JURNAL RIO

by Holy Store

FORMALIN DETECTION DEVICE IN TOFU FOOD WITH TELEGRAM MONITORING

ABSTRACT

Tofu is a side dish or food used by many people. As a processed food product made from soybeans, white tofu contains protein and high water content so it is very good for the growth of spoilage microorganisms. As a result, tofu is not durable and easily damaged. Damage to white tofu is characterized by a sour and slimy odor. The usual preservation methods for traders include soaking tofu in formalin to make tofu more resistant to decay, resistant to microorganisms, and maintaining its freshness for up to seven days. Formalin to prevent unwanted things. In food Because of the above problems, there needs to be special treatment against excessive use of formalin in food in Indonesia. Formalin should be limited within International Chemical Safety Programme (IPCS) limits for adult foods containing formaldehyde. And also sensors made of polymeric materials combined with activated carbon to detect formalin in food. The development of technology continues with the development of internet products from things that can communicate with each other through the internet. Then a tool was developed to solve the above problem. As part of the research, a formaldehyde detection device will be made in tofu food with a monitoring telegram. The system uses HCHO sensors and a Node MCUESP 32 microcontroller, which is then transmitted through a database that allows you to view through the LCD screen and the Telegram Android smartphone application, of which of course many applications are installed to facilitate this. Users are able to check formalin plates remotely via an internet network connection.

Keywords: Tofu; Lcd16x2; Esp32; Hcho; Telegram

1. INTRODUCTION

Tofu is a side dish or snack that many people eat. As a food product made from processed soybeans, white tofu contains high protein and water content, so it is very good for the growth of spoilage microorganisms. This causes tofu not to last long and break easily. The deterioration of white tofu is characterized by a sour and slimy smell. The way of preservation that sellers often do is to soak tofu in formalin so that the tofu is not easily rotten, resistant to microorganisms, and has a shelf life of up to seven days.(Masyarakat t.t.)

Pencampuran formalin bermasalah untuk digunakan dalam makanan tahu, di mana formalin itu sendiri adalah zat yang tidak berwarna, mudah terbakar tetapi memiliki bau khas. Formalin biasa digunakan untuk mencampur lem dan perekat dan juga dapat dicampur sebagai disinfektan. Haura, Yasin, dan Priuzen t.t.) There are many cases of misuse of formalin as a food preservative in Indonesia. Test results from the Food and Drug Supervisory Agency (BPOM) showed that 56% of 700 food samples containing formaldehyde were taken from Java, South Sulawesi and Lampung. Some of the dangers of foods for health that contain formalin for the human body if consumed continuously are eye irritation, eye cancer and worse, brain cancer that can cause death. (Formalin on raw tofu sold by Pasar Aksara and Lau Dendang Village Medan t.t.)

Technological advances that continue to grow to date by developing internet of things-based products that can communicate with each other via the internet are applied to this formalin detection device through telegram notifications to notify the results of formalin content in tofu foods. (Nodemcu et al. t.t.)

Given the many cases of food preservation, especially tofu using formalin. New solutions are needed to help potential consumers where foods contain formalin and which foods are safe for consumption. (Publish et all t.t.) With the formalin detection tool in tofu food with telegram monitoring, it is hoped that potential consumers will know better which foods contain formalin or not and shorten the time because in Wonoplintahan village, Prambon district, Sidoarjo regency area which is the place of this research there is not only 1 kind of tofu but many therefore this tool is made.

* Coressponding author

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2. LITERATURE REVIEW

Titled the design and manufacture of formalin detection devices in food using Arduino uno-based hcho sensors with notification via sms and Build Automatic Food Detection Devices Containing Microcontroller-Based Hazardous Preservatives. Food samples containing formaldehyde were detected using the Arduino uno microcontroller.(Pertiwi t.t.). Formalin Detection Device in Food Using IoT It can be concluded that the research runs according to its function using Arduino Uno as a microcontroller and DS18S20 Sensor sensor as a temperature gauge.(Syukri dan Mukhaiyar 2021). Design a Formalin and Borax Detection Device in IoT-Based Food Using the TCS3200 Sensor sensor as a light intensity detector in the color of objects and a frequency filter as a transducer that functions to convert current into frequency(Setiawan Sihombing dan Candra 2022). Formalin Detection Device in Fresh Fish Using Arduino and Arduino- Based Hcho Sensor as Microcontroller (Pratmanto dan Nur Khasanah 2021). Design of Formalin Content Detection Devices in Fish Based on Microcontrollers Using Arduino Microcontrollers, LCDs and Buzzers.(Korespondensi dkk. 2021). Design a Formalin Content Detection Device in IoT-Based Food nodeMCU ESP8266 as a microcontroller and lcd as a result display.(Anon t.t.-a)

3. METHOD

This research centers on the hcho sensor sending the signal that has been obtained from the hcho sensor to the 16x2 lcd via esp32 to telegram. The hcho sensor will send data results from how much formalin levels are given esp32 then displayed via 16x2 lcd and telegram application as monitoring.

3.1 System Design

At the stage of realizing this design on a device containing Nodemcu ESP 32 as a microcontroller of this circuit, the HCHO module is used to detect formalin in food and the 16x2 LCD serves as the output and monitor on the HCHO sensor.(Rhodamin dkk. 2020) This tool is made of acrylic material which has dimensions of 2.1cm longand 10cm wide, 5cm high. Design It can function to control the detection of formalin levels in food, especially tofu, whose information is displayed to 16x2 lcd and telegram. Mechanical Drawings In addition to the HCHO sensor, there is also a usb hole to load programs on the microcontroller and to turn on the tool.(Hardiyani, Nisworo, dan Teguh Setiawan 2023)

3.2 Wiring Design

This cable design consists of esp32 as a microcontroller. The first hcho sensor functions as a sender, the second esp32 functions as a receiver, the hcho sensor functions as a data sender, there are hcho, esp32, breadboard, and 16x2 lcd sensors.
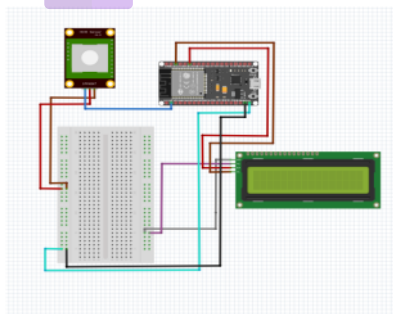

Fig. 1 Wiring Design

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Table 1
Nodemcu ESP32 Port Usage

NO	Nodemcu Esp32port	Usage
1	D21	SDA I2C
2	D22	SCL I2C
3	GND	GND I2C
4	VIN	VCC I2C
5	VP	SIG HCHO
6	GND	GND HCHO
7	VIN	VCC HCHO

Table 1 shows the cable connection between Nodemcu ESP32 and some supporting components such as hcho sensor, Lcd16X2. These cable connections must be established correctly for the system to learn properly.

3.3 Block Diagram

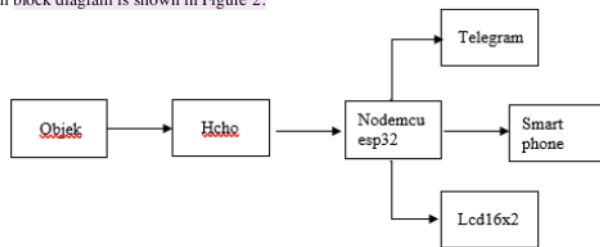The system block diagram is shown in Figure 2.

Figure. 2 Block Diagram System

From figure 2 it can be explained that it consists of 6 parts, namely Object, Hcho Sensor, Nodemcu ESP32, Lcd 16x2, Telegram, Smartphone. This block diagram system has an Hcho sensor component that acts as a sender. While in the data sender Nodemcu ESP32 which acts as a receiver. The output of the Hcho sensor is in the form of Ppm results, then these Ppm results are processed Esp32 into formalin levels from the object, and the results of the Ppm value are converted into the form of PPM values. The output from Hcho sends to Nodemcu ESP 32 via jumper cables. The output received by Hcho is in the form of a PPM value, then processed by Nodemcu ESP32 and forwarded to Lcd 16x2 and Telegram so that the value of PPM from objects contaminated by formalin can be seen through Lcd and Telegram.

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                    ┌──────────┐
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                    └──────────┘
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              ┌──────────────────────┐
              │ Upload program ke     │
              │ Nodemcu esp32         │
              └──────────────────────┘
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                    ╱──────────╲
                   ╱   Objek    ╲
                   ╲            ╱
                    ╲──────────╱
                         │
                    ╱──────────╲
                   ╱  Sensor    ╲
                   ╲   HCHO      ╱
                    ╲──────────╱
                         │
      ┌───────────────┐     ┌───────────┐
      │ Display on 16X2│◄───►│ Telegram  │
      │ LCD            │     └───────────┘
      └───────────────┘           │
           ┌──────────────┐  ┌───────────┐
           │ Display on    │◄─│  Upload   │
           │ smartphone    │  └───────────┘
           └──────────────┘
                │
           ┌──────────┐
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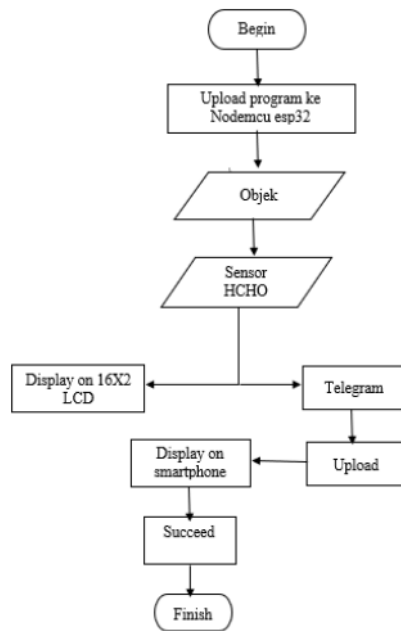
Figure. 3 Flowchart Program

3.4 Slave Flowchart Program

This flowchart begins by uploading the program to Nodemcu ESP32 reading data that has been sent by the Hcho sensor to the object, then the data will be executed Nodemcu ESP32 so as to produce data from the formalin levels. Then the results of the data are uploaded to the 16x2 Lcd and to the Telegram application on the smarphone.

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4 RESULT

Here are the results of the implementation of the tool. In figure 5, this is the result of implementing the tool. The components of the tool are described by numbering as follows: 1. Lcd Display 16x2 1602, 2. 12c IIC Module Lcd, 3. HCHO sensor, 4. Nodemcu ESP32 wifi, 5. Breadboard 400.

Figure. 5 Results of Tool
Implementation

How to use this tool is as follows:
1. Prepare data cables for the power source of the tool
2. Plug the usb cable into the Nodemcu ESP32 to turn on the appliance
3. Turn on the hostpot on the smartphone to connect ESP32 to the telegram application and get notifications and can monitor from telegram
4. Users can see the tool turns on and automatically the tool works

4.1 HCHO sensor testing

The calibration test of the HCHO sensor is performed by applying 5V to the Nodemcu and connecting the A0, GND and VCC pins 5V of the HCO sensor. Then check the voltage of the HCHO sensor with the positive probe connected to the VCC terminal and the GND pin connected to the negative terminal of the multimeter. And if everything works out then it will be seen in the image below.

Table 3

Sensor HCHO

Testing to -	Voltage needed (V)	Multimeter (V)	Deviation (V)	Accuracy (%)
1	5	4,35	0	100
2	5	4,35	0	100
3	5	4,35	0	100
4	5	4,35	0	100
5	5	4,35	0	100

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	Average	5	4,35	0	100

4.2 Testing Wifi Internet Network Connection on ESP32 Microcontroller as data communication

Testing the Wi-Fi internet connection with the ESP32 microcontroller was conducted to determine how fast and how long the ESP32 can initially connect to the Internet for data transfer. From the steps above, ESP32 testing can be seen at the initial stage of connecting to the Internet as a data transmission.(Nugroho t.t.) To find out if your ESP32 is connected to the internet or not, try to calculate the connection time to the server 5 times.

Table 3

Testing Connection of Wi-Fi Internet ESP32

Testing to-	Hotspot Connection on ESP32		Speed
	Condition	Waiting Time	
1st Test	Connected	6	Medium
2nd test	Connected	6	Medium
3rd test	Connected	6	Medium
4th test	Connected	6	Medium
5th Test	Connected	6	Medium

4.3 LCD (Liquid Crystal Screen) I2C 16x2 Testing

Table 6 shows 5 tests with LCD (Liquid Crystal Display) I2C 16x2 showing input scan results from ESP 32 tags showing results according to commands from Esp32.

Table 6

LCD (Liquid Crystal Display) I2C 16x2 Testing

Testing to-	LCD (Liquid Crystal Display) I2C 16x2		Description
	INPUT	OUTPUT	
1st Test	Other Form Detection Tools	Other Form Detection Tools	Success
2nd test	Other Form Detection Tools	Other Form Detection Tools	Success
3rd test	Other Form Detection Tools	Other Form Detection Tools	Success
4th test	Other Form Detection Tools	Other Form Detection Tools	Success
5th test	Other Form Detection Tools	Other Form Detection Tools	Success

4.4 Telegram Notification Testing

Table 7 shows 4 tests, where telegram notification test results have been obtained from ESP tags 32.(Carolin, Yanti, dan Sulistiyowati 2022) Testing found that telegram notification delivery was successful with a delivery time of 3 seconds.(Sohor dkk. 2020)

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Table 7
Telegram Notification Tes

Tes	Telegram		Description
	Input	Time	
1st Test	Current Formaldehyde Levels ppm Value	3	Succeed
2nd test	Current Formaldehyde Levels ppm Value	3	Succeed
3rd test	Current Formaldehyde Levels ppm Value	3	Succeed
4th test	Current Formaldehyde Levels ppm Value	3	Succeed

4.5 Tofu Testing On Hcho Sensors

Testing the hcho sensor on the measurement results of the tool is made in order to find out the ppm value in tofu.

Tofu testing on sensors Hcho

Testing to -	INPUT	OUTPUT Ppm	Deviation (V)	Accuracy (%)
1	Tofu White	6	0,8	100
2	Tofu Poong	5	0,2	100
3	Tofu Milk	5	0,3	100
4	Tofu Yellow	6	0,2	100
5	Tofu Japan	5	0,8	100
6	Tofu Round	5	0,3	100

4.6 Accuracy and Precision

Testing is carried out by comparing the measurement results of tools made with commonly used standard tools. In addition, testing is also carried out by taking results from actual and real-time conditions.
The calculation is carried out using several formulas.(Ajar untuk matakuliah Metode Pengukuran Fisika Program Studi Pendidikan Fisika 2020) including:

1) Average calculation formula.(Anon t.t.-b)

$$\mu = \frac{x1 + x2 + x3 \ldots + xn}{n}$$

a. Rata-rata sensor HCHO (Anon t.t.-b)

b. Perhitungan standar deviasi sensor HCHO (Anon t.t.-b)

2)

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \mu)^2}{n - 1}}$$

$$\sigma = \sqrt{\frac{\sum^n_{i=1} (\text{-}5{,}6)^2 + (7\text{-}5{,}6)^2 + (6\text{-}5{,}6)^2 + (\text{-}5{,}6)^2 + (\text{-}5{,}6)^2}{5\text{-}1}}$$

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$$\sigma = \sqrt{0,36+1,96+0,16+0,36+0,36} \quad \sigma = \sqrt{3,2} = 0,8$$
$$4$$

5. DISCUSSIONS

There are several suggestions for future research that can be consideredinto consideration in the study, such as making a formalin detection device in tofu food with Telegram monitoring that is simpler and more practical to carry everywhere and making a connection that is directly connected to telegram to find out how much the value of formalin content.

6. CONCLUSION

Based on the results of the tests carried out, conclusions can be drawn: (1) Hcho sensor tesT was carried out 5 times and produced an output of 4.35 that proves the hcho sensor can / is still active. (2) Testing of Wifi Internet Network Connection Testing on ESP32 Microcontroller takes 6 seconds at medium speed. (3) Testing of LCD (Liquid Crystal Display) I2C 16x2 that the output produced on the screen shows text corresponding to the input tag of the esp32 program. (4) Telegram notification testing obtained notification input results that match the esp32 program tag. (5) Tofu Testing on Hcho Sensors obtaining different ppm results can be proven that the accuracy of the HCHO Sensor can distinguish which tofu has high and low formalin content. This test runs normally and produces a suitable tool, but it is needed to examine how much formalin content is in foods, especially tofu and can easily monitor the results of formalin levels through the telegram application.

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Article Error You may need to use an article before this word. Consider using the article **the**.

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Missing "," You may need to place a comma after this word.

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Run-on This sentence may be a run-on sentence. Proofread it to see if it contains too many independent clauses or contains independent clauses that have been combined without conjunctions or punctuation. Look at the "Writer's Handbook" for advice about correcting run-on sentences.

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Prep. You may be using the wrong preposition.

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