

## Chain Drive Electric Bike

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**Abstract** -India is the second largest producer and manufacturer of two-wheelers in the world. It stands next to Japan and China in terms of the number of two-wheelers produced and domestic sales. The face of auto industry that was redefined with the invention of fuel-efficient technology is all set to see dawn of a new era in two-wheeler industry. It's not petrol or diesel or any other fuel, but it is electricity that has initiated a revolution in two-wheeler industry in India. So the electrically charged bikes or scooters have very bright future in area of personal transportation. This Paper studies about design and development and the comparison of different part of components. Also, electric two-wheeler components like Battery, Charger, BLDC motor, Controller, Dc-Dc Converter explain in this paper. The aim of this paper is to provide an optimal design of in-wheel motor for an electric scooter (E-scooter) considering economical production.

### 1.INTRODUCTION

Energy crisis is one of the major concerns in today's world due to fast depleting resources of petrol, diesel and natural gas. In combination with this, environmental decay is an additional factor which is contributing to the depletion of resources which is an alarming notification. Our paper proposes the solution for this above previous problems. The system which we innovated is the Electric Bike. This project has various benefits both to the members of the team and also external benefits thereby making awareness of using alternative modes of transport. The Electric Bike which works on the battery that is powered by the motor is the general mode of transport for a local trip. The solar panels can be alternative source for this by adding it to the system. The

Electric bike which will be running on battery, the power is supplied by the motor, thereby supplying this power to drive the other gear components. The main purpose of using this E-bike is that it is user friendly, economical and relatively cheap.

### 1.1 objectives

Electric bikes provide you with greater freedom in terms of mobility and riding experience. You can ride longer, faster, and further with the battery and charging infrastructure. The best part about riding battery bikes is that you can easily cut the traffic and highly congested roads usually found in the country.

### 1.2 Design Consideration

The force which develops across a specific cross section of the shaft, it generates stress at that point of cross section that are subjected to maximum loading. This internal or resisting moment gives rise to the stress called as bending stresses. Torsion: When the shaft which is twisted by the couple such that the axis of that shaft and the axis of the couple harmonize, that shaft is subjected to pure torsion and the stresses generated at the point of cross section is torsion or shear stresses. Combined Bending and Torsion: In actual practice the shaft is subjected to combination of the above two types of stresses i.e. bending and torsion. The bending stresses may occur due any one of the following reasons

- 1.Weight of belt
- 2.Pull of belts
- 3.Eccentric Mounting of shafts/gears
- 4.Misalignment of shafts/gears

On contrary, the torsional movement occurs due to direct or indirect twisting of the shaft Hence at any given point on cross-section of the shaft, the shaft is

subjected to both bending and torsional stresses simultaneously. stresses are taken in consideration while designing the shaft: In this model, In this section we will be describing the construction processes that led to the final prototype, presenting the main difficulties that we've come across, the alterations or adaptations that we had to make to the components and the processes used to do it.

Despite all its components are represented in the 3D model, only the frame was modelled in the CATIA V5 program and intended to be built. This frame was thought and projected with the intention of fulfilling our project requirements and as said before, to create a viable and better solution as a mean of transportation in metropolis environments, mostly directed to the "last mile" concept. Since the frame was the only part designed to be built and conceived from scratch, it was engineered taking in account the standard measures and usual components in bicycles. Thereby making easy to find and adapt the remaining components to the frame, components as the wheels, seat and seat post, headset, fork, stem and braking.

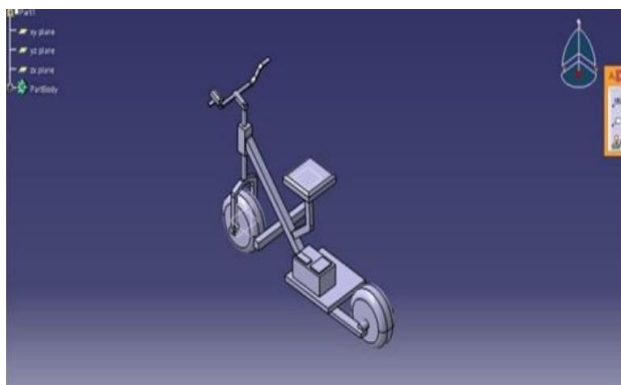
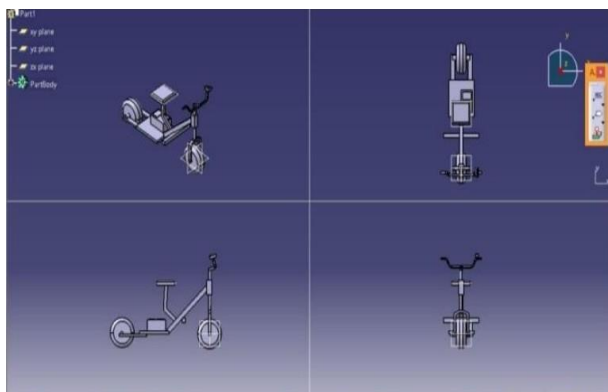


Figure 1: Design of Chain Drive Electric Bike

## Major difficulties

Along the building and mounting process, we came along with some difficulties. These biggest problems were due to the frame, as it is an old frame, some of

its dimensions aren't standard, requiring adaptations to make the components compatible. One big problem was to find components that could be fitted to the bicycle dimensions and fixation points. Components as the brake calipers were hard to find, the original bicycle and frame mountings were designed to use a braking system that nowadays had lost its use, a system in format of a horseshoe. Still, after vast research along several dealerships we manage to find the same calliper model that the frame was prepared and that was used by factory default. The handlebar was also hard to acquire, as there are few old bicycles with foldable and viable handlebars. Since we pretended to do some kind of restoration, keeping the bicycle classical look, we tried to use components alike, this made the components selection and acquisition slightly harder, but we've surpassed the problem. The internal gear system used, in the rear hub, requires a special washer that locks the hub axle and prevents it from spin. This washer connects the rear hub axle to there and dropout, the axle has two parallel faces that fit perfectly inside the washer and prevent it from spinning. The outer side of the washer also has to have two grooves, these fit in the rear dropout. These washers are crucial components as without them the gear system wouldn't work. The washers that came in the bicycle (manufacturers original) were very worn out and deformed and weren't able to perform its function, therefore had to be replace. Even with a vast search we weren't able to find these components as the manufacturing of this part has stopped long ago, since it a part that suffers a lot of wear, we also weren't able to acquire it from any used bicycles. Thus, we had to build two of these

washers, in order to the gear system to work properly. In the end, all the difficulties related to the building process and component adaptations were surpassed.

## Main Body

Main body consists of a front structure, mechanism, electric motor and battery.

### 2.1 Components

The front structure of a quad bike is a three dimensional truss with each of its member having support loads. The frame is to be welded into the bike chassis to form a rigid structure. The designing should start from the two dimensional frame at the bottom.

#### Dc motor:

The motor is having 250 watt. Capacity with maximum 2100 rpm. Its specifications are as follows:

Current Rating: 7.5amp

Voltage Rating: 48 Volts

Cooling: Air — cooled.



Figure 2: Motor

#### Frame:

The Frame is made up of M.S. along with some additional light weight components. The frame is designed to sustain the weight of the person driving the unit, the weight of load to be conveyed and also to hold the accessories like motor. Also it should be design to bear and overcome the stresses which may arise able to due to

different driving and braking torques and impact loading across the obstacles. It is drilled and tapped enough to hold the support plates.

#### Platform:

The Platform is designed with robust base so that it can hold the load along with the weight of the driving person uniformly. It is fabricated from Mild Steel at a specific angle in cross section and welded with a sheet of metal of specific thickness. The platform's alignment is kept horizontal irrespective whether it is loaded or unloaded and this is directly bolted and welded to the frame

#### Battery:

The battery also acts as a condenser in a way that it stores the electric energy produced by the generator due to electrochemical transformation and supply it on demand. Battery is also known as an accumulator of electric charge. This happens usually while starting the system.



Figure 3: Lead acid Battery

#### ChainDrive:

A Chain is an array of links held together with each other with the help of steel pins. This type of arrangement makes a chain more enduring, long lasting and better way of transmitting rotary motion from one gear to another.



Figure 4: Chain Drive

The major advantage of chain drive over traditional gear is that, of inlet gases (by the use of a throttle), but usually the chain drive can transmit rotary motion with the help of two decreased. The term throttle has come to refer, gears and a chain over a distance whereas in traditional many informally, to any mechanism by which the power or gears must be arrange in order to transmit motion.

### Controller:

Motor controllers may use electromechanical switching, or may use power electronics devices to regulate the speed and direction of a motor. Motor controllers are used with both direct current and alternating current motors. A controller includes means to connect the motor to the electrical power supply, and may also include overload protection for the motor, and over-current protection for the motor and wiring. A motor controller may also supervise the motor's field circuit, or detect conditions such as low supply voltage, incorrect polarity or incorrect phase sequence, or high motor temperature. Some motor controllers limit the inrush starting current, allowing the motor to accelerate itself and connected mechanical load more slowly than a direct connection.



Figure 5: Controller

### Throttle:

A throttle is the mechanism by which fluid flow is managed by constriction or obstruction. An engine's power can be increased or decreased by the restriction

### Braking System

For the braking system it is convenient to use braking system used in band brake system which consist of spring loaded friction- shoe mechanism, which is driven with the help of handlever.

### Sprockets:

The chain with engaging with the sprocket converts rotational power in to rotary power and vice versa. The sprocket which looks like a gear may differ in three aspects:



Figure 6: Sprockets

### Function:

The electric bike speed controller sends signals to the bike's motor in many voltages. These signals detect the direction of a rotor relative to the starter coil. The suitable function of a speed control depends on the employment of various mechanisms. In a purpose-built electric bike, Hall Effect sensor help detects the location of the rotor.

### Working

The switch is switched ON and the battery connected to the motor supplies energy to the motor. The motor starts and the cycle start moving the shaft through the housing and make the sprockets at the other end move and thus the rear wheel. When the motor is switched ON, the motor draws current from the batteries connected in series that would give an effective discharge of 12V. The motor uses

maximum current during starting and later on the current drawn reduces to 12Ah. The generator is mounted on side shaft of the bicycle, supports in such a manner that dynamo shaft is touching the back wheel tyre. The battery pack 1 supplies energy to the motor and when the battery is fully discharged the 2 way switch is turned ON the other battery pack. Then the generator wires are connected to the discharged battery. As the battery runs the rotation of the shaft produces an alternating voltage and to be passed through the bridge rectifier

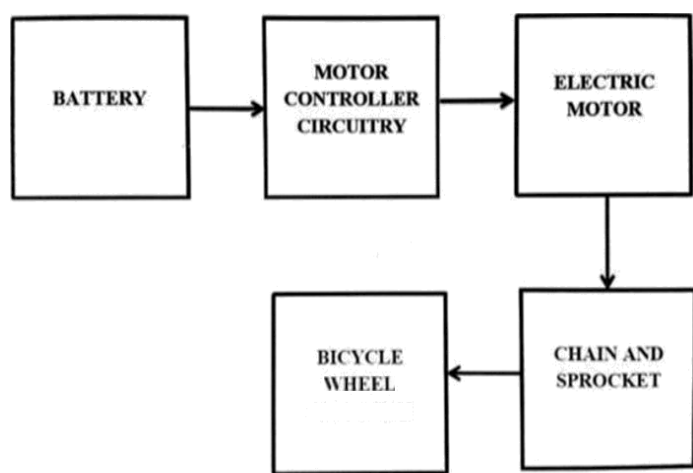


Figure 7: Working

## CONCLUSION

planning. Both local, regional and national policies are Now a days, utilization of fuel vehicles is increased rapidly which result into more air pollution. To control this, utilization of EV is must because it's several advantages like electric scooter is an eco-friendly product, It is more suitable for city as it can avoid the emission of harmful gases and thereby it can reduce the atmospheric pollution. Due to frequent increase in fuel prices, the electrically charged vehicle seen to be the cheapest one compared to the traditional vehicle. E-scooters are more suitable for rural areas where the numbers of petrol bunks are not adequate, so that the rural people can charge the vehicle with the help of electricity. To understanding the EV technology, this study helps to provide outline of EV (Scooter) and their various components. The research in the

area of bicycle planning, policies and land use consists of many different types of studies, but even though the studies are carried out with different methods and varied aims, they mostly point to the same results. The literature largely consists of comparisons of successful and less successful examples of bicycle-oriented planning around the world. What appears to be common among the

examples with high amounts of cycling is the multi-layered support for bicycle focused important to create good conditions for bicycle planning. Cities like Copenhagen and Amsterdam do not only have a strong history of bicycle-oriented city planning, but also relatively strong national support in shape of policies and planning. It seems that cities and countries that have a large part of trips made by bicycles are successful in creating both good policies and planning for the bicycle.

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