Indonesian Journal of Applied Technology, Computer and Science
Vol. 2, No. 1, Feb 2025, pp. 1-6
ISSN: 3063-8305

Prototype of Salt Content Monitoring System in Salted Fish Production Process Using Internet of Things

Dimas Frayoga Lubis[1], Mhd Basri[2]
[1,2]Department of InformationTechnology, Universitas Muhammadiyah Sumatera Utara, Indonesia

ABSTRACT

Salting fish is a traditional preservation process that involves the use of significant amounts of salt. The right salt content is essential to maintain the quality and safety of the final product. However, manual measurement of salt content is often inaccurate and time-consuming. Therefore, this study aims to develop an Internet of Things (IoT)-based salt content monitoring system that can monitor salt content in real time during the salting fish production process. This system consists of a salinity sensor connected to a microcontroller and an IoT platform for data collection and remote monitoring. Data obtained from the sensor is sent directly to the IoT platform via a wireless network, allowing real- time monitoring of the salting fish production process conditions remotely. NodeMCU ESP8266 is an IoT tool used to detect the salinity level of salt. The test results show that this system can provide accurate information on salt content in the salting fish production process, thereby helping producers control product quality more effectively. With the implementation of this system, it is expected to increase efficiency and quality in the salting fish production process and minimize errors due to inaccurate salt content measurements. In addition, this system also has the potential to be applied to other food processing processes that require salt content control.

Keyword : Salt content, solution, fish and air humidity, control system

Corresponding Author:
Dimas Frayoga Lubis,
Department of Information Technology
Universitas Muhammadiyah Sumatera Utara
Jl. Kapten Mukhtar Basri No 3 Medan, 20238, Indonesia.
Email : dimasfrayoga531@gmail.com

Article history:
Received April, 2024
Revised April, 2024
Accepted Mei, 2024

1. INTRODUCTION

Fish is one of the food ingredients that is inseparable from the daily food needs of humans, so that almost all over the world rely on fish as an important part of daily food, because of its protein content, nutrients, and others. so that almost every country's fishing industry provides jobs, from small fishermen to business people.

The fisheries sector has an important role in development and growth in Indonesia, especially in terms of expanding employment opportunities, increasing living standards, and has the potential to improve the welfare of the general public, fishermen, fish farming (including pond and freshwater fish farming), and all business actors in other fisheries (Siregar, 2024). The development of the fisheries sector business still faces various obstacles, including the nature and characteristics of marine resources that are easily damaged, so technology is needed to process these fisheries into durable products, especially traditional fish processing activities, especially drying and salting fish are forms of processing that are widely carried out by fishermen (Julian, 2019).

The advantages of fish also have disadvantages, namely that fish rot quickly if there is no supervision of the quality of the fish. The process of fish rotting can be caused by the activity of enzymes found in the fish's body itself, and the activity of microorganisms, the weaknesses possessed by fish have been felt to greatly hinder efforts to market fishery products and often cause major losses, especially when fish production is abundant. Therefore, in order for fish and other fishery products to be utilized optimally, their condition needs to be maintained (Sa'adah, 2022).

One of the preventions in preventing fresh fish from experiencing the rotting process, the salted fish industry is an important part of the fisheries sector. Where fish are preserved by being preserved by being salted or given salt to inhibit the growth of bacteria and other microorganisms that can damage fish. Salted fish processing is a promising business, because the price is affordable and many people consume it so that it can be sold to all levels of society.

Making salted fish is an easy way to process or preserve fish. Salting can be done in 2 ways, namely dry salting and wet salting. In dry salting, both large and small fish can be used. This salting uses crystal salt. The processed fish is sprinkled with salt and then arranged in layers. In wet salting, the fish is soaked in a saturated salt solution which is placed in a closed and leak-proof container (Putri et al., 2023).

The quality standard for salted fish SNI 8273:2016 shows that the permissible salt content is 12-20%. This indicates that to achieve the quality standard for salted fish, it is necessary to process it using an additional salt concentration of 15%. Excess salt can cause hypertension, stroke, kidney failure, coronary heart disease, obesity, high cholesterol and fat in the blood (Reizka a.Sainnoin, et al., 2019). One effort to prevent excessive salt levels and help the fisheries industry sector in processing salted fish is to improve the processing of the salted fish industry by developing a salt content monitoring tool during the processing of salted fish.

2. RESEARCH METHOD/MATERIAL AND METHOD/LETERATURE REVIEW

A. Research Stage

At this research stage there are several research stages or research designs which are systematic steps in conducting research.

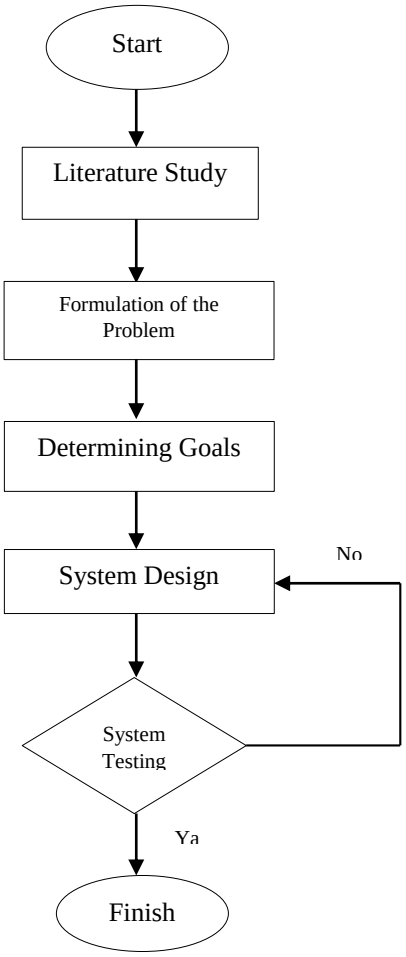

Fig 1. Research Stage

The following is an explanation of the research stages in the image above.

1. Literature study
   The study conducted a literature study by collecting and understanding theories from theory books, research journals, and other authentic library sources related to the research topic, namely the salt content monitoring system, NodeMCU
2. Problem Formulation

At this stage, the researcher formulated the problem which is the reason this research was conducted. This problem formulation aims for researchers to know the problem specifically so that it can be easier and more focused to solve the problem through research.

3. Determining Objectives
   The researcher determined the purpose of the research, namely to create a salt content detection system control tool with the Prototype method which is monitored using IoT technology. The monitored data changes to the salt content value which will be seen in the form of how much salt content is during the soaking process when processing salted fish in order to facilitate and obtain maximum quality in the salted fish soaking process using the salt content detection system.
4. System Design
   This stage of the system is the design stage of the system design or capital of the tool to be made. The system design consists of a system block diagram and an overall system overview.
5. System Design
   Product testing is done to determine the level of success of the tool that has been made. At this stage there are two tests, namely hardware and software.

B. Equipment Used

In designing this system, several tools, materials, and supporting application programs are needed, which are grouped into 3 parts, namely hardware, software, and supporting tools. The hardware used includes a laptop, smartphone, NodeMCU ESP8266, salinity sensor, 12C LCD, jumper cable, Bylnk, and tools. The software used includes the Windows 11 operating system, Arduino IDE 1.8.19, and the Blynk application. Meanwhile, the supporting tools used in building this tool include an electric soldering iron, bolts, glassboard, cutting pliers, and a screwdriver.

3. RESULTS AND DISCUSSION

A. Tool Design Results

Hardware design is the next stage after the previous design and some known components. At this stage, the design begins with the NodeMCU ESP8266 and the salinity sensor that will run the tool through the salt content to automatically detect the salt content. The design results are shown in Figure 2.

Fig 2. Tool Design Results

B. Overall Tool Testing

The overall testing of this tool is a combination of the tests that have been carried out for each previous component. When the monitoring system is activated, the program will run, the salinity sensor, which is used to measure salt content, will measure the salt content in a solution in the wet salting process. Continued by sending the results of the salt content measurement to the NodeMCU ESP8266, which is set in the program. To find out the salt content in the wet salting, the value can be seen on the LCD (Liquid Crystal Display) and Blynk.

C. Code Implementation

After the hardware is complete, the next stage is to create an algorithm that will help configure the system on the tool that has been made. The working principle is used when designing this interface display. This tool and the automatic temperature control system work well. This temperature and humidity control system uses an automatic temperature sensor, namely a salinity sensor and a NodeMCU ESP8266 microcontroller is used to monitor the salt content in the solution that will be used for fish immersion and display monitoring data directly on the Liquid Crystal Display (LCD) and Blynk. The script will be created using the C/C++ programming language, and the Arduino IDE software will be used to run it.

D. Salt Content Testing Using Salinity Sensor

At this stage as the author I will conduct salt content testing with different levels in a predetermined container where the division is divided into 3, namely low salt content, which is 0%, then average salt shows 20% and high salt content shows when the number touches 70% and above, at this stage as the author will start testing from 0%.

Fig 3. 0% Salt Content Test

At this stage, as the author knows, the salt content shows a figure of 0% where the tool has not been touched at all by water or fish containing salt so that it does not show an increase in the number on the LED board and for the next stage, the author tested with an average salt content where sufficient salt was placed in the container and showed the following results.

Fig 4. Average Salt Content

The following image shows the salt content in the fish shows a figure of 35% where this is the average or normal salt at that level where this result has been validated in the container automatically using the sensor.

Then the author will test by adding salt levels to the container to find out whether the salt levels are detected as high on the sensor where the results show the following image.

Fig 5. High Salt Content

The following image shows the results of a fairly high salt content in the final test where this figure is displayed as 100% and high salt is written on the LED, at this final stage, the tool was successfully used with a fairly limited container and was also assisted by a notification on the blink later.

Fig 6. Blynk View related to Salt Level Tool

Testing for each component works well, for each component works well, and is as expected by the researcher.

Table 1. Test Result Data on Salt Content Detection System Tool

No	Salt (gr)	Water (ml)	PPM	Salt Content
1	10	100	145	15%
2	20	100	202	20%
3	40	100	509	51%
4	60	100	836	84%
5	80	100	1000	100%

From the results of the salt content monitoring system tool test carried out on 100 ml of water, the salt content and PPM values show different values on the LCD (Liquid Crystal Display) and Blynk screens in table 4.3. At 20 grams of salt, the salt content is 20% and the PPM is 202, indicating that at 20 grams the good salt content in salted fish management uses the wet salting method.

4. CONCLUSION

After going through the design and overall testing stages, the following conclusions were obtained: The design and construction of the salt content monitoring system in the salted fish management process using a salinity sensor works according to the program on the NodeMCU ESP8266 so that it can monitor and view salt levels through the blynk application on a smartphone. Based on tests conducted by researchers, the tool and system work automatically and the maximum salt content limit is 1000 ppm. With NodeMCU ESP8266 it is more effective and efficient.

REFERENCES

Bima Prakarsa, F., & Edidas. (2022). Rancang Bangun Alat Sortir Panen Ikan Lele Berbasis Arduino UNO R3. Jurnal Pendidikan Tambusai, 6(1), 1202–1218.

Dian Permadi Rochmana. (2021). Rancang Bangun Prototype Sistem Kontrol Salinitas Dan Tingkat Ketinggian Air Pada Kolam Terpal Budidaya Lobster Batik Berbasis IoT.

Firdaus, A. N., Hakim, M. R., & Ilham, T. (2023). Pengembangan Water Quality Checker untuk Tambak Budidaya Pesisir. INSOLOGI: Jurnal Sains Dan Teknologi, 2(2), 369–377. https://doi.org/10.55123/insologi.v2i2.1840

Hakimi, A. R., Rivai, M., & Pirngadi, H. (2021). Sistem Kontrol dan Monitor Kadar Salinitas Air Tambak Berbasis IoT LoRa. Jurnal Teknik ITS, 10(1). https://doi.org/10.12962/j23373539.v10i1.59612

Sari, I.P., Batubara, I.H., & Basri, M. (2022). Implementasi Internet of Things Berbasis Website dalam Pemesanan Jasa Rumah Service Teknisi Komputer dan Jaringan Komputer. Blend Sains Jurnal Teknik 1 (2), 157-163

Julian, F. (2019). Analisis Pengembangan Industri Pengolahan Ikan Asin Terhadap Perekonomian Masyarakat Perspektif Ekonomi Islam. 1–63.

Kurniawan, A., Raka Thareq Azis Pohan, & Indra Agustian. (2023). Sistem Kendali Suhu Prototipe Mesin Pengering Biji Kopi Dengan Metode PID dan IOT Monitoring. Jurnal Amplifier : Jurnal Ilmiah Bidang Teknik Elektro DanKomputer,13(1),10–17https://doi.org/10.33369/jamplifier.v13i1.27437

Putri, A. K., Kresnamurti, A., Nailufa, Y., Rakhma, D. N., & Izazi, F. (2023). Edukasi Bahan Kimia Berbahaya untuk Pengawetan Ikan serta Pelatihan Pembuatan Ikan Asin Menggunakan Bahan yang Aman. PARAHITA : Jurnal Pengabdian Kepada Masyarakat, 4(1), 1–9.

Raharjo, E. B., Marwanto, S., & Romadhona, A. (2019). Rancangan Sistem Monitoring Suhu dan Kelembapan Ruang Server. Teknika, 6(2), 61–68.

Sari, I.P., Novita, A., Al-Khowarizmi, A., Ramadhani, F., & Satria, A. (2024). Pemanfaatan Internet of Things (IoT) pada Bidang Pertanian Menggunakan Arduino UnoR3. Blend Sains Jurnal Teknik 2 (4), 337-343

Sa'adah, W. (2022). Upaya Peningkatan Pendapatan Melalui Usaha Pengawetan Ikan Asin Mujair Di Kabupaten Lamongan. Mimbar Agribisnis: Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis, 8(1), 357. https://doi.org/10.25157/ma.v8i1.6792

Siregar, E. S. (2024). Pengaruh Hasil Tangkap Ikan Terhadap Pembangunan Dan Perkembangan Perekonomian Masyarakat Pesisir. 4, 6352–6360.

Susanto, F., Prasiani, N. K., & Darmawan, P. (2022). Implementasi Internet of Things Dalam Kehidupan Sehari-Hari. Jurnal Imagine, 2(1), 35–40. https://doi.org/10.35886/imagine.v2i1.329

Muharman Lubis Ilham Firman Ashari, Debby Erce Sondakh, Rahmawati Rolly Junius Lontaan, Mustarum Musaruddin Indah Purnama Sari, Muh. Nadzirin Anshari Nur, Hanalde Andre Muh. Rais, Janner Simarmata. Internet of Things (IoT) Dan Multimedia: Integrasi Dan Aplikasi. Medan: Yayasan Kita Menulis, 2024, pp.182

Utami, R. S., Roslidar, Mufti, A., & Rizki, M. (2023). Sistem Kendali dan Pemantau Kualitas Air TambakUdang Berbasis Salinitas, Suhu, dan pH Air. Jurnal Komputer, Informasi Teknologi, Dan Elektro, 8(1), 43–48.