

DESIGN AND CONSTRUCTION OF AN AUTOMATIC DUCK EGG INCUBATOR WITH A 200-EGG CAPACITY USING AUTODESK INVENTOR

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ABSTRACT

Small and medium-scale duck egg incubation is still largely performed manually, resulting in suboptimal control of temperature, humidity, and egg turning, which can potentially reduce hatching success rates. This study aims to design an automatic duck egg incubator with a 200-egg capacity using Autodesk Inventor Professional. The research employs the Research and Development (R&D) method, encompassing a literature review, 3D modeling, assembly, structural strength analysis using the Stress Analysis feature, and functional system testing via Black Box Testing. Structural analysis was conducted based on Von Mises Stress, Safety Factor, and Displacement parameters, while functional testing covered the heating system, hot air circulation, an automatic egg-turning mechanism using a 775 DC motor, a humidification system (mist maker), and a humid air distribution system (exhaust fan). The results indicate that the 200-egg capacity incubator design possesses a structure capable of safely withstanding operational loads—as confirmed by the Stress Analysis—and that all systems function according to the design, achieving a perfect success rate in testing. Consequently, the developed incubator design is viable for implementation and holds the potential to enhance the efficiency and success of the duck egg incubation process.

Keywords: *Duck egg incubator, Autodesk Inventor, Stress Analysis, Black Box Testing, automatic egg turner*