



Design and Manufacture of Formaline Detection in Food Ingredients Based on Arduino

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ABSTRACT

The use of formalin in food is now widely circulated in big cities. Formaldehyde is always chosen by producers so that these products are more durable and also inexpensive to help entrepreneurs reduce production costs. The difficulty of the community in identifying the characteristics of the presence of formaldehyde makes the community restless and feels disadvantaged. Therefore, a tool is designed to detect formaldehyde in arduino-based foods. This arduino-based system can test food ingredients practically and effectively because it doesn't take long to see the results. HCHO sensors are used to detect samples in food ingredients. With the HCHO sensor, humans can know whether the food contains formalin or not. The work process of this tool through the gas released from the food material. The test results will be displayed on the LCD screen, where the output is positive or not which has been detected by the sensor.

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1. INTRODUCTION

At this time the level of abuse of chemicals is very high, especially in foodstuffs, therefore it is very important for people to be careful in buying food ingredients. One of the triggers for abuse is the spoilage of food ingredients and the lack of public knowledge of the dangers, preservatives.

The rampant abuse of formaldehyde as a preservative in foodstuffs and the difficulty for the community to identify the characteristics of its presence in plain sight makes the community restless and aggrieved. So, a tool is needed to quickly and easily detect its operation as an indicator of the presence of formaldehyde in food ingredients.

In accordance with the Decree of the Minister of Health RI No.772 of 1998 concerning Food Additives, the addition of formaldehyde to food is clearly prohibited. The Food and Drug Supervisory Agency (BPOM) in this case has the authority to supervise the use of formaldehyde which is used as a food preservative as stated in one of the BPOM missions, namely to protect the public from the dangers of misuse of dangerous substances and the risks due to the use of these substances [1]–[3].

Several researchers have conducted research at ATmega328 microcontroller for design and testing with more resource [4], [5]. In this study we focused to used the ATmega328, HCHO sensor and Arduino to detected the formaline in food ingredients. With the design of this tool, it will help the community, government, and other parties to easily detect the presence of formaldehyde so that no more people are deceived or harmed by irresponsible parties. Based on the background above, the goal of this study to design and manufacture of formaline detection in food ingredients based on arduino.

2. RESEARCH METHOD

In this study we design a system block diagram is a set of activities that describe in detail how the system will run, designing details of the system to be made so that the system is in accordance with the requirements set in the system analysis stage. This system design aims to determine the source of input, data processing, and output carried out by the system. The components needed in the block diagram are the Arduino Uno, the HCHO sensor, relay, start button, fan button, LCD, and the LM2596 stepdown module [6], [7]. The block diagram design can be seen in Figure 1.

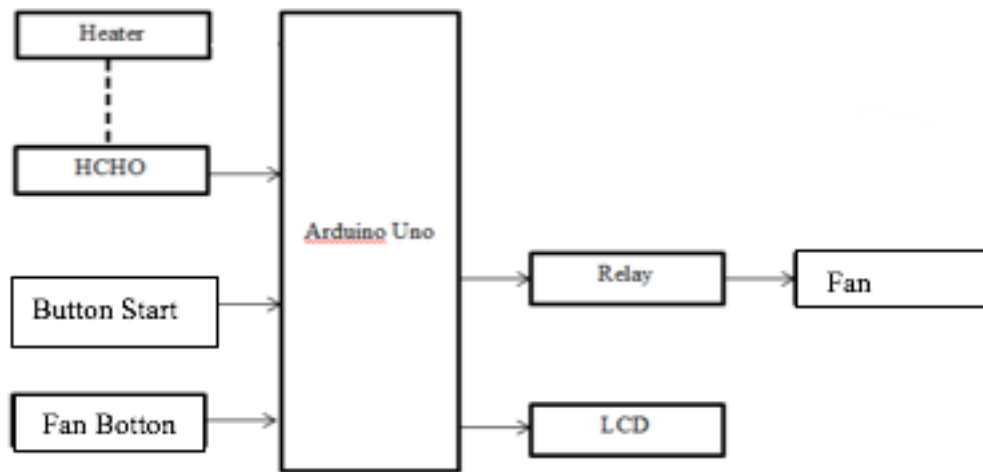


Figure 1. Block Diagram for Formaldehyde Detection in Food Ingredients

3. RESULTS AND DISCUSSION

To more easily understand how the tool works, it can be seen from the complete range of tools as a whole. The complete series of Designing and Making Formaldehyde Detectors in Arduino Uno-based Foodstuffs can be seen in Figure 2.

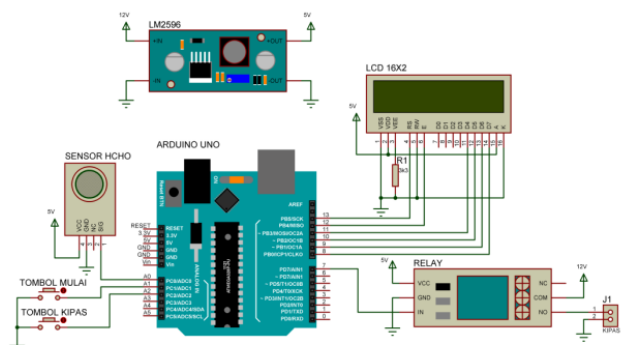


Figure 2. Complete Range

In the complete circuit above, this circuit consists of arduino uno, HCHO sensor, start button, fan button, relay, 16x2 LCD, and LM2596. The HCHO sensor circuit consists of one sensor module, and this sensor functions to detect formaldehyde levels in the food ingredients to be tested,

this sensor module has 4 pins, the VCC pin is connected to + 5V, the GND pin is connected negatively to the circuit, the NC pin is not connected and pin SIG is connected to pin AO arduino uno. The series of buttons consists of two buttons, namely the start button and the fan button. Each of these buttons is 2 pins. Pin 1 is connected to the negative of the circuit and pin 2 is connected to pins A1 and A2 of Arduino uno. The LCD circuit consists of one LCD module. This LCD serves to display information on the formalin content of the test results. This LCD module has 16 pins, pin RS is connected to pin 13 arduino uno, pin E is connected to pin 12 of arduino uno, pin D4 is connected to pin 11 of arduino uno, pin D5 is connected to pin 10 of arduino uno, pin D6 is connected to pin 9 of arduino uno, pin D7 is connected to pin 8 arduino uno. The relay circuit consists of one relay module, this relay functions to turn on and turn off the fan based on the Arduino Uno command. The relay has 6 pins where the VCC pin is connected to + 5V, the GND pin is connected negatively to the circuit, the IN pin is connected to the arduino 7 pin, the COM pin is connected to + 12V, and the fan is connected to NO on the relay module. The LM2596 circuit consists of one LM2596 module. Consists of 2 pins, namely + 12V, 5V. 12V function to connect to +12 power supply. 5 V function to connect all circuits requiring 5V.

Based on the design and manufacture of formaldehyde detectors in Arduino-based foods, the detection device was implemented. Implementation is the stages or processes through which the detection device is designed so that the system works can be used. Starting from the block diagram system design, circuit manufacturing, component assembly, control program development, to the formulation of conclusions.

The power supply is used to supply electric current so that the electric current becomes unidirectional. The power supply output voltage in this circuit is 12.30 volts. The power supply components can be seen in Figure 3.

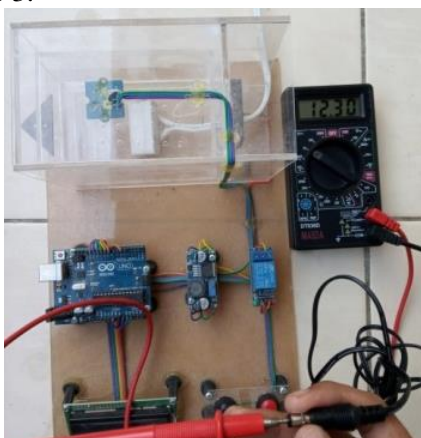


Figure 3. Power Supply Components

The HCHO sensor is used to detect formaldehyde in gaseous food ingredients and the results will be displayed on the LCD. And the result of the multi meter test is 1.67 volts when the food ingredients are detected by formalin. And when the food does not contain formalin, it changes to 0.15 volts as can be seen in Figure 4 a-b.



a



b

Figure 4. a. Sensor Components When Formalin Detects Food Ingredients, b. Sensor Components When Formalin Is Not Detected for Food Ingredients.

The LM2596 Stepdown Module is used to reduce the voltage from 12 volts to a voltage of 5 volts whose function is to provide a working voltage to a circuit that requires a voltage of 5 volts. The output voltage on the LM2596 stepdown module is 4.97 volts. The LM2596 stepdown component can be seen in Figure 5a. The detection button is used to start the formalin detection process. The component of the detection button when not pressed can be seen in Figure 5b and when pressed can be seen in Figure 5c. Display of a series of tools for designing and making formaldehyde detectors in arduino-based foodstuffs. This circuit uses the HCHO sensor and a button as input. Arduino Uno as a process or controller. Relay, fan and LCD as output as Figure 5.d.

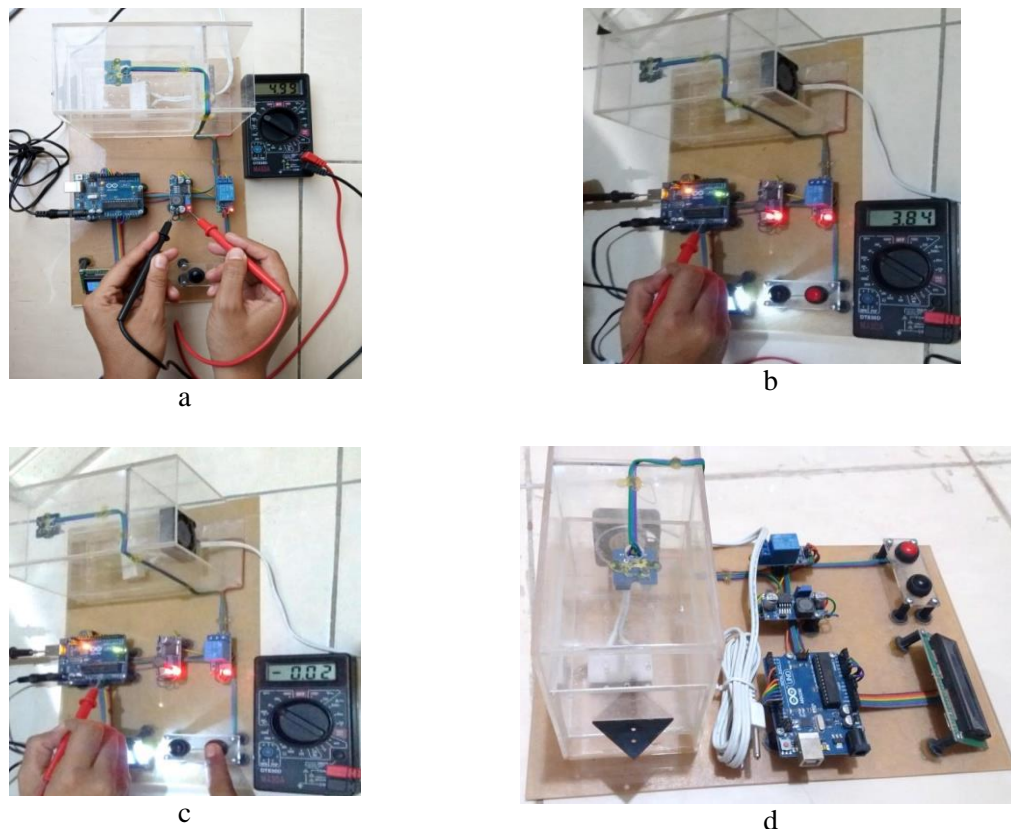


Figure 5. a. LM2596 Stepdown Module Components, b. Component Detection Button when not Pressed, c. Key Detection Component when Pressed, d. Series of Designing and Making Formaldehyde Detectors in Arduino-Based Food Ingredients.

The following is a test of formaldehyde detectors on food ingredients as a whole can be seen in Table 1.

| No | Types of Food Ingredients | Weight (gram) | Time (minute) | Temperature | Level (ppm) | | Voltage (volt) | |
|----|---------------------------|---------------|---------------|-------------|-------------|--------------|----------------|--------------|
| | | | | | Detected | Not detected | Detected | Not detected |
| 1 | Tofu | 200 | 1 | 10 | 53 | 0 | 0.64 | 0.09 |
| 2 | Yellow Noodles | 100 | 1 | 10 | 90 | 0 | 0.77 | 0.08 |
| 3 | Meatballs | 250 | 1 | 10 | 4.5 | 0 | 0.67 | 0.15 |

4. CONCLUSION

Based on the analysis and testing, with this tool can help us to determine the levels of formaldehyde in food ingredients. The circuit uses the HCHO sensor to detect formaldehyde in food ingredients. The system for designing and making formalin detectors in arduino-based foodstuffs has been successfully assembled. To get maximum results in testing food ingredients containing formalin, it takes 1 minute to wait for chemical reactions with food samples.

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