DEVELOPMENT AND TEMPERATURE CONTROL OF SMART EGG INCUBATOR SYSTEM FOR VARIOUS TYPES OF EGG

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ABSTRACT

This work is aimed at modeling, designing and developing an egg incubator system that is able to incubate various types of egg within the temperature range of 35 – 40^0C. This system uses temperature and humidity sensors that can measure the condition of the incubator and automatically change to the suitable condition for the egg. Extreme variations in incubation temperature affect the embryo and ultimately, post hatch performance. In this work, electric bulbs were used to give the suitable temperature to the egg whereas water and controlling fan were used to ensure that humidity and ventilation were in good condition. LCD is used to display status condition of the incubator and an interface (Keypad) is provided to key in the appropriate temperature range for the egg. To ensure that all part of the eggs was heated by the lamp, DC motor was used to rotate iron rod at the bottom side and automatically change position of the egg. The entire element is controlled using AT89C52 Microcontroller. The temperature of the incubator is maintained at the normal temperature using PID controller implemented in microcontroller. Mathematical model of the incubator, actuator and PID controller were developed. Controller design based on the models was developed using Matlab Simulink. The models were validated through simulation and the Zeigler-Nichol tuning method was adopted as the tuning technique for varying the temperature control parameters of the PID controller in order to achieve a desirable transient response of the system when subjected to a unit step input. After several assumptions and simulations, a set of optimal parameters were obtained at the result of the third test that exhibited a commendable improvement in the overshoot, rise time, peak time and settling time thus improving the robustness and stability of the system.

Keyword: Egg Incubator System, AT89C52 Microcontroller, PID Controller, Temperature Sensor.