

Modelling and Fabrication of Portable E-kit fixtures for Bicycles



Thejas Jain K, R Kumar, C Siddaraju

Abstract: *The percentage of vehicles on the road increasing day by day, which tends to increase the consumption of fuel and emission of this product hazardous to environment. The usage of fossil fuels should be reduced and also it should be available to future generation also. The emission of fuel products is hazardous to the environment and also to the human being. Considering this into account reduction of usage of fossil fuel is main concept i.e. Electric Bicycle. So the available bicycle would run on alternative source which reduces the human effort. For the bicycle to run a e-kit fixture is designed and manufactured in such a way that it is suitable for different types of bicycles. So that the fixing and removal of kit takes place in few minutes and it can be fitted other cycles. After assembling the e-kit to the bicycles it should run without human effort whenever needed.*

Index Terms: Electric Bicycle, E-kit fixture, Fossil Fuels.

I. INTRODUCTION

An electric bicycle, also named as an e-bike is a bicycle with a motor which can be used for movement. Primary motivation to distinguish the need of finding and altering e-bicycle is to beaten the issue of the contamination. The electric bike is an electrically-helped gadget that is intended to convey the electromagnetic energies to a present bike along these lines alleviating the client of creating the vitality which is fundamental to run the bike. It contains a solid engine and enough battery control that simply needs charging to help in slope climbing, create more noteworthy motoring speeds and gives totally free electric transportation. The crucial structure of an electric bike drive contains a controller that controls control stream the battery to the electric motor. It suggests the power gave from electric motor is used to run e-bike. The power demonstration parallel along the power conveyed by rider by means of pedal on the bicycle.

Revised Manuscript Received on 30 July 2019.

* Correspondence Author

THEJAS JAIN K Department of Computer Integrated Manufacturing from Ramaiah Institute of Technology, Bangalore, Karnataka.

Dr R. Kumar, Assistant professor, Department of Mechanical Engineering Ramaiah Institute of Technology, Bangalore, Karnataka

Dr. Siddaraju C. Assistant professor, Department of Mechanical Engineering Ramaiah Institute of Technology, Bangalore, Karnataka

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

The instrument such as motor, battery, pic controller is selected on the required criteria and also durability of the instrument. The functioning of each pins of the controller is given and the battery selection based on the different are discussed.

II. METHODOLOGY

First step is to select the materials which are required set up an electric bicycle, they are Motor, Battery, Controller, etc. The second step the most important step the designing of the fixture. The next step is to fabricate the designed fixture by selecting the material and by suitable operation. The next step is to assemble the selected material and fabricated material to the bicycle. The last step is check the speed and distance travelled by the bicycle.

III. MATERIAL SELECTION

A. DC Geared Motor: Here 250 watt with maximum of 2100rpm speeds and 24volts motor is selected. The current rating of the battery is 7.5amp.



Figure 1: DC Geared Motor

B. Battery: 12v and 7.5 amp hour lead acid batteries of 2 numbers are used and they are associated in parallel. Battery stores the electrical vitality produced and uses it to run the engine.



Figure 2: Battery

Modelling and Fabrication of Portable E-kit fixtures for Bicycles

C. *Controller*:The controller is an electronic circuit that controls the speed of an electric engine and furthermore fills in as a dynamic brake.Power required for the motor is provided by battery through controller. The controller is having 24volt dc voltage and a current limit of 21A and a power of 25 watt.

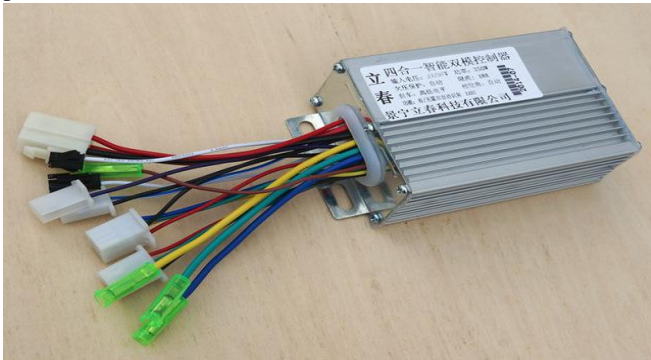


Figure 3:Controller

IV. MODELLING

A. Procedure for Manufacturing the Split Sprocket

1. Get the draft sigh or 2D cad design

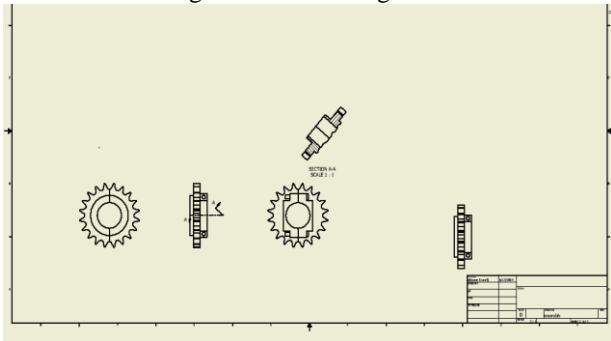


Figure 4: 2D cad design

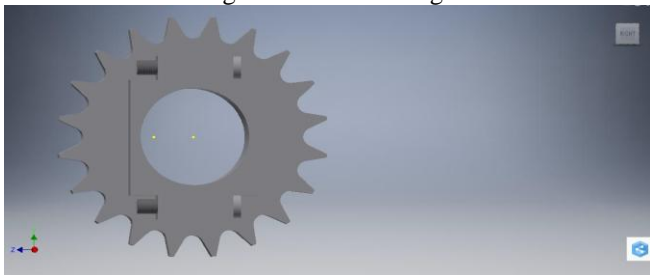


Figure 5:3D cad design

2. Determine the Specifications of the Sprocket

1. Bore diameter – 35.5 mm
2. Bottom diameter – 78 mm
3. Pitch diameter – 82 mm
4. Outer diameter – 85 mm
5. Hub diameter – 56 mm
6. Face width – 2.5 mm
7. Material used – Medium carbon mild steel
8. Number of teeth – 20

3. Drawing the First Sprocket Tooth

To draw the main tooth of the sprocket gear, this is cultivated as pursues.

1. Pick a begin point and draw upwards 1/2 of the pitch, out to the correct some separation (longer than anticipated rigging range).

2. Pivot the line stretching out to the right up a point of $[360^\circ/(\text{Number of tooth} * 2)]$.
3. Adhere to a meaningful boundary from the upwards and stretching out line to the crossing point of the calculated line.
4. Crossing point draw a line downwards the length of the pitch, and draw circles whose distances across are the roller measurement in addition to 0.005" at that point at each finish of that line.
5. Clean up the reference geometry loaded up with messy the illustration and after that draw a line on the rears of the two circles that will be the length of the pitch.
6. From the focal point of the reference line draw a line out that is 20% the length of the Pitch and another that is 60% the length of the Pitch. Toward the finish of the 20% line draw a vertical line which converges the two circles.
7. Toward the finish of the 60% line draw a vertical line that is 10% the length of the Contribute and expands equitably the two bearings.
8. Utilizing the 20% line and the line on the rear of the circles as trim limits to trim down the circles.
9. Draw a sunken curve that goes about as an augmentation from the cut circles end to the one finish of the 10% line.
10. With a span that is 8% of the pitch filets the two circular segments together.

4. Completion the Sprocket Utilize Round Example

After the principal tooth is drawn and once the reference geometry is cleared (1), completing the apparatus is a basic two stages process. First utilizing the roundabout example instrument to design the tooth around the begin point per the quantity of teeth. After that draw the required focus entire sizes is same as that of begin point and eradicate the begin point and any extra reference geometry.

B. Fabrication

To make the sprocket the material selection is important factor. Medium carbon steel is selected as the material. Medium carbon steel typically has a carbon in the range of 0.31% to 0.61% and a manganese content ranging from 0.060% to 1.65%.It has a tensile strength 500-700MPa and Brinell hardness number ranges between 170 and 210.AISI 1045 steel is characterized by good welding property, good machinability, and has high strength and impact properties in either the normalized or in hot rolled condition. Milling operation is carried out to get the final product.Horizontal milling machine is used for manufacturing the split sprocket. The final product is shown in below figure.



Figure 6(a): Final product



Figure 6(b): Final product

C. Assembly

The fabricated Split sprocket is fixed to the rear wheel hub using allen key. Motor is attached to the rear wheel shaft using provided fixture. The chain connection given to the motor shaft to the split sprocket. The battery and controller is fixed to the main frame of the bicycle. Speed of bicycle is controlled by thumb throttle. Connections are given to the motor and battery through controller. Power required for the motor is provided by battery through controller. The finally assembled electric bicycle shown below.



Figure 7: Finally assembled electric bicycle

V. RESULTS

The electric bicycle is tested for maximum speed achieved and also distance travelled by the bicycle when the battery is fully charged.

The speed of the bicycle found to be with a load of 80kg=16-18km/hr.

Distance travelled by the bicycle with fully charged battery=28.900km.

VI. CONCLUSION

The presently available electric bicycles are fitted with electric kit which is permanently fixed to the bicycle. Therefore a universal electric kit which is more flexible and can be attached to any type of existing bicycle is manufactured. The kit is portable type and who use this kit are in need of this kit for a particular time and whoever they decide not to use thus kit they can remove this kit without much difficulty. For the people like milkmen, newspaper vendors, flower and fruit seller this type of kit is very helpful because the cost of the kit is low and it can be helpful to them.

VII. FUTURE WORK

The present work is on designing and fabrication of sprocket only. For future work a universal fixture which is required to hold the motor can be designed and fabricated. By fixing a dynamo to the wheel the self-recharging of the battery can be done. For generating power solar panel can attached to the bicycle and connected to the battery, so which helps for charging the battery.

REFERENCE

1. Mitesh M. Trivedi, Manish K. Budhwani, Kuldeep M. Sapovadiya, Darshan H. Pansuriya, Chirag D. Ajudiya, "Design & Development of E-Bike-A Review", *Iconic Research and Engineering Journals*, Vol.1, Issue 5, Nov 2017.
2. Bhoopathi S, Saranya A, Raghuram S, Revanth R, "Design and Fabrication of Low Cost electric Bicycle", *International Research Journal of Engineering and Technology*.
3. Prabhu Randhir, Prathik Gaurshettiwar, Shubham Waghmare, Kunal Mogre, Prof. C.K. Tembhurkar "Design and Fabrication of Electric Bicycle", *International Journal Of Innovation in Engineering and Science*, Vol.2, No.5, 2017.
4. Akshay N. Khonde, Aditya R. Ughade, Kapil, D. Warghane, Rajat R, "Performance Evaluation of Electric Bicycles", *International Advanced Research Journal in Science, Engineering and Technology*, Vol. 4, Special Issue 3, January 2017.
5. Kunjan Shinde, "Literature Review on Electric Bike", *International Journal Research in Mechanical Engineering and Technology*, Vol.7, Issue 1, Nov 2016-April 2017.
6. Yashwanth Sharma, Praveen banker, Yogesh Raikwar, Yogita Chauhan, Madhvi Sharma, "R&D On Electric Bike", *International Research Journal Of Engineering and Technology*, Volume 5, Issue 2, Feb 2018.
7. <http://www.wikipedia.org>

AUTHORS PROFILE



THEJAS JAIN K is an M.Tech student in Computer Integrated Manufacturing from Ramaiah Institute of Technology, Bangalore, Karnataka. The completed project is Modelling and Fabrication Of Portable E-kit Fixtures for Bicycle.



Dr R. Kumar is an assistant professor in the Mechanical Engineering Department of RIT. His areas of interests include subjects like CAD/CAM, CIM, Robotics, Rapid Prototyping, Mechatronics and Microprocessor.



Dr. Siddaraju C. is an assistant professor in the Mechanical Engineering Department of RIT. His areas of interests include subjects like Microstructure-Property Correlations in Metallic systems.