

# Design and Development of Chassis, Braking And Steering System of Pedal Assisted Electric Car

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**Abstract-** During the revolution for the eco-friendly technologies bicycles were the most depended modes of transportation, along with this the consideration of the increase in fuel price and the environmental factors. We must admit that it is far better to use a bicycle over a motor vehicle for short distance travelling. Imagine how useful would the bicycle be if even the small effort applied by man for climbing slopes and riding on rough terrain is reduced in it. "The e-Bike". Our idea of implementation of the project was mainly based towards providing a tribute to the "GREEN ENERGY".

**Keywords-** Pod Car, Real change, e-Bike, eco-friendly technologies, Green Energy.

## I. INTRODUCTION

Pod Car is meant to be a practical every day vehicle. It has approximately the same seating position and seat height as a small car, allowing easy access and good visibility in traffic. It has four wheels to be narrow enough for bicycle paths but still be stable in the curves. It has a full water proof body to keep you warm and dry in any weather, heated. The specifications for Pod car are in a state of flux. This is because as we re-design Pod Car to optimize for manufacture, we are taking all that we learned in building the prototype, and making it better. We are also adding improvements as suggested by our supporters, such as adding the capacity to carry a child passenger by increasing the size of the cargo area our project has four sprockets, two are connected at pedal section, one at rear wheel and one at motor respectively. One with rear wheel and another one with motor.

When we pedal the cycle we feel comfort only in straight path in case if we pedal in slope or hill areas we may feel difficult to pedal for this purpose only we have found this. Being green has never been easier. By choosing Pod ride, you take positive action to reduce your carbon footprint and make the world a better place. The unit developed by us is combination of the standard geared bicycle with an electric power motor that would assist the rider throughout his journey.

## II. REVIEW OF LITRATURE

### 1. Chassis:

Chassis should withstand the shock, twist, vibration and other stresses caused due to sudden breaking, shocking road condition.

Chassis should be light weight and it can sustain the weight of driver, cornering force like other cars chassis. Tubular chassis is upgrade from ladder chassis because tubular is stronger than ladder.

### 2. Braking System:

- Breaking System is the guarantee of safety of the car. It should be absolutely reliable.
- For real braking condition within achievable range hydraulic braking system is used.

### 3. Steering System:

There are 3 types of steering systems. They are front wheel drive, rear wheel drive, and all wheel drive.

It is difficult to get a decent handling out of the Four Wheel steering.

Rack and pinion is most common steering system used in recent cars. The basic function of a human powered series hybrid (SH) drive is the same as that of today's electric bicycle drives, which are parallel hybrids (PH). A SH drive is more versatile for the same cost. There are no mechanical transmission elements so that maintenance is simplified. The paper reviews the technology in brief and this technology is being utilized by our project group which is intended to make a series hybrid vehicle as a final year project.

## III. OBJECTIVE

- To reduce fuel consumption which pollutes the nature day by day the pedal assisted electric car helps to do that.
- Pod car has recreated the bicycle to meet today's urban mobility needs and enabling wider adoption.

- By implementing this car we fix the root of green energy.

#### IV. METHODOLOGY

- Selection of material
- Design of Chassis

- Selection of motor
- Selection of Battery

- Selection of wheels and driving system
- Assembly of work and Testing

##### 1. Pod Car:

Pod Car is meant to be a practical every day vehicle. It has approximately the same seating position and seat height as a small car, allowing easy access and good visibility in traffic. It has four wheels to be narrow enough for bicycle paths but still be stable in the curves. It has a full waterproof body to keep you warm and dry in any weather, heated windshield, and soft seat with back support, air suspension and studded tires in winter.

A small trunk for your shopping bags and a tow bar for a bike trailer when you want to bring your kids. The electric motor and control system are from a standard e-bike system and should make it a street legal bike in many countries. And may then be operated on bicycle paths and without a driver's license. The specifications for Pod car are in a state of flux. This is because as we re-design Pod car to optimize for manufacture, we are taking all that we learned in building the prototype, and making it better. We are also adding improvements as suggested by our supporters, such as adding the capacity to carry a child passenger by increasing the size of the cargo area.

Our project has four sprockets; two are connected at pedal section, one at rear wheel and one at motor respectively. One with rear wheel and another one with motor. When we pedal the cycle we feel comfort only in straight path in case

If we pedal in slope or hill areas we may feel difficult to pedal for this purpose only we have found this. While you are pedaling the cycle, if you feel trouble you need not to do anything because gyroscope sensor will sense the angular position of bicycle and sends the output to the circuit. From there circuit differs the voltage level which passes through the motor through this it may vary the speed it.

Proudly sitting as the fastest growing category in the cycling industry globally, the rise in popularity of electric assisted bicycles, or e-cars, is impossible to ignore. This is largely thanks to the many ways in which e-cars can be of benefit for everyone from non-riders to engrained cycling enthusiasts. Simply put, an e-bike widens the possibilities of cycling being viewed as a viable transportation option as well as a sustainable leisure activity.

An e-car is a bicycle with an integrated electric motor offering some form of assistance to a rider in propelling the bike forwards. This assistance can come in many forms including hub assist; however, pedal assistance is by far the most popular option.

#### V. DESIGN OF CHASIS

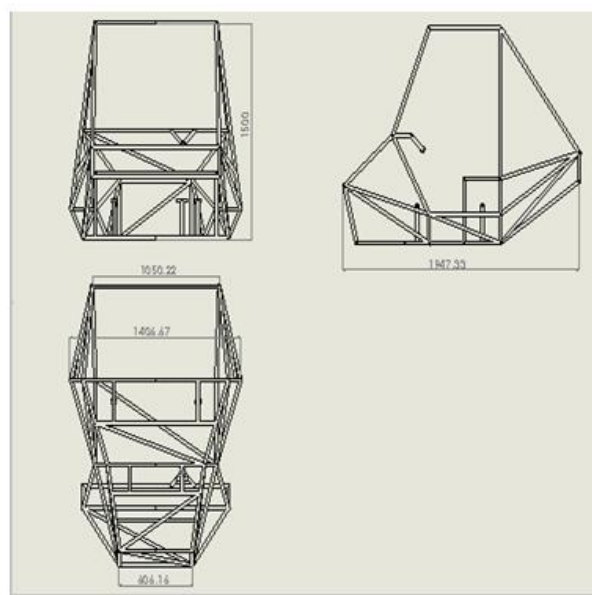


Fig 1. Drafting and Drawing.



Fig 2. Design of frame.

### 1. Design of Steering:

The perfect steering is achieved when all the four wheels are rolling perfectly under all conditions of running. While taking turns the condition of perfect rolling is satisfied if the axes of the front wheels when produced meet the rear wheel axis at one point.

This point is the instantaneous center of the vehicle. For this purpose, inner wheel has to turn more than the outer wheel. To achieve this condition, two types of mechanisms have been devised.

### 2. Ackerman Steering Geometry:

Ackerman steering geometry is a geometric arrangement of linkages in the steering of a car or other vehicle designed so solve the problem of wheels on the inside and outside of a turn needing to trace out circles of different radii.

### 3. Rack and Pinion Steering Gear:

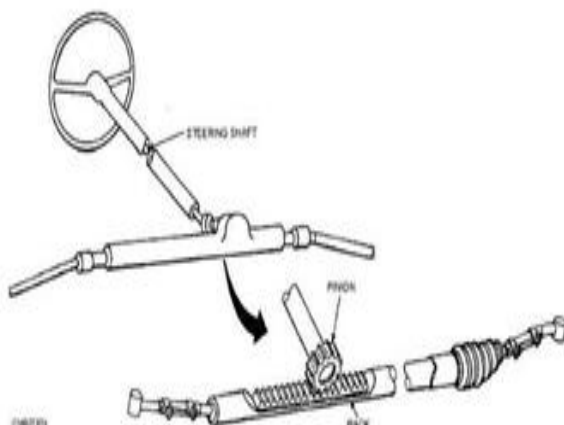


Fig 3. Rack and pinion steering gear.

## VI. STEERING GEOMETRY

### 1. Inner Wheel Angle ( $\theta$ ) $43^\circ$ .

The range of inner wheel angle for ATVs are generally use between  $35$  to  $45^\circ$

### 2. Outer Wheel Angle ( $\phi$ ) $33.35^\circ$ :

$$\phi = 33.35^\circ \dots \dots \text{Outer wheel angle}$$

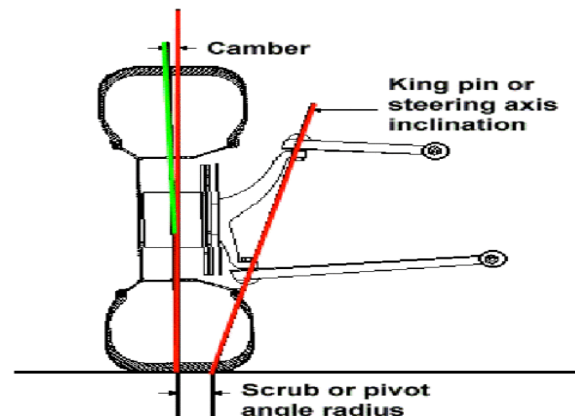
### 3. Turning Radius-

The turning radius for this machine was to be kept below 3m.

### 4. Castor = $-3^\circ$

Requirement of the vehicle for running it in the onion field castor of  $-3^\circ$  was decided to be implemented to attain the straight motion of the vehicle while plucking the onions.

### 5. Camber = $5^\circ$



### 6. King Pin Inclination = $8^\circ$

The purpose of the KPI is to produce vertical displacement of the vehicle in during steering in an upward direction.

### 7. Ackerman Percentage-

Ackerman percentage decides how much your inner tire turns compared to outer tire. 100 % Ackerman condition is when the turning circles of both inner and outer tire are concentric while 0 % means both

## VII. ANALYSIS OF DESIGN

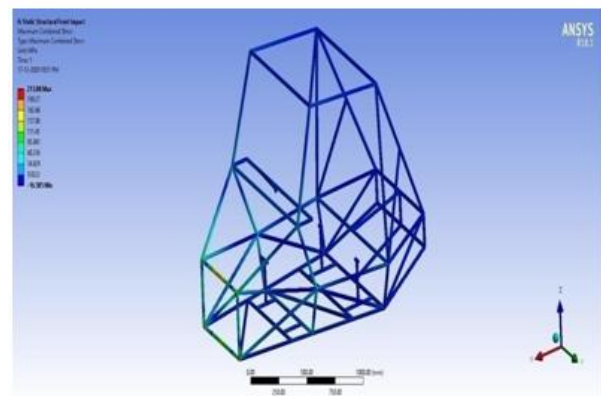


Fig 4. Front impact total deformation in Ansys.

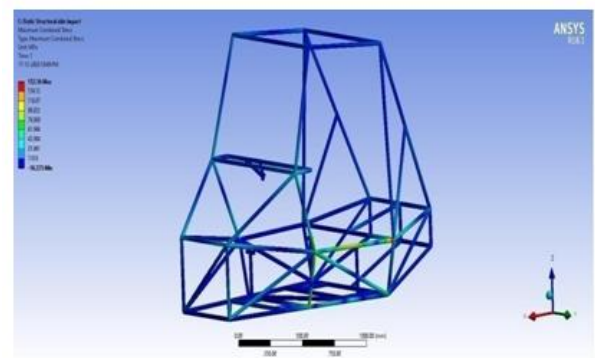


Fig 5. Side impact total deformation in Ansys.

## VIII. ACTUAL DESIGN OF BODY

## REFERENCES

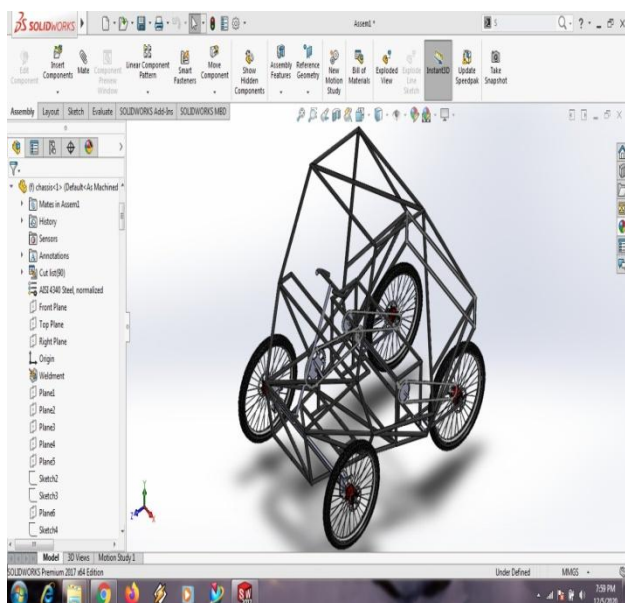


Fig 6. Position of Shaft.

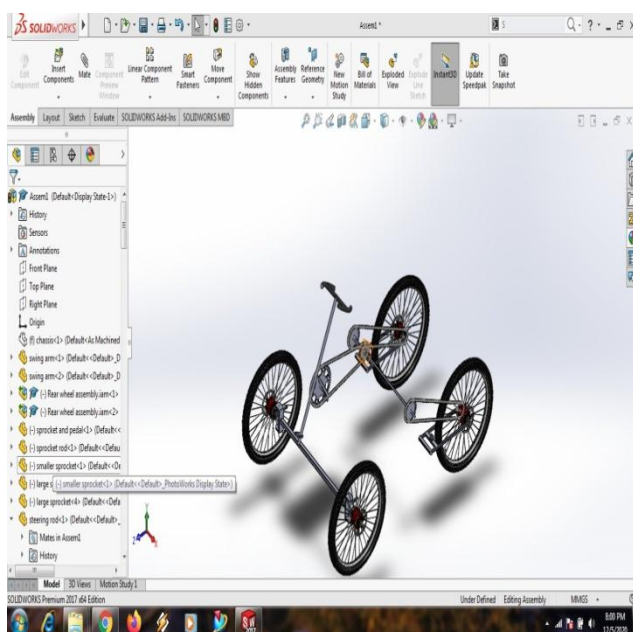


Fig 7. 3D Design.

## IX. FUTURE SCOPE

As we are going to take step towards green world, the use of solar pannels is the key element to produce energy which requires driving a car.

We can add more powerful motars which runs on electric supply with less power and high speed. This is two seater vehicles by now we can manufacture with more capacity of passanger so we can enjoy with our family while driving.

- [1] Mr. Anand Rachappa Ashtagi Department of Mechanical Engineering, Solapur University / VVPIET, Solapur, India -1 Nov 2014.
- [2] Vijayan, S. N., Sendhilkumar, S and Kiran Babu, K.M International Journal of Current Research Vol. 7, Issue, 05, pp.15697-15701, May, 2015.
- [3] How to improve the performance of traffic brake [J]. Test Weekly. 2011 (17).
- [4] Dr. Vijay kumar, Abhishek Yadav, Gaurav Arya, Md. Moshin. PARIPEX - INDIAN JOURNAL OF RESEARCH VOLUME-6 | ISSUE-7 | JULY-2017 | ISSN - 2250-1991 | IF: 5.761 | IC Value: 79.96.
- [5] Milan Bukvić, Živojin Petrović, Blaža Stojanović, Saša Milojević Article • July 2017.
- [6] [W. Reinelt, W. Klier, C. Lundquist, G. Reimann, W. Schuster] file:///C:/Users/Vikramsinh%20Patil/D own loads/Steering%20system%203-main.pdf.
- [7] Mingfei Gaoa, Jibin Hua, Zengxiong Peng file:///C:/Users/Vikramsinh%20Patil/Downloads/Study\_on \_Optimization\_for\_Transmission.
- [8] Muhammad Khristamtoa,\*, Achmad Praptijantoa , Sunarto Kalega file:///C:/Users/Vikramsinh%20Patil/ Downloads/Steering%20system-main%20(1).pdf
- [9] Bibliography: <https://www.mypodride.com/>
- [10] <https://www.indiegogo.com/projects/podride-a-practical-and-fun-bicycle-car#/>
- [11] [https://en.wikipedia.org/wiki/Electric\\_bicycle](https://en.wikipedia.org/wiki/Electric_bicycle)
- [12] <https://www.gazellebikes.com/en-us/pedal-assist-electric-bikes>