

## SELF POWER GENERATING ELECTRICAL BICYCLE

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**Abstract** - Now days bike or vehicle is very important our fast life for traveling and this is also play very important role in growth of economy but main drawback this bike and vehicle is produce pollution in environment because of burning fuel. For this reason increases global warming and also storage of fuel is limited. Due to that now days need of eco-friendly technology for traveling .e-bike (electrical bicycle) this is nothing but one example of eco-friendly technology but this technology having some drawback to overcome the drawback of e-bike i have develop now design self power generating electrical bike. This design overcomes all the drawback of e-bike. Self power generating electrical bike is nothing but the self power generating bike that generate own power by using some arrangement of equipment and drive the bike without any external energy. This type of bike no need to any external energy just like fuel or charging of battery by externally .this is charge internally without any effect on operation of self power generating electrical bike.

**Key Words:** Bicycle, dynamo, rechargeable batteries.

### 1. INTRODUCTION

Global warming are becoming major problems in the current scenario. Therefore people try to move towards clean energy. transportation is one of the source of pollution or global warming because bike or any type of vehicle work on fuel (petrol, diesel)it burn and produce harmful gases in air due to that pollution is increases and this source of energy is imitate therefore today's need to move other clean source of energy for transportation. that free from pollution and it easily available. Electrical bike is one of the way to reduce this type of problem. Electrical bicycle called as e-bike. In the 1890s, electrical bicycles were documented within U.S. Patents. On 31 December 1895, ogden bolton jr. was granted u.spaten 552,271foe battery power bicycle with "6-pole brush -and commutator direct current (dc) hub motor mounted in the rear wheel". There were no gears and the motor up to 100 amperes from a 10-volt battery. This

type of e-bike is modified day by day but this is also having some limitation just like it having charging by externally .if the battery discharge in travelling it create problem that means it use for small distance only. So some modification required in the design of e-bike. This modified design is cheap for the common people in our country afforded to buy it.

### 2. NEED OF SELF POWER GENERATING ELECTRICAL BICYCLE

We know that today word is so fast this is possible only because of fast transportation. E.g. if any time any machine fail of any company and this part is not available in that company that time company order that part from near city company and that time this near city company is not or fail to transport or take large time for delivery .that time other company not produce any type of product due to that demand of that particular product increases .this produce effect on economic condition of our country's it is clear that from above example what is important of transportation our regular life. It means when the transportation is stop are that time word work very slowly. Now days all the vehicle work on fuel but storage of fuel is imitated that means when the storage of fuel is totally finish that time transportation is totally stop. There for today's need is self power generating electrical bike that bike generate owner power and work on self power without effect on working of operation and this is not having any type of external energy it is free from pollution.

### 3. HYBRID SYSTEMS

#### i) Overview:

This section of the paper deals with the mechanical design of the system and the various parts used in the system integration. The power transmission system consists of the motor, the chain sprockets, flywheel, housing and the

rear wheel. However, before we could select these components, we performed some basic calculations relating energy transfer through the system. Primarily we focused on the current requirements of the system, and a number of torque-speed relationships. Both the acceleration on flat ground and hill climbing ability of the system depend on how much torque can be delivered by the various system components. Before we could size the batteries, we needed to estimate when the motor would demand the most current and the duration that it would draw its peak current. These situations would be at start up (acceleration) and when climbing a gradient. The main components affected by the following calculations are the motor and the battery.

**ii) Components of Hybrid System**

**a) DC GENERATOR:**



Fig. 3.1: Dynamo

The most and main important component in design of self power generating bike is dc generator because power generator is done by this generator. Generator is nothing but the machine that convert mechanical power into electrical power. It is based on the principle of production of dynamically (motionally) induced e.m.f (electromotive force). whenever a conductor cuts magnetic flux, dynamically induced e.m.f. is produce in it according to faraday's laws of electromagnetic induction. in this design I have use dc generator because dc generator having advantages over ac generator such as no conversion of supply is required from ac to dc there for it may be cheap and design having low Weight .

Generator specification: - Rated DC voltage: 12V, 6watt

**b) PMDC MOTOR (Permanent magnet DC motor):**



Fig. 3.2: PMDC Motor

Permanent magnet DC brushed motors (PMDC motors) consist of permanent magnets, located in the stator, and windings, located in the rotor. The ends of the winding coils are connected to commutator segments that make slipping contact with the stationary brushes. Brushes are connected to DC voltage supply across motor terminals. Change of direction of rotation can be achieved by reversal of voltage polarity. The current flow through the coils creates magnetic poles in the rotor that interact with permanent magnet poles. In order to keep the torque generation in same direction, the current flow must be reversed when the rotor north pole passes the stator south pole. For this the slipping contacts are segmented. This segmented slip ring is called commutator.

Motor Specifications:- Power: 150W; Voltage: 12V; Current: 15A; RPM: 1000; Overall length: 0.23m; Mass: 1.5Kg.

**c) FLYWHEEL:**

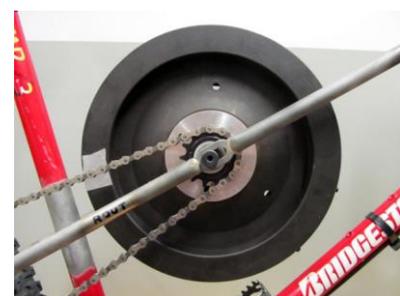


Fig. 3.3: Flywheel

Flywheel is nothing but one of the mechanical device that use for store rotating energy. Flywheel have An inertia called the moment of inertia .the amount of energy stored in flywheel is proportional to the square of its rotational speed. Energy is transferred to a flywheel by the application of a torque to it, thereby increasing Its rotation speed and hence its stored the energy. Flywheel releases stored energy thereby decreasing the flywheel’s rotational speed. It is providing continuous energy when the energy source is discontinuous for example flywheel. Flywheel is made of steel and rotate on conventional bearing these are generally limited to a revolution rate of a few thousand RPM some modem flywheel are made of carbon fiber material and employ magnetic bearings.

Flywheel specification: - 40Teeth, Diameter: 0.7

**d) Housing:**

Housing is used for making an interconnection between the rotating flywheel and the sprocket at the other end. It is this sprocket from the rotating flywheel connected to a shaft that drives the multi crank freewheel. The housing is attached with a rubber bush to avoid the shocks. They are normally used in door hinges for making perpendicular movable connections. The ball bearing inside the housing chamber allows the free rotation of the connecting shaft inside the housing.

Design Specifications:- Length: 1m; External Diameter: 0.7m; Internal Diameter: 0.5m; Thread Pitch: 0.024m.

**e) Multi-crank Freewheel:**

Multi crank freewheel is developed as alternate mechanism to drive the rear wheel from the motor power the crank is developed in such a way that the ball bearing has a special effect when rotation on one direction through motor happens the ball bearing external lock holds the moving pedal thus restricting its motion, on the other hand when the rotation with pedal happens the bearing engages with the pedal and thus the drive through cranking happens. For developing, the crank was attached with another crank of the same diameter so that there will not be any difference in the pedaling effect to the rider.

Design Specifications:- Crank Diameter: 0.18m; Number of Teeth: 52

**f) Sprockets:**

A sprocket or sprocket-wheel is a profile wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which are radial projections that engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth. Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. chain mechanism, a practice largely copied from bicycles. Sprockets are of various designs, a maximum of efficiency being claimed for each by its originator. Sprockets typically do not have a flange. Some sprockets used with timing belts have flanges to keep the timing belt centered. Sprockets and chains are also used for power transmission from one shaft to another where slippage is not admissible, sprocket chains being used instead of belts or ropes and sprocket-wheels instead of pulleys. They can be run at high speed and some forms of chain are so constructed as to be noiseless even at high speed.

Design Specifications :- Sprocket 1 (connected with the motor) Number of Teeth: 16; Diameter: 70mm  
Sprocket 2 (connected with housing) Number of Teeth: 16; Diameter: 70mm

**g) Rear Sprockets (Gear Mechanism):**

A number of sprockets have been provided at the rear drive in order to attain variety of speeds as well as facilitating slope climbing. We have 7 different sprockets at the rear drive that provide 7 different speed and torque. Each of them is used whenever they are required. Shifting the gear is by conventional tension shift mechanism using a derailleur that would loosen the chain in order to shift the gear.



Fig. 3.4: Rear Sprockets

When the rider wants to attain maximum speed from the system he can shift the gear arrangement to the lowest gear (i.e 7th gear) and similarly when he wants the easiness in riding or get higher torque for slope climbing the he can shift the gear to highest number (i.e 1st gear).because of the added weight of the system a rider may wish to cycle at the highest gear that would provide him the easiness to ride. Specifications:- Type: Tension Shift Mechanism; Number of Speed: 7 Speed

**h) LEAD ACID BATTERY:**



Fig. 3.5: Lead Acid Battery 12 V

In lead acid battery positive electrode use of lead oxide (PbO<sub>2</sub>) plate and negative electrode use of lead (Pb)plate, and the electrolyte loses much of its dissolved sulfuric acid (H<sub>2</sub>so<sub>2</sub>) due to that type of battery is called as lead acid battery. Lead acid battery was invented in 1859 by French physicist Gaston Planted and this is oldest rechargeable battery. this battery having ability to supply high surge current along with their low cost, therefore it use in motor vehicle to provide the high current required by automobile starter motor. Lead acid battery recycling is one of the most successful recycling programs in world. In the united states 99% of all battery lead was recycle between 2009 and 2013.gel designs are sealed, do not require watering , can be used a valve for gas blow off . For this reason, this type of design can be maintenance free.

Lead acid battery: Rated voltage : 12V; Rated current: 15Ah; Number of batteries:2; Battery Rating = 12 V \* 14 Ah = 168

**i) Chain Drive:**

Chain drive is a way of transmitting mechanical power for one place to another. Power is conveyed by a roller chain, known as the drive chain or transmission chain passing over a sprockets gear, with the teeth of the meshing with the hole in the links of chain.



Fig. 3.6: Chain Drive

Chain drive can be suitable for the speeds up to the 900m/minute. The chain drive system uses one or more roller chain to transmit power from a differential to the rear axle. this system allowed for a great deal of vertical axle movement ,and was simpler to design and build than a rigid driveshaft in a workable suspension also it had less unsparing weight at the rear wheel than Hotchkiss drive , which would have had the vehicle would have a smoother ride. The lighter unsparing mass would allow the more efficiency.

**4. WORKING OF THE PROTOTYPE:**

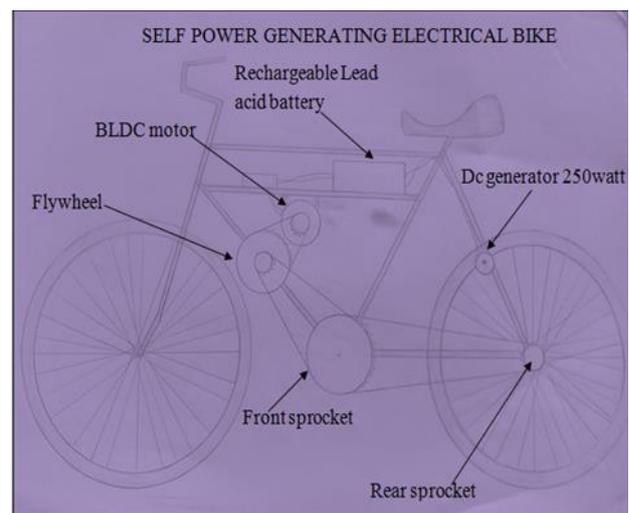


Fig. 4: Design of Electrical Bicycle

The 150 watt PMDC motor which gives a 1000 RPM at 12V and 15A rating was linked with a flywheel using the sprocket ratio at 16:40 (motor : flywheel) teeth ratio, the shaft from the flywheel was then linked to the sprocket on the other side with a housing. The drive from this sprocket to the multi crank freewheel is attached again at 16:52(sprocket: crank freewheel) teeth ratio. These ratios were selected for maximum efficient power transmission with minimal loss. The drive from this crank is directly linked with rear wheel sprocket that facilitates its motion. When the motor is switched ON, the motor draws current from the two dry cell batteries connected in parallel that would give an effective discharge of 12V and 14A. Since the motor uses maximum current (11 amp) during starting a

battery of that specification was used. Later on as the effective speed increases the current drawn reduces to 1.77A. Figure 9 shows the final assembled prototype of the hybrid bicycle.

The motion of the motor actuates the flywheel whose rotation in turn drives the shaft through the housing and make the sprockets at the other end move which would drive the multi crank and thus the rear wheel. It should be noted that while the motor is in working mode the pedals won't rotate which would otherwise cause discomfort to the rider. For this to work we have added a ball bearing at the crank spot that would disengage the inner ring while motor is in rotation and engage them when the motor is switched off.

#### 4. CONCLUSION

It is clearly seen that the electrical bicycle gives a clean and more economical solution to the energy crisis. People use bikes and fuelled vehicles for even travelling short distances without making use of bicycles and other non – fuelled vehicles. Most number of people from the list have been those which think riding a cycle is equivalent to providing extra effort for cycling. In order to avoid this electric assistance has been provided to the cycle that will ease the user to ride the unit with the help of a motor. Even the hardship of climbing slopes and riding on rough terrains has been reduced. All these aspects are available keeping in mind the factor of pollution being affected at all. The factors that our prototype design of bicycle provides to the rider are:

- Simplified riding with minimal effort on flat as well as gradients.
- Easiness of riding on rough terrains.

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#### BIOGRAPHIES



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