SOLAR POWERED E-BIKE

Sahil Ghonge
Dept. of Automobile Engineering
Saraswati College of Engineering
Kharghar, India

Sanket Patil
Dept. of Automobile Engineering
Saraswati College of Engineering
Kharghar, India

Vivek Yakkundi
Dept. of Automobile Engineering
Saraswati College of Engineering
Kharghar, India

Darpesh Pawar
Dept. of Automobile Engineering
Saraswati College of Engineering
Kharghar, India

Pratik Ahire
Dept. of Automobile Engineering
Saraswati College of Engineering
Kharghar, India

Abstract - As we all know, fuel prices, especially gasoline, are constantly increasing every single day. Pollution caused by vehicles in cities and urban areas continues to rise. To overcome these problems, constant efforts are being made to find other alternative energy sources for vehicles and other operations. The manufactured solar powered bike is powered by a BLDC motor located in the front/rear axle housing or in middle and powered by solar energy. Solar panels mounted on the fairing will charge the battery, which in turn powers the hub motor/mid-mounted motor. When the bike is idle, the solar panel charges the battery. If there is a small amount of sunlight available, the e-bike can be charged from a mains socket. The result of this project will cause low dependence on fossil fuels. It will also use the vast amount ofsolar energy that is abundantly available on Earth's surface.

Keywords: Chassis, Motor, Controller, Battery, Throttle, Brake, Solar panel.

I. INTRODUCTION

The use of motor cars in the world is roaring. buses are contaminating the world's metropolises, releasing ever- adding quantities of carbon dioxide and other climate- changing hothouse feasts into the atmosphere, and consuming vast quantities of oil painting. The intimidating fact is that auto use is growing important faster than the mortal population, with achromatism nowhere in sight. However, there could be over 3 billion vehicles in use by 2050, which would exceed 20 buses per 100 people, If current trends continue. Indeed also, the world auto power rate would be nowhere near the current 70 buses per 100 people in the US. currently, the price of oil painting is constantly adding . People want to use electricity rather of oil painting to run transport. In China, the electric bike assiduity has grown fleetly in these 10 times. The design of e-bikes is moving towards being more environmentally friendly. Energy from the sun can be used to operate electronic bias. An electric bike was designed in this design. The accoutrements used are more environmentally friendly and the cost is much lower than the being e-bike. The maximum speed of the bike is 20 km/h. Charging time using electricity is 2- 3 hours and 4- 6 hours using solar energy. The design meets the conditions of the Chinese government. China is also our target request. We've anatomized the electric bike request to understand the requirements of its citizens. The target guests want to have an e-bike that's light in weight and doesn't need to be recharged frequently. They also take care of bike safety.

II. LITERATURE REVIEW

In 2016, [1,2]bicycle sales in Europe reached around 19 million units, although e-motorcycle sales reached 1.6 million devices in the same year, with 36% in Germany, 16% in the Netherlands, 10% in Belgium and 8% in France , subsequently with the help of various European countries with lower reserves. In 2016, 35 million e-bike gadgets were sold internationally, and in 2023, global e-bike revenue is projected to reach 40.3 million devices. Today, e-bikes are considered one of the most promising sustainable options for automotive transport and represent one of the fastest growing segments of the delivery market. Statistics show that they are becoming more and more popular, so it is important that they are further investigated.

Meanwhile, China and Japan are the most important markets for e-bikes and are also the 19 largest international manufacturers and exporters. Europe is emerging as a viable market, with Germany, the Netherlands, Switzerland and Denmark dominating the production and sales of e-bikes.

The new invention is the enhancement of the solar e-bike [2,3]. Solar e-bikes are e-bikes with integrated photovoltaic(PV) solar cells on the bus or other corridor of thee-bike frame that can charge their batteries while situated and on the go. In addition, there are also solar powered e-bikes whose batteries can be charged through a charging device that's powered by photovoltaic(PV) solar modules. Solar-charged e-bikes are connected to solar charging stations that charge the batteries when they're situated. Adhisuwignjo [5](2017) states that employing solar power to charge e-bikes could be critical to the development of forthcoming bike-participating systems. In this regard, the time period" solar- powered e-bikes" includes both forms of e-bikes, particularly solar- charged e-bikes and e-bikes that contain photovoltaic cells, which are also known as solar e-bikes.

In 2015, Ivan Evtimov [6] 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 [7] 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 [8] 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[9] 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

1. CHASSIS:

A chassis is the core structural element of the vehicle which holds the weight of all the components and the rider. A medium sized bicycle chassis is used for this E-bike**.** The frame has a carrier at rear which is used to fix the solar panel and the batteries on. The frame also provides a mounting place for the motor. All the electronic components such as the controller and the connections are encased in a plastic box/container to protect the electronic components from external elements.

Fig.1. Chassis

2.Motor:

A motor is an electrical machine that converts electrical energy into mechanical energy. Most motor operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. The motor used here is a 12V, 150W DC motor which provides a torque of 0.45nm. The motor is connected to a brush controller which is then connected to the battery. The Motor has a sprocket on which the bicycle chain is fitted which is then connected to the rear wheel sprocket this whole configuration is the powertrain of the E-bike.

Fig.2. DC Electric Motor

3. Controller:

The controller operates the flow for electric current. They are devices used in conjunction and switchboards. The controller is the most essential part of the power management system. The controller has connection points for various components such as motor, battery, indicator, battery charging, stop lights, brakes, power lock/switch, and most importantly the throttle.

Fig.3. controller

4. Battery

A battery is a device that stores chemical energy and converts it into electrical energy. Batteries use a chemical reaction to do work on charge and produce a voltage between their output terminals. Two batteries of 12V each are connected in a series configuration to provide the combined output of 24V, this 24V output is required for the controller to work as the controller is of 24V. And both of the batteries are secured on the rear rack or carrier of the bike frame, which are covered by the solar panel.

Fig.4. Battery

5. Throttle:

The throttle provides and controls the power provided to the motor which propels the bike forward. A connection for throttle is given on the controller through which the throttle is connected and fitted near the handle bar. The throttle is used

to control the rpm of the motor which interns controls the speed of the vehicle.

Fig.5. Throttle

6. Brakes:

Brakes are just like normal bicycle brakes except they have a switch inside them which cuts off the power from the motor when brakes are applied. Brakes also have capability to trigger the indicator lights.

Fig.6. Brake

7. Solar Panel:

Solar panels are used to convert the solar energy into electrical energy. The photovoltaic cell are used for the conversion of energy. The solar panel is a 10W one having surface area of 896sq cm. Which is fitted on the carrier of the Bike on a frame which is custom made and welded to the carrier.

Fig.7. Solar Panel

IV. RESULT AND DISCUSSION

The assembly of all all the electronic components and mechanical component was successful. The E-bike was able to charge and run on Solar energy. The output of the solar panel used could be better to charge the battery more rapidly and efficiently and also lithium ion batteries would be a better option in this application instead of the lead acid batteries used in this case. Various Gear Ratios can be obtained by changing the sprockets on the motor and wheel hub. We can also use a bigger frame to incorporate a bigger battery, motor, and solar panel. Higher wattage wall charger can also be used in future implementations to increase the speed of battery charging through wall electricity. Special charging hubs that will charge the vehicle via plug-in mode which run on solar energy can be build to encourage greener energy in form of solar energy. Through out the process there were a few engineering challenges like unavailability of proper components and lack of infrastructure required to fabricate the vehicle. The budget of the vehicle was also a integral part of how far can we take this project in terms of capacity and technology used. For sure this vehicle can be built even better with higher budget allowance.

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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.

FUTURE ASPECTS

The Sun emits enough power onto Earth each second to satisfy the entire human energy demand for over two hours. Given that it isreadily available and renewable, solar power is an attractive source of energy. However, as of 2018, less than two percent of the world's energy came from solar. Historically, solar energy harvesting has been expensive and relatively inefficient. Even this meager solar usage, though, is an improvement over the previous two decades, as the amount of power collected from solar energy worldwide increased over 300- fold from 2000 to 2019. New technological advances over the last twenty years have driven this increased reliance on solar by decreasing costs, and new technological developments promise to augment this solar usage by further decreasing costs and increasing solar panel efficiency.

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