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Designing Fully Automatic Forced Air Egg Incubator Using PIC Microcontroller

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***Abstract*: A microcontroller based minimal effort programmed egg hatchery has been planned utilizing locally accessible material and assets to accomplish a financially savvy plan. The planned hatchery consolidates the setter and hatcher together. The hatchery comprises of three primary parts; packaging which guarantees clean and great warm disconnection, constrained air to guarantee same temperature everywhere on the egg, programmed eggs plate going framework to empower legitimate development of extra-early stage layer during brooding and the microcontroller-based control unit to screen and control the hatching boundaries for example temperature, moistness, ventilation, egg turning satisfies as nature brooding with the assistance of sensors and other related gadgets. A sixteen character by four lines and sixteen character by two lines fluid gem shows is added to imagine settings during arrangement and the framework status during activity. The hatchery has had the option to brood for hen, duck, quail eggs. The temperature and stickiness were controlled cautiously. It has programmed egg turning framework, and caution on the high and low temperature and dampness. The reason for this undertaking is to configuration, build and carry out microcontroller based ease all-inclusive homegrown hatchery which can brood various kinds of eggs and to modernize present smaller than expected incubation center innovation.**

***Keywords*: Hatchability, Hatcher, Incubator, Setter.**

1. Introduction

The quickest developing and most beneficial Agri-business in the current Indian market situation is Poultry cultivating. It is the type of creature cultivation which raises tamed birds like chickens, ducks, turkeys, quails and geese to deliver meat or eggs for food. Individuals in our nation raise poultry essentially so as to get meat and egg to satisfy their everyday utilization. Egg hatchery assumes a significant part in the general poultry creation framework particularly during the day old chick advancement. A piece of the hidden jobless individuals can be utilized with the family poultry advancement and creation business by delivering their own DOC (Day Old Chick) in their own egg hatchery, to lessen the current DOC and bring forth egg issue. An egg hatchery is a piece of gear that makes the ideal conditions for an egg to brood. Fruitful brooding climate relies upon keeping up positive conditions for incubating ripe eggs. Temperature, Humidity, Ventilation and Turning recurrence during the brooding time frame uniquely influence the hatchability of ripe eggs and chick quality. Hatching is the administration of a prepared egg to guarantee agreeable advancement of the undeveloped organism inside the treated egg into a typical chick, cycle of keeping the treated eggs warm to permit appropriate improvement of the incipient organism into a chick.

2. Methodology

This chapter describes the various steps involving in this work, such as Egg Incubator controller design and structure design.

A. Block Diagram

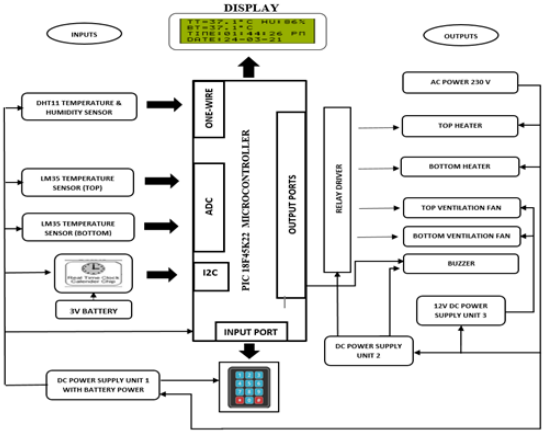

Fig. 1. Block diagram of temperature control, humidity, date & time

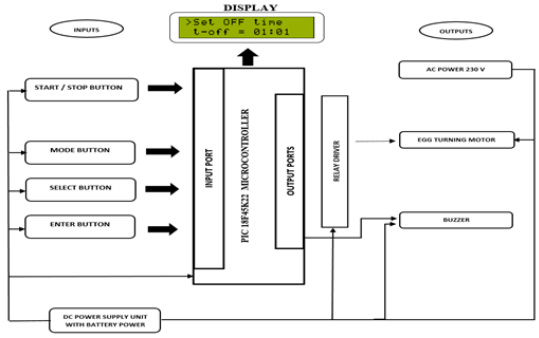

Fig. 2. Block Diagram of Egg Turning Motor, Timer Setting & Control.

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B. *Flow chart*

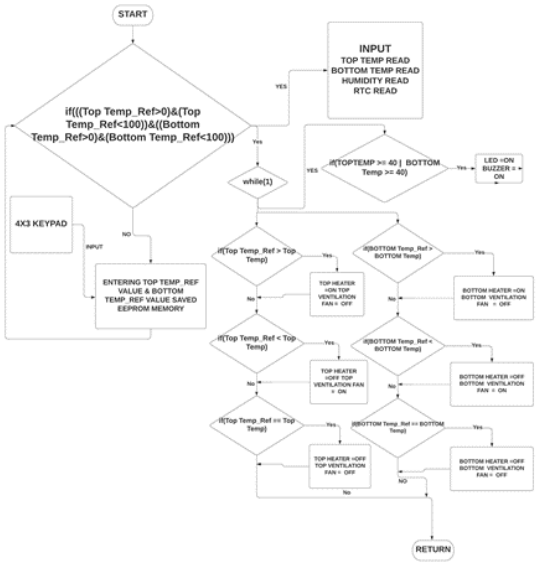

Fig. 3. Flow Chart of temperature control, humidity, date & time.

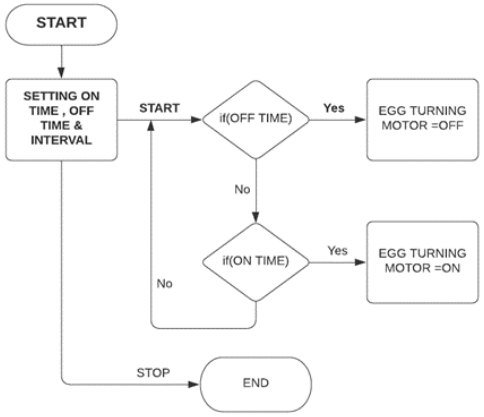

Fig. 4. Flow chart of egg turning motor, timer setting & control.

C. *System Operation*

1) *Temperature Control*

- A programmed temperature control framework can screen and control the temperature inside the hatchery without human mediation. The main role is to deal with the temperature inside the hatchery dependent on setting by the client of the framework.
- The PIC microcontroller is utilized to naturally control the temperature inside the hatchery. The ideal temperature setting is entered utilizing a keypad and put away in non-unstable memory of the PIC, in the EEPROM to keep this setting in any event, during the framework reset or force OFF. A 3x4 keypad is associated with PORT B. The '*' key of the keypad is utilized to get to setting menu and the '#' key is utilized to ENTER (Save) the setting in PIC EEPROM. The Top radiator, Bottom warmer, Top ventilation fan and Bottom ventilation fan are controlled utilizing semiconductors (BC108) and 5v Relays associated with pins RD0 and RD1 of the microcontroller separately.

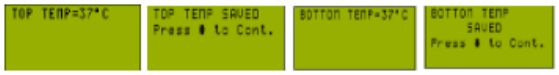

Fig. 4. Setting ref temperature setting & control

- The temperature of the zone is estimated utilizing two simple temperature sensor, the LM35 accuracy coordinated circuit temperature sensor is utilized for this. The microcontroller peruses the temperature continuously and contrasts it and the ideal worth. On the off chance that the ideal worth is higher than the deliberate worth, the warmers is switched ON to create heat for the eggs. The warmers are turned OFF once the ideal temperature is reached. If then again the deliberate qualities is higher than the ideal worth, the fans is turned On to cool the region inside the hatchery to keep up temperature at 37°C. The LCD shows the deliberate temperature from the sensors continuously.

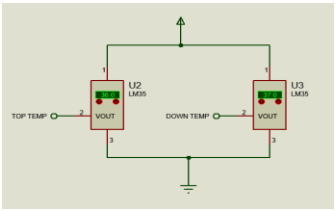

Fig. 5. LM35 sensors

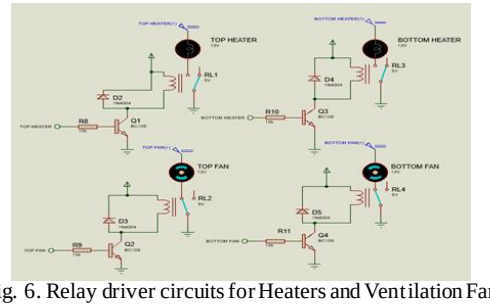

Fig. 6. Relay driver circuits for Heaters and Ventilation Fan

- During fire up, the LCD will show "Programmed INCUBATOR", following two seconds, if there is no reference temperature set, the program will go in arrangement mode and brief the client to enter the reference temperature and save it in PIC EEPROM. Be that as it may, if the reference temperature has effectively been set, the program will go straight in activity mode showing the top temperature and the base temperature esteems which is perused from the sensors.

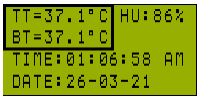

Fig. 7. Displaying Top Temperature and Bottom Temperature.

- When the temperature of top warmer or base radiator

increments above 39°c then a ringer associated with the PORT C will sound ON and the LED will show by ON and OFF.

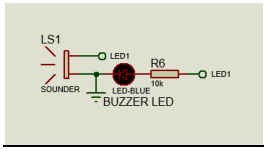

Fig. 8. Buzzer and LED for over temperature indication

2) Humidity

- Humidity is a proportion of the measure of water fume noticeable all around. Relative mugginess estimates the measure ofwater noticeable all around comparable to the greatest measure of water fume (dampness). The higher the temperature, the more water fume the air can hold.

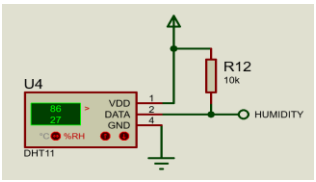

Fig. 9. DHT11 sensor circuit

- The DHT11 sensor's advanced yield is given to the microcontroller to show the Relative Humidity (RH%) inside the hatchery. Dampness is deliberately controlled to forestall superfluous loss of egg dampness. The overall stickiness in the hatchery among setting and three days before bring forth ought to stay at 58-60% or 28.9-29.4 °C, wet-bulb. When incubating, the dampness is expanded to 65% relative stickiness or more.

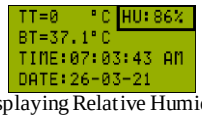

Fig. 10. Displaying Relative Humidity in LCD

3) Real Time Clock and Calendar

- The DS1307 ongoing clock (RTC) IC is a 8 pin gadget utilizing an I2C interface. The DS1307 is a low-power clock/schedule with 56 bytes of battery reinforcement SRAM. The primary benefit of RTC is that they have a game plan of battery reinforcement which keeps the clock/schedule running regardless of whether there is power disappointment.
- The DS1307 has two yield ports SCL and SDA. The SCL pin is associated with the third Pin of PORT C and the SDA pin is associated with the fourth pin of PORT C. The correspondence between the RTC and PIC microcontroller utilizing I2C convention.
- The DS1307 is used to display the current Date and Time in the LCD to monitor the Incubation process duration.

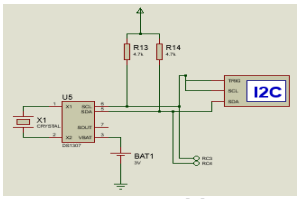

Fig. 11. RTC module circuit

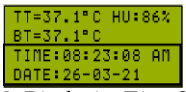

Fig. 12. Displaying Time & Date

4) Timer for Egg Turning Motor

Digital clock switches are utilized to control the activity of electrical gadgets dependent on a modified timetable. A programmable advanced clock dependent on the PIC 18F45K22 microcontroller that can be modified to plan the on and off activity of an Egg Turning Motor. The Motor is controlled through a transfer switch. This clock switch permits you to set both on and off time. That implies, you can program when would you like to turn the gadget on and for how long you need it to be stayed on. The greatest time stretch that you can set for on and off activity is 99 hours and 59 minutes. Here an intuitive UI utilizing a 16×2-character LCD alongside 4 push buttons. The clock gets contributions from the 4 press catches. Their capacities are depicted as follows:

- *On/off time:* This clock gadget permits you to set both on and off time. At the point when the clock is at first fueled on, the gadget is in off condition and both on and off occasions are 0. Squeezing this catch, you can switch between the on and off time on the showcase.
- *Select:* This permits you to choose between the on and off time settings just as hour and moment digits. The chose digit is increased by squeezing the ON/OFF TIME button.
- *Enter:* When the fitting hour and minutes are chosen, squeezing ENTER settle the relating on or off time.
- *Start/stop:* is to begin or stop the clock. In the event that the clock is as of now on, you can stop it whenever during its activity by squeezing this catch.

Fig. 13. Setting ON time & OFF time

- For our hatchery we possess to set the ON energy for 1 moment and OFF an ideal opportunity for 4 hours. By the manner in which the Egg turning Motor will pivot eggs for 1 moment ceaselessly and stays OFF for 4 hours. This cycle works consistently Until the START/STOP button is squeezed.
- The Egg Turning Motor will pivot multiple times/day briefly. The transfer controlled circuit controls the Egg Turning Motor.

3. Hardware and Software Description

1) Hardware

The hardware components used for simulation is listed below,

- PIC18F45K22
- LM35 Sensor
- DHT11
- Buzzer
- 4x3 Keypad
- 12v DC Fan
- 5V Relay
- LCD Display
- AC 3 RPM Motor
- AC Lamp

2) Software

The software used for simulation and Code,

- Proteus 8 Professional
- Mikro C pro for PIC.

4. Results and Discussion

1) Simulation Design

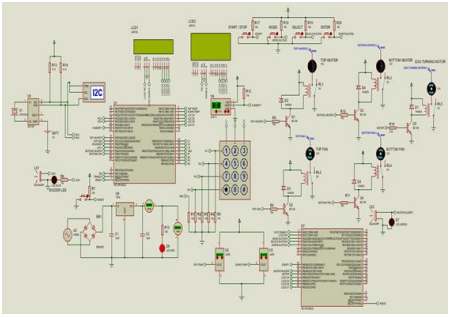

Fig. 14. Simulation Design of the system

2) Simulated Output

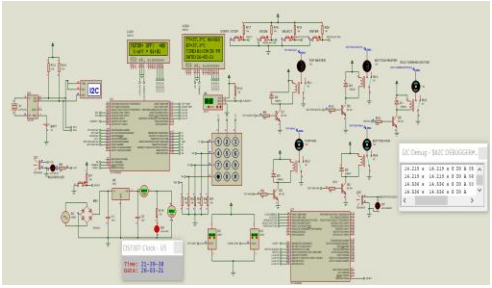

Fig. 15. Simulated output of the system

I finished my venture "Planning completely programmed constrained air egg hatchery utilizing PIC microcontroller". In the reproduction arrangement, every one of the info sensors and the yield gadgets are associated with the PIC microcontroller. The temperature sensors and DHT11 are functioning admirably and give exact aftereffects of temperature and Humidity. With the temperature sensors, the programmed temperature control framework is performed well by turning ON the radiators and killing the Ventilation fans when the LM35 esteem is underneath the ideal worth and killing the warmers, and turning ON the Ventilation fans when the LM35 esteem is over the ideal qualities. To keep away from an over-temperature signal is utilized the ringer shows when the temperature is over 39 ° C. RTC module assists with showing the current date and time. The Timer idea assists with killing ON and the Egg turning engine with predefined on schedule and OFF time esteems. Since it is a reproduction interaction, later on the equipment part can be carried out with Low-cost materials with high proficiency of egg incubating rate.

5. Conclusion

In this project, "Fully automatic forced air egg incubator using pic microcontroller" is designed using components in the Proteus software and the programming for the simulation is done in using MIKRO C PRO software. This task utilizes microcontroller to control the boundaries of hatchery for steady and exact egg brooding interaction. The control unit depends on a PIC microcontroller. It is worked for checking (room temperature), control (hatchery temperature, egg turning, ventilation and mugginess) and showing various boundaries for example temperature, moistness, time, date and set temperature and so on Going further, the greater part of the units can be manufactured on a solitary alongside microcontroller consequently making the framework reduced in this way making the current framework more viable. To make the framework material for continuous purposes segments with more prominent reach should be executed.

6. Future Scope

- This planned hatchery model could be one of the least expensive with a sensible limit of eggs, gainful to limited scope to enormous scope poultry ranchers and examination research center.
- The hatchery can be adjusted to run on sunlight based or wind power since the force prerequisite of the hatchery in the wake of arriving at its set temperature is very low (69 Watts or under 69 Watts), which might be useful for the provincial reproducers, where there is a regular force cut or no electrical force supply.
- In future, this undertaking can be adjusted by utilizing a PID regulator with overshoot as low as conceivable utilizing better quality microcontroller to control temperature likewise improve the turning framework.

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