

Fabrication and Experimental Analysis of Lithium-Ion Battery Based Smart Electric Bicycle

Prof. Ravikant K. Nanwatkar¹, Rohan K. Awasare², Omkar G. Tagade³, Pranay K. Kamble⁴,
Rushikesh D. Jogdand⁵

Assistant Professor, Mechanical Engineering, NBNSSOE, Pune, India¹

UG Student, Mechanical Engineering, NBNSSOE, Pune, India^{2,3,4,5}

Abstract: Building a Project plays a vital role in improving skills as well as in boosting career opportunities for an engineer. Designing and building any machine comes with its share of success and failures. This is a way of brainstorming, creating new ideas which help in betterment of our future and also opens to other new ideas. The Electric vehicle has been popular for the last two decades and now its market is also booming in India. Bicycle being the greenest mode of transportation comes with a drawback that cannot be ignored in this fast-paced world. Transportation is now greeted as time saving process. So, this is where electric bicycle mainly came into picture. People need a green, health preserving, fast mode of transportation and E-bicycle gave it all. More than just being these things electric bicycles is also able to generate back electric power by the use of pedaling of wheels through regenerative mode of the motor used. Our Aim is to making a Cheapest Rate Electric Bicycle from Market Price, which will be run on li-ion battery as an energy storage device. The work includes simulation of electric vehicle using MATLAB/Simulink to evaluate the rate of working parameters i.e., state of charge, voltage and current w.r.to time and to evaluate the distance covered related to the velocity and acceleration of the vehicle. Further the same results are validated with experimental results after fabrication of the proposed e-bicycle. This project will be a novel solution for the persons whose daily distance of travelling is not more than 10 km of range and efficient reuse of scrap old cycles, also this project includes concept of generating electrical energy through mechanically paddling, thus this project is good solution for exercise and generated energy can be further used for small scale applications like mobile charging of glowing the bulb in night mode.

Keywords: E-mobility, E-bicycle, Lithium-ion Battery, Battery Pack, Regeneration of Energy, etc.

REFERENCES

- [1] Ravikant K. Nanwatkar, Dr. Deepak S. Watvisave, "Analysis and Simulation of Hybrid Energy Storage System for Electric Vehicle" in July 2021| IJIRT | Volume 8 Issue 2 | ISSN: 2349-6002.
- [2] Jaewon Sung, Nguyen Ba Hung [2017] "A study of the dynamic characteristics and required power of an electric bicycle.
- [3] Peter K. Joseph, D. Elangovan [2019] "Linear control of wireless charging for electric bicycles".
- [4] Sachin S. Kakkattil, K.S. Sandeep [2020] "Design and fabrication of foldable electric bicycle".
- [5] Hanghang Zhu, Zhi Pei [2020] "Data-Driven Layout Design of Regional Battery Swapping Stations for Electric Bicycles".
- [6] Huai Chuangfeng, Liu Pingan [2011] "Measurement and analysis for lithium battery of high-rate discharge performance".
- [7] Nguyen Ba Hung1, Octaeck Lim [2021] "A simulation and experimental study of dynamic performance and

- electric consumption of an electric bicycle”.
- [8] Bart Jelijs, Joost Heutink [2020] “How visually impaired cyclists ride regular and pedal electric bicycles”.
 - [9] Lorenzo Stilo, Diana Segura-Velandia [2020] “Electric bicycles, next generation low carbon transport systems: A survey”.
 - [10] Wenqiu Liu, He Liu [2020] “Life cycle assessment of power batteries used in electric bicycles in China.
 - [11] Sheng Jin a, Xiaobo Qu [2015] “Estimating cycle way capacity and bicycle equivalent unit for electric bicycles”.
 - [12] Daniel Meyer, Wenlong Zhang [2015] “Heart rate regulation with different heart rate reference profiles for electric bicycle riders”.
 - [13] Sigal Kaplan, Dagmara K. Wrzesinska [2018] “The role of human needs in the intention to use conventional and electric bicycle sharing in a driving-oriented country”.
 - [14] Salvatore Mellino, Antonella Petrillo [2016] “A Life Cycle Assessment of lithium battery and hydrogen-FC powered electric bicycles: Searching for cleaner solutions to urban mobility”.