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## Design and Fabrication of E-Bike with a Hybrid Sprocket

*D.Bharath, B.Ajay, D.Anupama, B.Shiva kumar, D.Jairam, CH.Bhaskar\**

*GMR institute of technology, Razam, vizayanagaram, Andhra Pradesh, PIN-532427, India.*

*Mail Id: [bharathdasari4141@gmail.com](mailto:bharathdasari4141@gmail.com)*

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### ABSTRACT

In the current scenario the global warming had become a major problem in the world which causes depletion in ozone layer due to that UV rays directly enter on the earth directly which is harmful to the human skin additional to this the other major problem is depletion of fossil fuels due to its more usage so as an alternative of this problem we had developed electric vehicles and made them come into usage but for a common purchasing it becomes a greater task so to make this possible we have come with a idea which is the portable electric drive unit which it contains a motor, dc booster, controller etc. used to produce electricity that can be used or stored. Implementation of electricity for all modes of transportation is already existing but the challenge is to optimize the usage, cost, and storage which is more environmental pollution free and can be brought in cheaper prize and can be installed to a normal cycle. Which is compact, portable and easy to use. In addition to we are using a sprocket that is removable so that it can be installed easily to the bicycle for transmission of power also if the power transmitting gears are damaged due to wear and tear or due to overheating this can be used so that the time and work load can be used.

Keywords: Global Warming, Portable, Optimize, Transmitting.

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### Introduction

Energy and power have become so essential to our nation. The energy can be produced from different sources of energy which can initially classified into renewable and non-renewable resources the hydropower, solar, wind is considered to be renewable and the thermal, diesel, nuclear, geothermal are the form of conventional and non-renewable sources of energy. The major amount of energy is being produced by the non-renewable sources where the thermal power plants play a major role in it. So, to avoid this problem and save our mother earth and hand over the fossil fuels to our next generations we had come with a unique idea that is e-bike. It is completely different from the existing electric bikes as they uses electricity which are produced by charging which is a product of thermal power plants where it indirectly effects the environment but in these e-bikes the electricity is produced by the self-generation so that it can be used efficiently and also the problem of global warming can be reduced as the strength of middle class populated persons are more where they no capability of these electric bikes but in these they can buy an electric drive unit and install it to it normal existing cycle in our home. As cycle is preferred as best transport mode for short distance in villages. E-bicycle is a bicycle which is assisted with a electrical drive unit. A portable model of power-assisted bicycle has been designed, set up and tested. The electrically assisted bikes are normally powered by rechargeable battery, and their driving performance is influenced by battery capacity, motor power, operation weight, control, and particularly by the management of the assisted power.

In addition to these we have been designed a removable sprocket that can be fixed easily without disturbing the actual design if the cycle where it can easily fixed and removed and also gear is an important component in transmitting power so it is the most commonly used component in the large mechanical machinery. Due to the continuous long working hours the gears get wearied due to heat or other external factors by using these removable gears we can replace it easily.

### 1.1. Materials used in sprocket

Mostly the material used in the sprocket is M50 steels or high-speed steels Through the estimation of the leftover pressure and size, and the perception of the microstructure, the relationship among the size change, the remaining pressure and carbide precipitation of M50 bearing steel at working temperatures was contemplated. That's what results show the left-over pressure at the outside and within the M50 bearing rings are compressive, which for the most part shows the personality of occasional delivery, and this outcomes in the size increase of the bearing rings. Inside the temperature scope of 250C, how much auxiliary carbides increments with the increment of temperature, which anyway near stays consistent at 300C the shapes can be observed in figure1.1. At similar temperature, how much optional carbides increments with the increment of time. The precipitation of optional carbides results in the size lessening of bearing rings, and yet, the optional carbides increment the leftover compressive pressure. During 0e100 h at working temperatures, the principal influencing factor on the size change is the arrival of the compressive leftover pressure, which causes the size increment of the bearing rings. During 100e250 h, the primary impacting factoids the precipitation of optional carbides, which causes the size reduction of the bearing rings. While during 250e300 h, the principal affecting component turns around to be the arrival of the compressive leftover pressure, and this causes the size increment of the bearing rings.

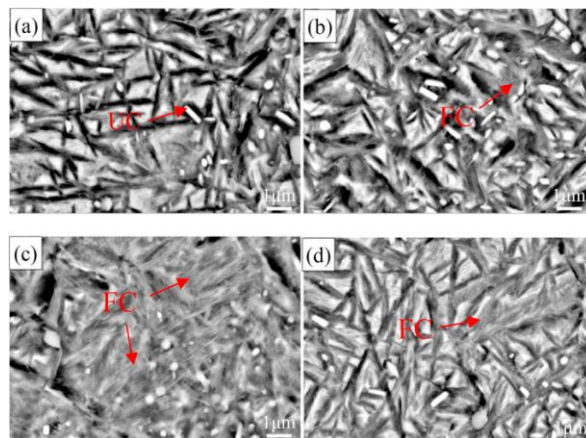


Fig 1 Microstructures at different temperatures after holding for the same time of 300 h. 120 C (a), 150 C (b), 250 C (c) and 300 C (d).

### 1.2 Process used in manufacturing

manufacturing enterprises have become progressively aware of energy wastage and natural outflows. The energy consumption and ecological impact of each assembling cycle is unique. This study intends to think about the natural impacts of the hotproducing process and machining process for assembling sprocket wheels. It is vital to plan a preform while fashioning a sprocketwheel. The sprocket wheel tooth segment is the flimsy spot in collapsing, and an unwilling deformity might happen. Accordingly, preform and streakplug shapes are basic plan factors in the hot producing process for assembling sprocket wheels. Limited component examination was utilized to plan the preform, and dissect the disfigurement and impact of blaze plug in the hot manufacturing process. The energy utilization for angenuine item and for an item founded on the investigation were contrasted with examine the natural impacts. The outcomes showed that the material misfortune and energy utilization were

decreased in the created hot producing process; this cycle is a green cycle with comparatively higher energy saving than the machining system.



Figure 2 Hot forging process.

### ***1.3 Use of electric vehicles***

Presently a day there is overwhelming interest in electric vehicles due to its benefits connected with contamination and utilization of energy. Electric vehicles utilize electric engine rather than interior burning motors. Two sorts of engines are utilized in electric bicycle are brushed engine and brushless engine. This electric engine gets electric charge from batteries. Electric charge is been created from a few sources (i.e sunlight-based energy by introducing the sunlight-based charger or by wall charging which is given inhouse) there by utilizing traditional assets. Batteries gave in EV comprise of set of cells associated with each other to give appropriate measure of voltage to framework as well as to pushed the vehicle. Variety in batteries rely on voltage, number of cells, weight and so on and kind of use chooses the existence of battery. Electric vehicle doesn't produce any Exhaust gases there by assisting with diminishing the contamination. Exceptional huge number of exploration work is been done on Electric Vehicle in ventures. In 2009 China made 22.2 million units and turned into world's driving maker.

### ***1.4 DEVELOPMENT OF AN INNOVATIVE E-BIKE***

A new power-assisted bicycle model has been designed, built, and tested. The following are the main innovative solutions for the peeled prototype: the electric motor position; the new mechanical transmission; the low cost measurement system of the driving torque; the special test rig. Unlike the common approach, in which the electric motor is located on one of the three hubs of the bicycle, the peeled prototype concept consists of an electrical motor in the centre that transmits torque to the central hub via a bevel gear. The peeled prototype also includes a new low-cost driving torque measurement system based on a strain gauge load cell located on one side of the vehicle. examines motor techniques for lowering the cost and increasing the range of electric vehicles (EVs). Environmental concerns, energy crises, and the greenhouse effect have all pushed for the adoption of clean energy EVs in recent years. To accomplish this goal, technical challenges in vehicle cost and range must be overcome. In this context, this article discusses the advantages and disadvantages of three mainstream EV motors in terms of vehicle cost and range: permanent magnet synchronous motor (PMSM), induction motor (IM), and switched reluctance motor (SRM).

### 1.5 Comparison of different batteries used in electric vehicles

Battery controlled Electric Vehicles are beginning to assume a huge part in the present car industry. There are many sorts of batteries tracked down in the development of the present Electric Vehicles, being difficult to conclude which one satisfies best all the most significant attributes, from various perspectives, like energy stockpiling proficiency, useful qualities, cost value, wellbeing and usage life. This study presents the independence of an Electric Vehicle that uses four distinct sorts of batteries: Lithium Particle (Li-Particle), Liquid Salt (Na-NiCl<sub>2</sub>), Nickel Metal Hydride (Ni-MH) and Lithium Sulfur (Li-S), every one of them having the same electric energy stockpiling limit. The oddity of this logical work is the execution of four distinct sorts of batteries for Electric Vehicles on a similar model to assess the vehicle's independence and the effectiveness of these battery types on a driving cycle, progressively, digitized by programmatic experience.

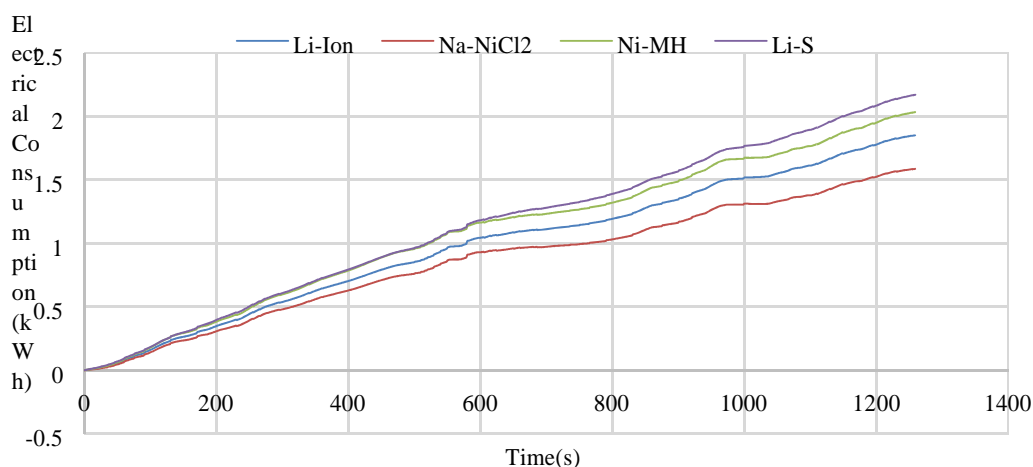


Figure 3 Comparison of usage of different electric batteries.

## 4 Conclusion

By the above observations we have concluded that the normal bicycle is easily modified and converted to electrical bicycle by installing the portable drive unit with minimum knowledge . We have designed an easy fit and removable gear which can easily mounted on the hub with help of bolt . We also made the secondary chain which is easily attach and detach by replacing master link with screw and nut . In this project we have introduced self charging where the drained battery can be charged through pedaling . By this we can say this is also a hybrid vehicle . An average person of 60kg can run this vehicle at 20kmph for 88km of range . And when battery is drained or at low charge he can recharge the battery to 25 % through pedal a 5km drive , which gives a 20km range .

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