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System of monitoring on carbon dioxide of broiler chicken growth in closed house

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Abstract. The broiler is one of the chicken to be able to grow fast for producing meat in a relatively short time. In modern times broiler farms have entered the industrial scale. Poultry in this case broiler chickens breathe by inhaling oxygen and releasing carbon dioxide gas and water. In this case, if the oxygen content in the cage is too low, this condition is related to the temperature and humidity of the cage, it will affect the production and health of the chicken. This study aims to determine to find out the distribution of carbon dioxide in broiler farming in a closed house. Method, Equipment was used namely hardware and software specifications; the first, Laptop Creation of programs and real-time data retrieval is done using an Intel Core i3 - 2310M type laptop, 2 GB RAM memory and Microsoft Windows 7 operating system. The second, the Toolbox. power, driver, actuator. The three Closed House and Enclosure Support Devices measuring 1.8m x 1.3m x 1m are made of boards, equipped with fans, lights, chickens, and sensors. The research support tools include: multimeters, cables, solder, lead, and lead suction. The fifth, MATLAB Software Th system designed is simulated with MATLAB software version 7.8.0.347 (R2009a) with Simulink facilities. The sixth is Code Vision AVR software for creating and coding programs. Code vision used is version 1.25.9. The results of monitoring system carbon dioxide test integrated in real-time the first produce 500 ppm in free air while the second test produces 1000 ppm carbon dioxide if based on the characteristics still carbon dioxide threshold in the closed house.

1. Introduction

Indonesia is an agrarian country where most of the people are livestock and farming. Broilers (broilers) are fast-growing chickens that can produce meat in a relatively short time (5-7 weeks). Broilers are one source of animal protein that can meet the needs of animal protein in Indonesian society. Broilers have advantages and disadvantages. The advantage is the soft meat, large body size, wide chest shape, solid, and contains and relatively fast growth. Broilers are one source of animal



protein that can meet the needs of animal protein in Indonesian society. Broilers have advantages and disadvantages. The advantage is the soft meat, large body size, wide chest shape, solid, and contains and relatively fast growth [1,2].

The need for human protein increases with an increasing population. The increasing needs can be met by increasing the production of protein from livestock both in terms of quality and quantity. One source of animal protein is broiler chicken meat. Judging from the nutritional value, broiler chicken meat is not much different compared to meat from other livestock [2].

Closed house is a cage system that is able to provide quality air, both in terms of composition, speed and the right amount so that the chicken is comfortable. This enclosure will minimize the influence of environmental conditions that are currently very volatile. The main principle of a closed house is to provide comfortable conditions for livestock by removing heat from the cage generated from the chicken's body, lowering the temperature of the incoming air (if needed), regulating the appropriate humidity and releasing harmful gas, such as carbon dioxide (CO₂) and ammonia (NH₃). And all these processes can be set automatically. This convenience is often one of the interesting considerations to change an open house cage into a closed house.

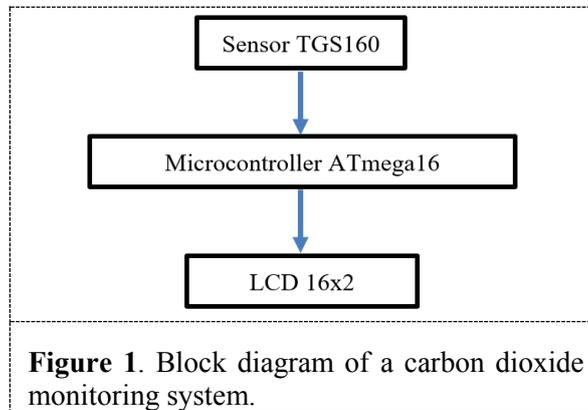
The function of the closed house is to minimize contact between chickens and environmental conditions outside the cage, create an ideal environment in the cage, increase chicken productivity, land efficiency and labour and create an environmentally friendly animal husbandry business system that must be able to regulate the temperature of 26°C-33°C and gases dangerous substances such as carbon dioxide (CO₂) 300-3000 ppm [3]. Carbon dioxide (CO₂) is a gas that is odourless, colourless and one and a half times heavier than clean air (O₂). CO₂ is produced from the body's metabolic processes (respiratory processes, red) along with the production of body heat. This gas can cause shortness of breath in chickens if the levels are very excessive. High levels of carbon dioxide will cause chicks lethargy and decreased weight of the chicken. However, the only practical way to get excess water from the chicken coop is through ventilation where the fan circulation must be optimized so that air circulation from the outside into the cage is fresher [4].

The state-of-the-art monitoring system of humidity and ammonia temperature of broiler chickens in a closed house performed three scenarios of the starter, grower, and finisher periods [2-6]. monitoring system developed to monitor CO₂ in circulation in buildings using wireless [7]. The artificial intelligence systems developed the application of knowledge-based expert systems to monitor and control the CO₂ capture process properly [8]. The analysis technique for monitoring carbon dioxide is NDIR Analyzer. Gas analyser is a tool that can analyse the type of air gas around the environment [9]. Monitoring CO₂ emissions from one source is transportation of CO₂ emissions [10]. The advantage of producing sensing and transduction methods has optical, electrochemical, conductivity differences based on chemical compounds [11]. The methods of monitoring the Carbon Monoxide emissions by using Wireless Sensor Networks on the air pollution [12]. An implementation to CO₂ the geologic sequestration in Algeria as along a zone fault/fracture intersected by the injection well [13]. In the development of this paper a monitoring system for broiler chicken carbon dioxide in a closed house. The purpose of this study was to determine the distribution of carbon dioxide growth of broiler chickens in a closed house. The purpose of this study was found out the distribution of carbon dioxide during the growth of broiler chickens in a closed house.

2. Methods

Equipment was used namely hardware and software specifications; the first, Laptop Creation of programs and real-time data retrieval is done using an Intel Core i3 - 2310M type laptop, 2 GB RAM memory, and Microsoft Windows 7 operating system. The second, the Toolbox. power, driver, actuator. The three Closed House and Enclosure Support Devices measuring 1.8m x 1.3m x 1m are made of boards, equipped with fans, lights, chickens, and sensors. The research support tools include: multimeters, cables, solder, lead, and lead suction. The fifth, MATLAB Software Th system designed is simulated with MATLAB software version 7.8.0.347 (R2009a) with Simulink facilities. The sixth is Code Vision AVR software for creating and coding programs. Code vision used is version 1.25.9. A

carbon dioxide monitoring system is a system without feedback. The carbon dioxide sensor reading on the closed house system will then be sent to the microcontroller and then continue to be displayed via a 16x2 LCD, as shown in Figure 1.



The TGS4160 carbon dioxide sensor is a gas sensor specifically used to measure carbon dioxide levels in the room on a closed house. The ATmega16 microcontroller functions as its brain a tool to store the program that the programmer wants. The microcontroller reads the sensor then sends the data to the Matlab Simulink via a USB serial circuit. In addition to sending data, the microcontroller also receives data from monitoring output data from Matlab used to move the actuator if the data is not appropriate. The ATmega16 microcontroller system is made up of several input-output devices. The relationship of the ATmega16 microcontroller with the input-output device is shown as in Figure 2.

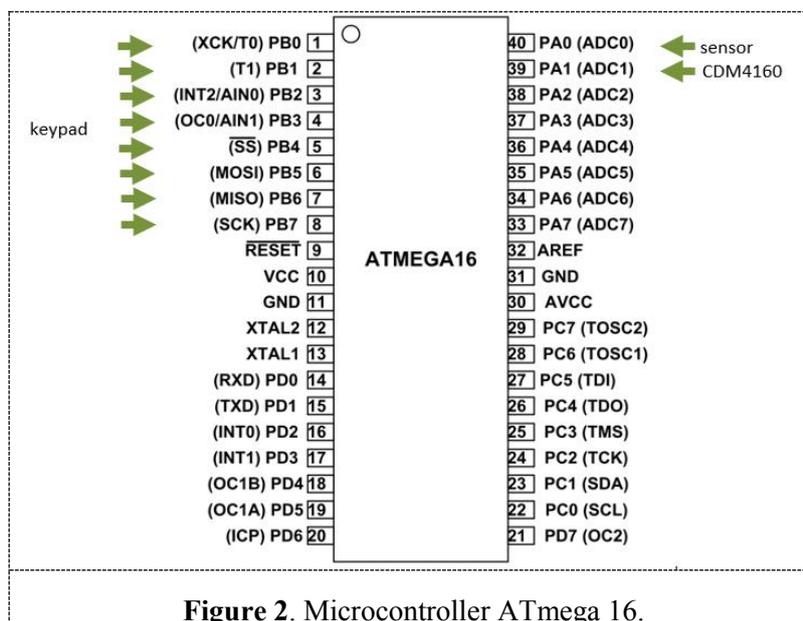


Figure 2. shows the minimum system design of the ATmega16 microcontroller and its relationship with various I -O (Input / Output) equipment. I / O equipment used is CDM4160, zero-crossing detector, AC voltage controller, LCD, keypad. To perform these functions, the allocation of the use of ports is available on the ATmega16 microcontroller. Pin A.1 is connected to CDM4160. Port B functions as a keypad input receiver. Port C is connected to the LCD display. Pin D.2 as an external interrupt connected to the zero-crossing detector. Pin D.3 is connected to the AC voltage controller which is used to control the heater (heater), Pin D.4 is connected to the AC voltage controller on the

fan. The ATmega16 microcontroller circuit uses an external crystal oscillator as an oscillator external frequency generator of 11.0592 MHz which can be used as a pulse source for the CPU.

3. Results and discussion

3.1. Monitoring system testing of carbon dioxide

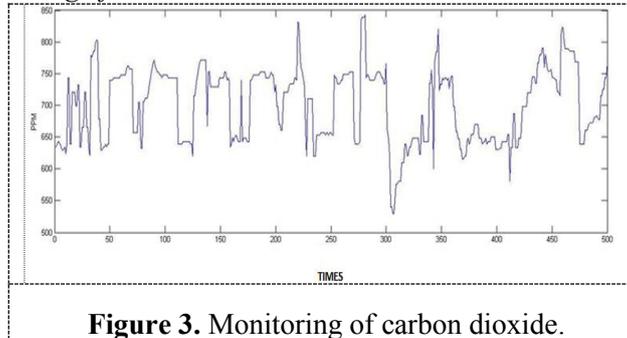


Figure 3. Monitoring of carbon dioxide.

Monitoring systems produce carbon dioxide data simulations in free air, carbon dioxide levels below 500 ppm, so it is still said to be clean air (Fig. 3). This place shows away from the by-products of burning fossil fuels, inorganics released from volcanoes and other geothermal processes such as hot springs.

3.2. Monitoring system testing of carbon dioxide

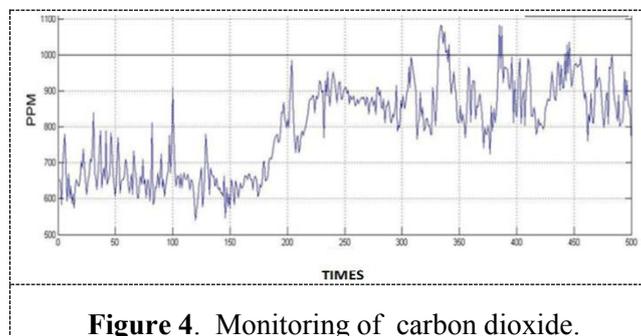


Figure 4. Monitoring of carbon dioxide.

Figure 4 above is Carbon dioxide simulation results show the value of carbon dioxide travel 1000 ppm. This happens during the day and evening, so when carbon dioxide touches 1000 ppm.

4. Conclusion

Monitoring system carbon dioxide test integrated in real-time the first produces 500 ppm in free air while the second test produces 1000 ppm carbon dioxide if based on the characteristics still carbon dioxide threshold in the closed house.

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References

- [1] Murtidjo B A 1987 *Pedoman beternak ayam broiler* (Yogyakarta: Kanisius)

- [2] Allimuddin 2012 *Supervisory Control Environmental Closed House Model* (Bogor: Institut Pertanian Bogor)
- [3] Syafar A M 2018 Desain Sistem Kandang Ayam Broiler Tipe Close House Berdasarkan Parameter Suhu dan Kelembaban *J. INSTEK (Informatika Sains dan Teknol.)* **3** 91–100
- [4] Masriwilaga A A, Al-hadi T A J M, Subagja A and Septiana S Monitoring System for Broiler Chicken Farms Based on Internet of Things (IoT) *Telekontran: Jurnal Ilmiah Telekomunikasi, Kendali dan Elektronika Terapan*
- [5] Seminar Kudang Boro A, Subrata I D M and Nomura N 2012 Temperature control system in closed house for broilers based on ANFIS *Telkomnika* **10** 75
- [6] Alimuddin K B S, Subrata I M D and Sumiati N N 2011 A supervisory control system for temperature and humidity in a closed house model for broilers *Int. J. Electr. Comput. Sci. IJECS, ISSN 1231–2077*
- [7] Habibie N, Wiska R, Arshad A, Nugraha A M and Diantoro R 2016 CO₂ Monitoring System for Prototype of Building Air Quality Management Using Wireless Sensor Network, *Intl J. ICT* **2**
- [8] Zhou Q, Chan C and Tontiwachiwuthikul P 2010 Monitoring and diagnosis of the carbon dioxide capture process using an intelligent system approach *Procedia Environ. Sci.* **2** 2–8
- [9] Suryati I, Lubis M T and Mawaddah N 2018 Simulating the potential for Carbon Dioxide (CO₂) reduction by the application of environmentally friendly transportation (Case study: Gatot Subroto Street, Medan City) *E&ES* **126** 12116
- [10] Ismayanti R I, Boedisantoso R and Assomadi A F 2011 Kajian emisi Co₂ menggunakan persamaan mobile 6 dan mobile combustion dari sektor transportasi di Kota Surabaya *Tek. Lingkungan. Inst. Surabaya Inst. Teknol. Sepuluh Nop.*
- [11] Santonico M, Pennazza G, Parente F R, Grasso S, Zompanti A, Stornelli V, Ferri G, Bizzarri M and D'Amico A 2017 A gas sensor device for oxygen and carbon dioxide detection *Multidisciplinary Digital Publishing Institute Proceedings* **1** 447
- [12] Paruchuri V L and Rajesh P 2018 IoT for monitoring carbon monoxide (CO) emissions using wireless sensor networks in smart cities *Int. J. Eng. Technol* **7** 1045–50
- [13] Vasco D W, Dixon T H, Ferretti A and Samsonov S V 2020 Monitoring the fate of injected CO₂ using geodetic techniques *Lead. Edge* **39** 29–37