

Review Paper on Solar Powered E-Bike

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Abstract:- As we all know the fuel prices especially the petrol is rising 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. The solar assisted bicycle made is driven by DC motor fitted in front or rear axle housing & operated by solar energy. The solar panels mounted on the fairing will charge the battery & which in turn drive the hub motor/centre mounted motor. When the bicycle is idle, the solar panel will charge the battery. If low amount of sunrays are available then the E-bike can-be charged with an AC wall outlet supply.

This project will result in low dependency on fossil fuel. It will also utilize the vast amount of solar energy that is available on earth surface.

I. INTRODUCTION

One in every of the biggest sources of air pollutants in city areas is transportation. Air pollutants have numerous influences on human health, the climate, ecosystems, and the built environment. Internationally a lot of countries governments guide emission-loose mobility and don't forget its essential for the improvement of their national sustainable strategies. On account that 2000, governments have been promoting bicycles as an opportunity mode of transportation to update personal cars, especially in city regions in which the terrain and the road community allow it. Bicycles should make a contribution to the reduction of air pollution, visitors congestion, noise emission, and strength consumption, permitting at the equal time a more fit lifestyle for customers. In addition to this, the bicycle constitutes one of the most available and cheapest transportation modes. Many towns have promoted bikes, mainly by means of implementing bike-sharing programs for public use.

The first industrial e-bikes had been available in Japan in 1980s, but they handiest commenced being hugely advertised inside the early 2000s, when the progressed battery and motor generation simplified the manufacture and assembling of the e-bikes, as a result permitting aspect modularity and decreased fee. These e-bikes can be powered by solar energy which is readily available and a clean source of energy.

II. LITERATURE REVIEW

This concept of e-bike is very versatile and highly usable, the concept discussed in the studied research papers point that, that this bike can be used in many use cases while

reducing the carbon emission as it uses solar power. Since the bike is solar powered, it can also be operational in remote locations which are cut off from cities and do not necessarily have power supply by the means of electric grid. As the vehicle has two methods of charging i.e., wall charging and solar charging, in scenarios where the rider is at a remote location and does not have enough charge in the battery to get the rider out of that remote location, the vehicle can be charged by solar power and the rider would be able to get out of that situation. There is still scope of improvement in terms of battery technology, solar technology and the overall solar bike technology needs some more time and adaptation to fully evolve into widely accepted technology.

Below mentioned are some research papers which had integral information about this concept which are as follows,

In 2016, [2,3] the bicycle sales in Europe reached round 19 million units, even as inside the equal year, e-motorbike sales reached 1.6 million devices, of which 36% were in Germany, 16% inside the Netherlands, 10% in Belgium and 8% in France, followed with the aid of different European countries, with lower stocks. In 2016, 35 million gadgets of e-bikes have been sold international, and in 2023, worldwide income of e-bikes are forecast to attain 40.3 million gadgets. Today, e-bikes are taken into consideration one of the maximum promising sustainable options to car transportation and represent one of the fastest developing delivery marketplace segments. Statistics show that they are becoming more and more popular, and it is therefore important for them to be further investigated. In the interim, China and Japan are the most important markets for e-bikes, and they're also the largest manufacturers and exporters international. Europe is emerging as an applicable marketplace, with Germany, The Netherlands, Switzerland and Denmark main the manufacturing and sales of e-bikes.

The creation of the e-motorbike could be powerful, aiming to reduce the usage of automobiles. Additionally, the e-bike resolves most of the motives human beings supply for now not cycling, physical and offers most of the same benefits as the car. In current years, e-bikes were turning into a completely famous transportation method inside the Netherlands, in particular many of the aged and commuters greater specially, the percentage of e-bikes in motorbike income has rapidly grown from 12% in 2009 to over 28% in 2015. In the interim, there are round 2 million e-bikes within the Netherlands, as compared to round 23 million normal bikes.

A recent innovation is the improvement of the solar e-bike. Solar e-bikes are electric bikes with integrated photovoltaic (PV) solar cells on their wheels or other components of the e-bikes' skeleton, that can feed their batteries when parked and during trips. Additionally, there are also solar-charged e-bikes, the batteries of which can be charged via a charging device, that's powered by means of photovoltaic (PV) solar modules. Solar-charged e-bikes are related to solar-powered charging stations to charge their batteries whilst parked. Adhisuwignjo (2017) states that the use of sun strength for e-bike charging could be decisive for the development of the forthcoming bike-sharing systems. On this appreciate, the time period 'solar-powered e-bikes' covers both forms of e-bikes, in particular the solar-charged e-bikes and e-bikes that comprise included PV cells additionally known as solar e-bikes.

In 2015, Ivan Evtimov [5] built an experimental e-bike to evaluate its performance in all respects. The test explored his three standard urban routes in the city of Ruse, Bulgaria. It was shown that the energy recovery rate varies from 6 to 14% depending on the transfer situation and road gradient. They clocked his 215km in the test with an average recovery rate of 5.5% for him. The less you brake and accelerate, the greater the regeneration. In addition, it was found that one person using this e-bike produced up to 15 times less pollutants compared to a conventional car.

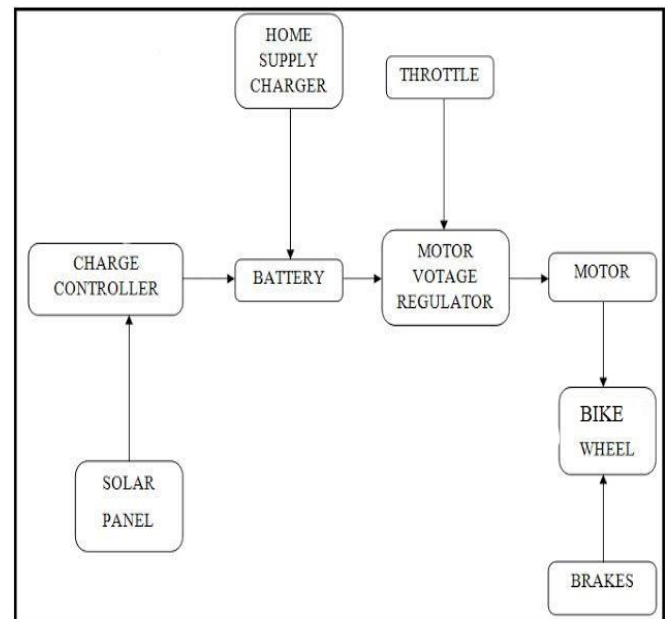
In 2016, Mohammad Reza Maghami [6] conducted an experiment to see how much power was lost due to pollution of solar panels. They found that dust reduced his PV output power from 2% to 50% in various ranges. Based on daily, monthly, seasonal and yearly basis. Therefore, they suggested cleaning the accumulated dust on PV modules daily to reduce power loss.

In 2017, S.T. Wankhede [7] wasn't experimenting with multi-charging e-bikes at all. E-bikes can be addressed by custom drives that are most efficient for their particular work cycle. It also adopts a PIC16F72 controller, which has overcurrent protection. Experiments have shown that the controller has better dynamic characteristics and works more stably. In 2017, Kunjan Shinde was working on an e-bike. This is a modification of the existing cycle, using electrical and solar energy if solar panels are provided, increasing overall energy production. As the consumption of natural resources such as gasoline and diesel increases, new modes of transport must be identified, thus giving way to alternative resources such as electric bicycles. Operating costs per km are very low and can be further reduced with the help of solar panels.

III. METHODOLOGY

The bike will be made by using a light bicycle like frame which will help us to keep the overall weight of the bike as low as possible, it will be powered by a battery pack and solar panels will be used to charge the battery.

Propulsion will be obtained by means of either a hub drive motor or a centre mounted motor that will send power to the rear wheel by means of chain drive.



In the schematic above the working of the solar power bike power distribution network is shown. Some of the key components are given below,

Frame: this is backbone of our vehicle as it supports the weight of the components and the rider itself, it's a custom-made frame built to incorporate the components like battery, motor and other electronics.

Battery: This is the power storage system. The battery will provide the power to the motor and all of the other electric components like speedometer, lights etc.

Solar Panels: These are the components that will help the battery charge when the bike is stationary (parked).

Electronics: these consist the aids like lights, speedometer, horn etc.

Charging System: this system will be taken in use while changing the bike, when there is not enough time or sunlight to charge it over the solar panels.

Safety Systems: breaks, turn indicators etc are a part of the safety system and it's our top most priority.

IV. CONCLUSION

Solar-assisted bikes are retrofits of existing bikes powered by solar energy. Suitable for both city and country roads made of cement, asphalt or mud. These bikes are inexpensive, simple in construction, and widely used for short trips, especially for school children, students, office workers, villagers, postmen, etc. Very suitable for young people, the elderly and the disabled.

Needs of the economically poor social class. It is free to operate all year round. The most important feature of this bike is that it saves millions of dollars in foreign currency by not using precious fossil fuels. Environmentally friendly and non-polluting as there are no emissions. Also, in case of

emergency or cloudy weather, it can be charged with an AC adapter and is quiet. Fewer components and easy assembly and disassembly reduces maintenance requirements. In terms of future energy systems, it is important to identify new ways of transportation and electricity generation, and solar-powered e-bike pools could just be the case.

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