International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-7 Issue-4s, November 2018

Design and Fabrication of a Solar Car

Sasikumar C, Aswath C, Surendrakumar K, Suryaprakash A

Abstract: ***The primary goal of this venture was to structure and create the Electric Solar Vehicle which is intended for single-seated vehicle fuelled by 2 kW BLDC centre engine (motor). Electric sun oriented vehicle is fabricated to improve a safe and Eco-friendly transportation. In the current scenario, due to increase in population and usage of vehicles, the consumption of fossil fuels like petrol and diesel are keep on increasing. Due to this, the availability of fossil fuel will reduce in turn to increase in demand and cost and it will be exhausted in future. Because of this, it is necessary to find the alternate fuel to operate the vehicles. In the non renewable energy sources, Solar energy is one which is freely available. Daylight is viewed as a wellspring of vitality which can be utilized for many applications. Sun based vitality is being utilized to create power through daylight. The fundamental segment to fabricate a sunlight based vehicle with a sun based board solar panel and a battery to store the electrical vitality. The sun based cells gather a bit of the sun's vitality and store it into the batteries of the solar based vehicle. After the vitality is stored in the batteries, it is accessible for use and the engine and controller is made to drive the vehicle. There are two arrangements of batteries; one of which will get the electrical vitality from the solar board to drive the engine and another will be utilized as helper control source which will give expected capacity to other electrical gadgets being utilized in the vehicle. After that the engine controller changes the measure of vitality that streams to the engine to compare to the throttle. The engine utilizes that vitality to drive the wheels.***

Keywords: ***BLDC Motor and controller, Batteries, Solar panel, Seamless pipes, Steering set, Tyres and brake set.***

I. INTRODUCTION

The idea of fabricating sunlight based vehicle is from Imperial Society of Innovative Engineers (ISIE) which arranges the electric sun based vehicle title ESVC which is an Asia's biggest sun oriented vehicle title. According to this, a solitary situated sun based vehicle is designed and fabricated with a BLDC motor, power source (battery) and additionally sun based board. The reason for this venture is Eco-accommodating and safe to ride. A sunlight based vehicle is essentially controlled by direct sun oriented vitality. 48 V 100 amps Li-ion battery is used to run the 48 V 2000 W BLDC motor which transmits power to drive the vehicle. . The vehicle is fabricated for hustling on the dashing track, so least load of the vehicle gives most extreme effectiveness. Seamless Pipes (AISI 106-B Grade) is used in the vehicle. The structure of the vehicle is displayed with the end goal since vehicle is fit for the track and to take corners in the most effortless way.

Manuscript published on 30 November 2018.
***Correspondence Author(s)
Sasikumar C, Department of Mechanical Engineering, Bannari Amman Institute of Technology, Sathyamangalam – 638 401.
Aswath C currently pursuing BE in Mechanical Engineering at Bannari Amman Institute of Technology, Sathyamangalam – 638 401
Surendrakumar K currently pursuing BE in Mechanical Engineering at Bannari Amman Institute of Technology, Sathyamangalam – 638 401.
Suryaprakash A currently pursuing BE in Mechanical Engineering at Bannari Amman Institute of Technology, Sathyamangalam – 638 401.

II. LITERATURE REVIEW

Imperial Society of Innovative Engineers [1] are well known Society of India for organizing Motorsports events, live projects based industrial training and research and publication. ISIE – India provides a platform to the students and professionals for the development and enhancement of their technical as well as managerial skills. A platform especially for engineering students is developed where they can easily face real-time engineering problems and find the best solution, especially in the sector of Electric and Hybrid.

Sharma et al. discussed that the future of vehicles seems to be with the combination of various energy sources. This sort of growth in vehicles to look for the benefits from the best quality of each energy source and it is particularly useful in urban driving vehicles. Cities of India one of the major medium of transportation like buses, lorries and auto rickshaws, which produce a huge amount of air contamination as well as greenhouse gases like CO_2. At present, transportation charges increases due to the usage of costly non-renewable fuel [2].

Singhalet al. discussed thatthe renewable energy is essential for today's world as the non-renewable sources that are going to get exhausted shattered in near future [3]. The solar vehicle is one of the replacement of the non-renewable sources of energy. The basic principle of Electric Solar Vehicle (ESV) is to use energy that is accumulated in a battery during and after charging it from a solar panel. The batteries are in charged conditions are used to drive the motor which serves here as an engine and runs the vehicle in reverse or forward direction.

Wamborikar et al. detailed that energy from the sources for generating electricity, running automobile vehicles etc. But the main drawbacks of these fossil fuels are that they are not environmental friendly and they are exhaustible [4]. To deal with these problems of fossil fuels, it is necessary to look at the non-conventional sources of energy. Because of this, an Electrical motor vehicle that runs on solar energy is designed. Vishal improved that the solar car is to create an eco-friendly vehicle with the help of solar energy [5]. Initially solar panels are used as a source of power to charge the batteries in addition to that self power generation system and thermo-electrical power generation system are also used as an alternate source to charge the batteries. These systems help to run the vehicle during the absence of solar power.

III. COMPONENTS USED IN SOLAR CAR

A. Wheels & Tyres:

There are different types of tires accessible in the market and the determination is made based on the traction of the tires.

Minimized structure of the tire is likewise considered while doing the choice. Slicks give better grip than a treaded tire. Activa Aviator tires are chosen since they have increasingly more surface region and better footing. Wheel specifications: Wheel diameter and tread width are 12 inch and 4 inch respectively.

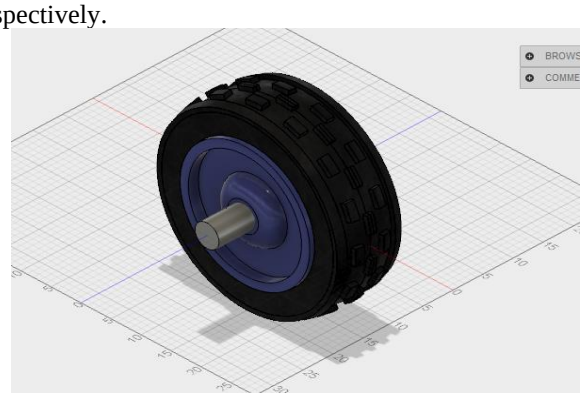

Figure 1 Designed Tyre using software

B. Brake:

Brakeis the most essential element in any vehicles. It makes use of to stop the vehicle and to control the movement of the vehicle. Mostly, either disc brakes or drum brakes are used. A brake disc normally made of cast iron or ceramic is associated with the wheel or the axle. To stop the wheel, friction material used as brake pad is constrained mechanically, hydraulically against the two sides of the disc. Friction makes the disc slow or stops the wheel.

After a long overview in market and concentrating different parameters, a disc brake from Activa aviator is placed over drum for its better cooling efficiency because of uncovered contact surface, simple assembly, uniform wear in disc, better anti fading character, less weight and occupies less space. The dimensions of the disc are 200 mm external diameter and 10 mm thickness. There are two kinds of calliper accessible. One is a fixed type and the other is a float type. Fixed type of calliper is utilized in the disc in both back and front wheels to stop the vehicle. Fixed calliper has a good performance but it is costlier than the floating type calliper. The calliper has a piston diameter of 30 mm. Activa Aviator calliper and DOT 3 brake oil are used in the vehicle. Its cost is less and has a great performance.

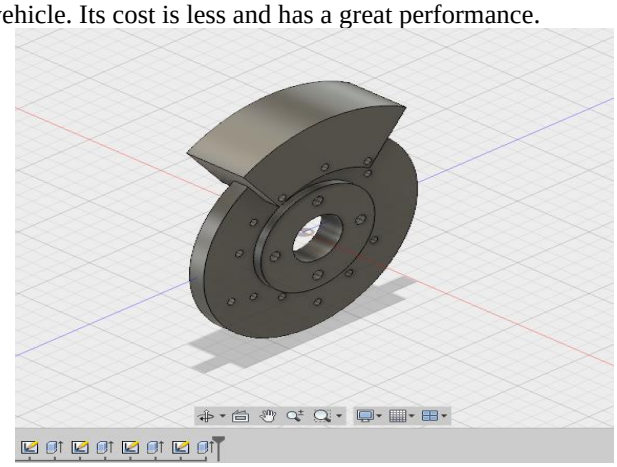

Figure 2 Brake disc and caliper

C. Suspension (Double Wishbone type):

Mounting In vehicles, a independent type double wishbone (upper and lower A-arm) suspension is used. It has two wishbone shaped arms to locate the wheel. Every wishbone or arm has two mounting joints, one is mount with the chassis and the other is mount with the knuckle joint. The shock-absorber and coil spring mount to the wishbones to control vertical up and down movements.

Figure 3: Suspension

D. Steering System:

Steering is the component used to turn the vehicle while cornering. The fundamental aim of steering is to guarantee that the wheels are pointing in the ideal directions. This is normally accomplished by a progression of linkages, tie-rods, pivots and gears. The control of vehicle is done by the steering system. It gives directional changes to the moving vehicle. To fulfil this condition, the inner wheel must turn through a more prominent angle than the outer one; if not tire wear is greatly increased. While taking a turn, each wheel must move on an arc and these arcs ought to have a common centre.

In the steering system, the rack and pinion mechanism is used. For perfect steering, all the four wheels revolve around an instantaneous centre. For this reason inner wheel needs to turn more than the outer wheel. To accomplish this condition, Ackermann steering mechanism is utilized. It comprises of a four bar chain having turning pairs. The stub axles are connected together by two short track arms and a tie rod. In this solar based vehicle, four bar linkage mechanism is used. Purpose for this is to take sharp turns on the track rapidly. So by using this system driver has the straight forward to control wheels on time. Steering ratio of 9:1 is used which implies on pivoting steer wheel at 9° which turns the wheels by 1°.

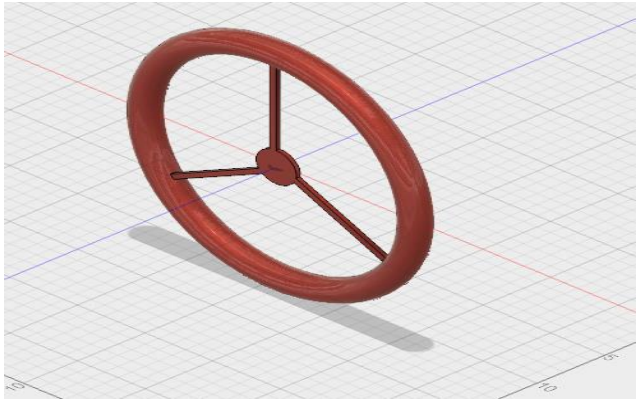

Figure 4 Steering wheel

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

E. Transmission (Drive chain)

The power train is used to transmit the power of the engine to the wheels and tyres. At the point when a vehicle keeps running on a track, it encounters an obstruction drive from outside the vehicle. It is known as a running resistance of the vehicle on a track. On the off chance, a driver needs to keep its speed consistent and needs equivalent capacity of power. Running resistance yet needs more power for increasing speed resistance. All endeavours are made to make the power transmission as an effective and reliable as could be expected under the circumstances.

IV. METHODOLOGY

At the point when the electrically operated throttle pedal is throttled, the controller controls and transmits required current and voltage to the engine. The required measure of current is from batteries which are charged from sunlight by solar panels. The solar panels get sun's radiation and charges the batteries. The solar panel comprises of photovoltaic cells which observes heat from daylight i.e. sunlight and changes over it as current. The engine shaft rotates and make the drive shaft rotates. The drive shaft rotates the wheel and vehicle moves. There is no emission and it is an Eco-friendly vehicle.

When the vehicle is needed to stop, brake pedal is pressed which is associated as an arrangement with master cylinder and thus related with the calliper to stop the vehicle. The calliper impels the brake pad and it will stop the disc to rotate which is connected with the wheels of the vehicle. Forward and reverse switch is utilized to run the vehicle in forward and reverse movement. The kill switches are making use of to stop the vehicle ordinarily or if there should be arise and an occurrence of any crisis. It stops the general supply of current to the engine.

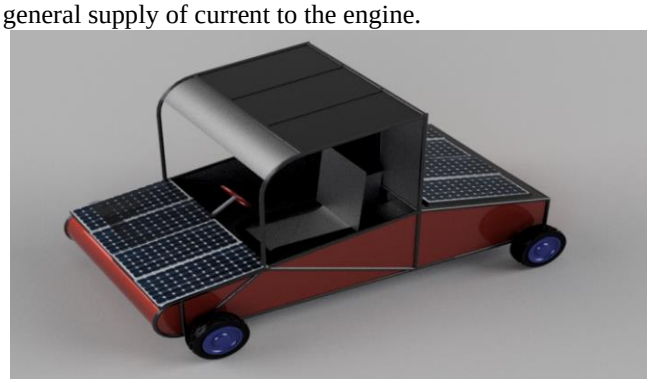

Figure 5 3-D Diagram of Solar car

Figure 6 Solar car

V. CONCLUSION

a. Solar vehicle is made with a single seat to run in the race track.
b. The vehicle efficiency is high as the weight of the vehicle is very less.
c. Solar vehicle can be available at low running and maintenance cost and it requires only more initial cost.
d. High safety measures are considered while fabricating.
e. Solar vehicles are used to make pollution free environment.

REFERENCE

1. Asia's biggest solar vehicle championship organised by Imperial Society of Innovative Engineers (ISIE) releases 5th Electric Solar Vehicle Championship (ESVC) 2017-2018 Rulebook and we referred the rules and regulations to fabricate our vehicle.
2. Sharma P, Vashistha S, Pal S, Parihar R S, Singh S, Garg S and Vishnoi A, ���Solar Powered Vehicle", Imperial International Journal of Eco-friendly Technologies, Vol. 1, issue-1 (2016), pp.209-212.
3. Singhal A, Shukla L, Gupta A, Iqbal M, Singh D and Gupta M K, "Solar Electric Powered Hybrid Vehicle", Journal of Electronic Design Technology, ISSN: 2229-6980 (online), , Vol. 6, Issue 3.
4. Wamborikar Y S, Sinha A, "Solar Powered Vehicle", Proceedings of the World Congress on Engineering and Computer Science, San Francisco, USA, Vol. II, WCECS 2010.
5. Vishal S, "Design analysis and manufacturing of new technology Solar Car", International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395-0056, Vol. 4, Issue 8, 2017.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)