

Prototype of Cast-based Ergonomic Electric Folding Bike for Small-Medium Industries product development

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ABSTRACT

Electric bicycles are the development of bicycles that function as a means of transportation and are now changing their function to sports equipment that is currently in demand by the public. In general, electric bicycles are formed from the main components, namely the frame, handlebar, axle, saddle, wheels, brakes and an electric motor is installed from battery power. Alternative frame production technology is needed to reduce dependence on imports and so that the bicycle frame production process can be produced by small-medium industries. The electric folding bicycle model needs to be developed considering that the middle and upper market segment requires a flexible electric bicycle. The aims of this study were 1) to develop an ergonomic design of an electric folding bicycle frame, and ready for small-medium industries production, 2) to develop an effective and efficient electric folding bicycle frame production process, and 3) to make a prototype of an ergonomic electric folding bicycle at a competitive price.

The stages of research by applying research and development methods are as follows: 1) The process of analyzing geometric needs; 2) folding bicycle frame design; 3) frame design simulation; 4) validation and revision of the frame design; 5) the production process of a combination of cast and welded frames; 6) folding bicycle frame testing; 7) bicycle component assembly, 8) folding bicycle function test, 9) bicycle electrical system assembly; 8) electrical function test; 9) limited trial of electric folding bicycles; 10) electric bicycle prototype production.

The results show that the frame design developed for this folding electric bicycle applies 5 main components, namely the head tube, seat tube, right main frame, left main frame and hinges. The simulation results with Ansys software show that the maximum stress due to a load of 2000 N is 61 MPa, so it is still below the strength threshold for cast aluminum, which is 165 MPa. The production process for folding electric bicycle frames uses 2 methods, namely casting to make frame components and the TIG welding method to assemble frame components into complete frames. The production cost of the folding electric bicycle frame prototype per unit is IDR 1,330,000. The complete prototype of a folding electric bicycle using a 500 W battery has a production cost per unit of Rp. 10.750.000,-.

Kata Kunci: *prototype, electric bicycle, cast frame, Aluminum*