw and connected to a charge controller.

Charge controller: The charge controller regulates the voltage and current from the solar panels to ensure that the battery is not overcharged or damaged. It also prevents the battery from discharging when not in use.

Battery: The battery is the energy storage device that powers the e-rickshaw. It is charged by the solar panels through the charge controller.

Motor: The motor is the primary component that drives the e-rickshaw. It is typically an electric motor that is powered by the battery.

Controller: The controller is the electronic circuitry that controls the operation of the motor. It receives input from the throttle and other sensors and adjusts the motor's speed accordingly.

Wheels: The wheels are the components that provide motion to the e-rickshaw. They are typically connected to the motor through a chain or belt drive.

Brakes: The brakes are used to slow down or stop the e-rickshaw. They are typically mechanical brakes that are operated by foot pedals or hand levers.

Overall, a solar-powered e-rickshaw system offers many benefits, including reduced operating costs, reduced carbon emissions, and increased energy independence. However, the cost of the system and the availability of sunlight are significant considerations that must be taken into account before implementing such a system.

Solar Photovoltaic And Energy Calculation

Solar photovoltaic systems convert sunlight into electricity using semiconductor materials. These systems can be used to power homes, businesses and even entire communities. When designing a solar power system, several factors should be considered, including the amount of sunlight available in the area, the size of the system required, and the electrical requirements of the site or location point.

To calculate the electricity output of a solar system, several variables must be considered. The first is the system power, measured in watts (W) or kilowatts (KW). This represents the maximum amount of energy the system can produce under ideal conditions, usually measured as the maximum output power under standard test conditions (STC).

The second variable is the amount of sunlight available in the area, which can be measured in solar irradiance or the amount of solar energy per unit area per unit time. This is usually expressed in watts per square meter (W/m²) or kilowatts per square meter (kW/m²).

The third variable is system efficiency, which represents the percentage of sunlight that the system can convert into usable electricity. This can vary depending on the quality of the photocell and other components, as well as environmental factors such as temperature and shade.

Literature Survey

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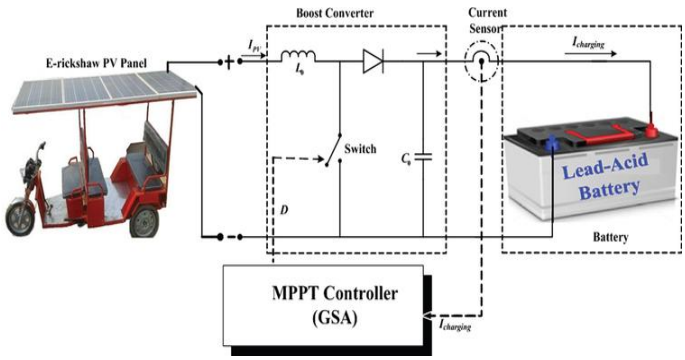
Spefications Of E-Rickshaw

Seating Capacity	6(50 Kg Luggage)
Battery ranking	100AH
Battery sort	LEAD Acid
Electricity utilization\ charge	5-6 Unit
Charge of Time	6-7 Hours
Range per charge	100 Km & above
Maximum Power of motor	1140W& 48V(Input)
Type of Motor	BLDC
Maximum Speed	25KM\hr

Estimated Stucture: -



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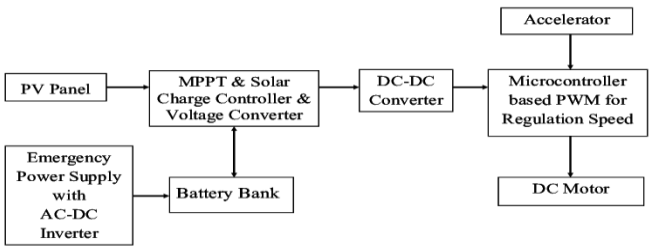

PV is a basic components used in e-rickshaw are shown in fig. some of the important components are described in following section

- **Controller:-** heard that we are using MPPT controller called max power point tracker connected to DC motor. It is responsible for controlling the vehicle's acceleration.

- The controller is the heart of the electric trailer, it performs the following functions

Electric rickshaw controller is one of the main components of the battery powered vehicle that governs its complete operation. The work of this controller is to take electrical power from the battery and supplies to the electric drive motor. Based on the use and position of accelerator, controller delivers the power level; zero power when the acceleratoris not being used and rickshaw is stopped, full power when the driver accelerates the speed and any power level in between when driving at different speeds. The technical specification of the electric rickshaw controller are heat resistant, compatibility with almost all motors, speed locking facility, speed switching facility, reverse switching, overload protection, deliver high torque and control other electrical systems.

Product type	E-Rickshaw Controller
Frequency	50 Hertz (HZ)
Power	500 to 2000 Watt (w)
Colour	Gray
Supply Ability	100 Piece Per Day

- **DC to DC converter**- It is useful to convert direct current to direct current. because our requirement is direct current .
- **PWM**: - We use pulse width modulation due to the load variation of the electric trailer. To change the engine speed.
- **AC to DC invertor** Initially, we need AC power to power the battery, then the inverter is converted into DC power to run our car.
- **Battery Bank**: - heard we use lead acid batteries. Over heat protection
- Regenerative Braking
- BLDC Motor of 250W with voltage rating 48V or 60V.

Advantage

- Eco – friendly – E-rickshaws can be the best alternative to petrol or diesel .run vehicles as they are operated on battery.
- These rickshaws do not emit smoke and thus.
- E-rickshaw not contribute to the increasing air pollution.
- 40% less energy consumption cost.
- Very low maintenance and running cost.

Conclusion

- After the study it can be said that being a potential bearing mode of transport of present and future e-rickshaw is the best contender.
- So with the analysis of e-rickshaws past present and future with benefits some issues like its slow speed, disposal of lead –acid battery.
- it has started making its mark in the Indian transport system.
- Using lithium-ion battery instead of lead –acid battery and by suitably positioning all weight contributing components optimization of weight can be done.

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