

Project Report
on
Pedal assisted Hybrid-Electric Bicycle- MK 03

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By the students of EEE, IV semester

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| MENTORS | | |
|--|--|---|
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DECLARATION BY THE TEAM

We, the undersigned, solemnly declare that the project report is based on our own work carried out during the course of our study and the development of MK03 under the supervision of **Dr. Snehaprabha TV, HoD, EEE**

We assert the statements made and the conclusions drawn are an outcome of our work. We further certify that:

- I. The work contained in the report is original and has been done by us under the general supervision of our supervisor.
- II. The work has not been submitted to any other Institution for any other degree/diploma/certificate in this university or any other University of India or abroad.
- III. We have followed the guidelines provided by the university in writing the report. We have followed the guidelines and IEC standards while developing the prototype. (IEC 60598-1 Luminaires)
- IV. Whenever we have used materials (data, theoretical analysis, images and text) from other sources, due credit has been given.

Report verified by the team members.

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1. Project Abstract

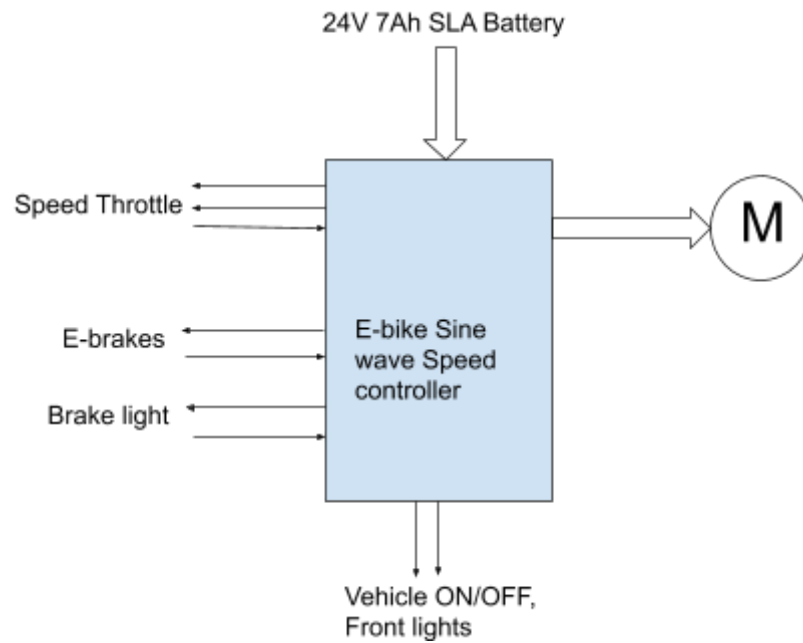
Pollution is the most painful problems among the many which need to be addressed as soon as possible as we do not expect our future generations to be buying oxygen. One of the main causes of this ever-increasing problem is fossil-fuel vehicles. Even after major advancements in emission control and vehicle design, they fail to protect our environment in terms of pollution. Hence an electric vehicle revolution in India is necessary. We hope that this project can be one of the main catalysts for such a revolution

2. Proposed Design

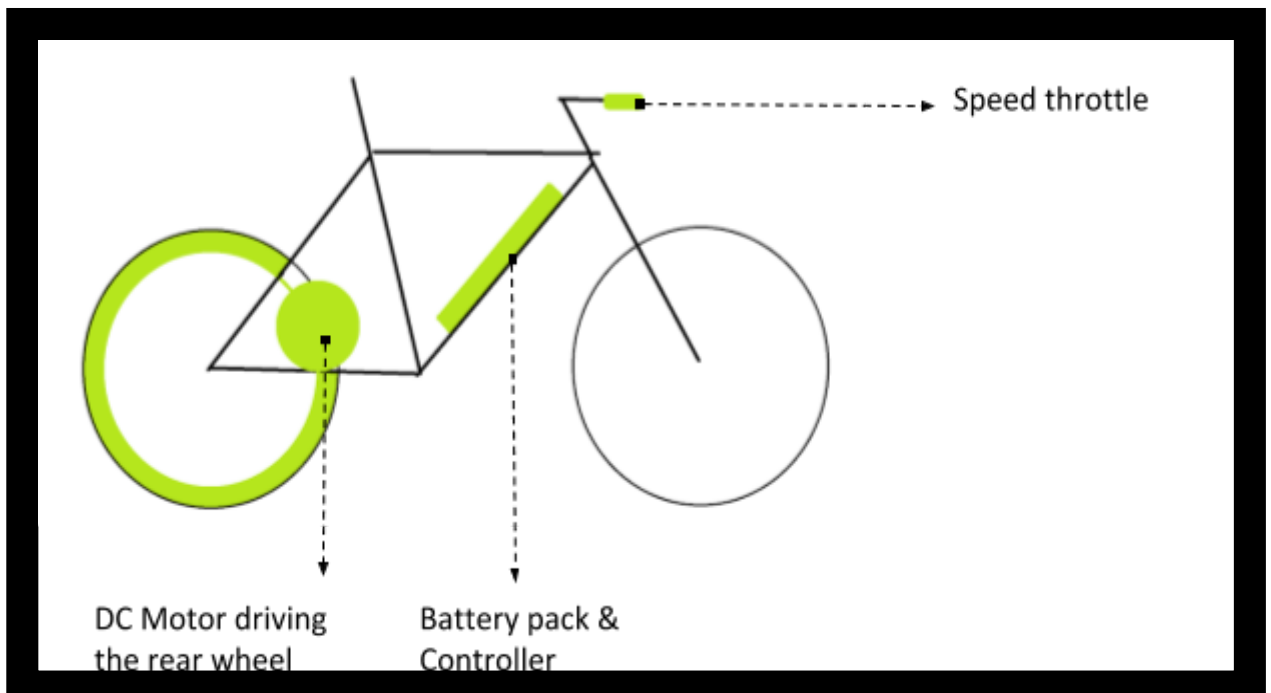
- a. Why eBikes?** A hybrid-electric eBicycle aims to provide a viable, affordable and truly an environment-friendly replacement for fossil-fuel bikes. This first phase of this new revolution is achieved by modernizing bicycle travel. A mix of the old-school bicycle with modern day controllers and DC motor is guaranteed to make heads turn.

It has a potential to change the way we travel and which in turn creates a healthy environment. This idea has not come into the mainstream because of the lack of awareness of the concepts of electric and hybrid vehicles. The general public is also less informed about the capabilities of electric transportation. More awareness should be created among the stakeholders on the potential of renewable energy applied to electric vehicles.

b. BLOCK DIAGRAM



MK-03 Layout



c. COMPONENTS USED:

| COMPONENT NAME | QUANTITY | MAKE AND MODEL | PURPOSE |
|--|-----------------|---------------------------|---|
| 12V 7Ah Sealed Lead acid Battery | 2 | EXIDE | Battery pack |
| AST Works 24V 250W motor speed controller | 1 | AST Works | Motor controller |
| Bicycle frame and wheels | 1 | Huffy cycles | Body of the e-bicycle |
| FreeWheel crankshaft | 1 | -developed- | For free moving pedals when motor is engaged |
| Front and Rear LED lights | 1 | -developed- | Lightings |

- d. How does MK03 work?** The MK03 is a pedal assisted hybrid electric bicycle, which means it can be driven by both pedalling and by the DC motor. This is an important feature which helps it differentiate from the existing ebikes.

4. Innovativeness of the Proposed Solution: This project has great potential in terms of product innovation, feasibility, customer satisfaction and in terms of business growth. The main innovation will lie in developing more efficient battery packs and controllers. Higher range with better speeds is what we aim in achieving at considerable costs. Efficient charger and motor speed controller is the backbone of any EV. Charging time is the main factor which discomforts the general public from buying Electric Vehicles. We have improved the charging time in MK 03.

5. Impact of the proposed solution: The main pain point as discussed above is the lack of public awareness of hybrid-electric and electric vehicles. This product aims at being a huge stepping stone for the next big thing, all-electric vehicles. Many economically backward classes will be hugely benefited by this as this is a one-time investment and the running costs are exponentially less compared to the running costs of fossil-fuel vehicles. The youths who demand more luxurious yet cheap mode of transportation are a huge market.

6. Test results and Vehicle specifications: A series of 9 tests were conducted to ensure the parts and materials used are suited for the purpose used. The tests conducted are listed below and the reports have been attached.

- a. Test ride 1- Speed & Range
- b. Body Inspection- cracks, stress marks
- c. Test ride 2
- d. Standard High pressure jet Wash
- e. Standard Rain Condition test
- f. Test ride 3
- g. Test ride 3- after waterproofing
- h. Test ride 4- by bicycle and EV enthusiasts
- i. Vehicle Spot check

After conducting the above tests, we arrived at the following specifications of MK03.

| Specifications of MK03 | |
|-------------------------|---|
| Make & Model of bicycle | Huffy cycles, USA |
| Class | Pedal assisted ebicycle |
| Body-style | Single hard frame, rear wheel drive |
| POWERTRAIN | |
| Transmission | Separate drivetrains for pedal and motor |
| Battery | 168Wh, Sealed lead acid |
| Electric range | 8 KM |
| Hybrid Range | 15 KM |
| SPECIFICATIONS | |
| Battery capacity | 8 KM at 168Wh |
| DC Charging | 3 KM available after 30 minutes of charging |
| DC fast charging | 8 KM available after 30 minutes of charging |
| Powertrain | Single Motor rear wheel drive |
| Motor | DC permanent magnet Series motor |
| Power | 250 W (0.335 HP) |
| Power-to-weight Ratio | 25W/kg |
| Acceleration | 0-25 kmph, 5 seconds |
| Top speed | 38 Kmph (Hybrid) |

| | |
|--|--------------------|
| | 25 Kmph (Electric) |
|--|--------------------|

7. The next phase, MK 04: The upcoming prototype, the MK 04 will be totally developed in Presidency University, under the guidance of EEE Hod. It will have a design which maximizes form and function. All old designs will be changed and a new set of Li-ion Batteries will be used, ensuring customization of speed and range without compromising safety. All electronics, including the all LED front and rear lights, turn indicators and warning lights, Electric horn, Vehicle Information System will be developed.

Initial designing of MK 04 has begun and photocopies of the preliminary drawings are attached.

We would like to extend our gratitude to our mentors Dr Snehaprabha T V (EEE, Dept. HOD, Presidency University), Ms Kavya PS (EEE Faculty, Presidency University) and Mr. Nagesh (EEE Technical Staff, Presidency University) for their invaluable support in helping us to implement this idea.