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Tablespoon Sterilization Devices Use Ultraviolet (UV) Automatically To Prevent The Spread Of A Covid-19

(Perangkat Sterilisasi Sendok Makan Menggunakan Ultraviolet (UV) Secara Otomatis Untuk Mencegah Penyebaran Covid-19)

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Abstract. A spoon is a tool to be used instead of a hand in reaching for something. It was rounded, hollow, and round. Most of the use of spoons apart from home is also used extensively by food merchants. Tablespoons among the traders were used interchangeably by the buyers. The cleanliness of eating utensils is an important factor and has an impact on the quality of food. Less hygenic washing may include bacteria such as e. coli, vibrio, clostridium, salmonella, staphylococktail, bacillius sp. for that matter, equipment laundering is essential. A study of the problem will prevent the spread of various viruses and bacteria. One is by making an instrument that can be used to sterilize the tablespoon by using a uv exposure. According to tests taken at upt the ponorogo area health lab,

Keywords: Tablespoon; Uv Light; Sterilization

Abstrak. Sendok adalah alat yang digunakan sebagai pengganti tangan dalam meraih sesuatu. Itu bulat, berongga, dan bulat. Sebagian besar penggunaan sendok selain dari rumah juga digunakan secara luas oleh pedagang makanan. Sendok makan di antara para pedagang digunakan secara bergantian oleh pembeli. Kebersihan peralatan makan merupakan faktor penting dan berdampak pada kualitas makanan. Pencucian yang kurang higienis dapat mengandung bakteri seperti e. coli, vibrio, clostridium, salmonella, staphylococktail, bacillius sp. dalam hal ini, pencucian peralatan sangat penting. Sebuah studi masalah akan mencegah penyebaran berbagai virus dan bakteri. Salah satunya dengan membuat alat yang dapat digunakan untuk mensterilkan sendok makan dengan menggunakan paparan sinar UV. Berdasarkan pemeriksaan yang dilakukan di upt lab kesehatan daerah ponorogo,

Kata kunci: Sendok makan; Sinar UV; Sterilisasi

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I. INTRODUCTION

A tablespoon is a tool to be used as a substitute for hands in picking up something. Table spoons among traders are used interchangeably by buyers. All eating utensils that have a chance of direct contact with food must be kept clean. Because, the cleanliness of cutlery is the most influential and important factor in determining the quality of food and beverages. If this is allowed, germs and viruses can multiply [1].

Unhygienic washing can cause several bacteria such as E. coli, Vibrio, clostridium, Salmonella, Staphylokokkus, Bacillius Sp. For this reason, washing equipment is very important. In view of the current outbreak of the Covid-19 virus. The way to clean cutlery is done by traders by washing the equipment using soap, then rinsing it using water that is stored in a bucket. Not infrequently the water used to rinse cutlery has been used many times, so that the level of hygiene for cutlery is still lacking [2].

Coronavirus Disease 2019 (Covid 19) is a large family of viruses that are transmitted between humans. Transmission of the virus that causes Covid 19 from human to human occurs through direct human contact with objects that have been infected with the virus. At room temperature the virus can survive for 5 days on metal surfaces, on aluminum at 20°C the virus can survive for 2 to 8 hours, and on steel at 20°C the virus can survive for 48 hours or two days [3].

The washing of cutlery should be done by removing the remaining dirt, washing with special soap, rinsing with clean running water, and freeing pests by immersing the cutlery in boiling water. Then, put the cutlery on a special shelf or container that is placed in the cutlery storage room for the drying process [4].

Based on the type of spoon material, there are two ways that are used to sterilize spoons, namely by boiling and irradiating. In this tool sterilization is done by irradiating Ultraviolet (UV) lamps. Ultraviolet light can be used for sterilization, genetic research, and medical purposes. UV light has a wavelength of 4 nm to 400 nm where the highest efficiency for controlling microorganisms is at 365 nm [5]. This tool uses an Arduino Nano type microcontroller equipped with a UV lamp, Blower, LCD, and Esp8266 Module. The workings of this automatic spoon sterilizer is that the user provides a work instruction through the keypad to open and close the door, after the door is opened, the washed spoon will be inserted into the sterile tray. spoons that are still wet will be dried using a blower. After drying is complete the UV lamp will activate. Tool owners can find out how the tool works from the notifications that appear on the LCD and also notifications on the Telegram application.

II. LITERATURE REVIEW

Tablespoon

Tablespoons become objects of sterilization because the risk of disease transmission when spoons are used interchangeably has a very large chance [4].

[Figure 1 about here.]

Servo

The working principle of a closed-loop servo uses feedback to control the final position and initial motion. The input of the control can be in the form of digital and analog signals which will determine the position of the output [6].

[Figure 2 about here.]

Ultra\violet (UV) lamp

By using UV (Ultraviolet) exposure to kill organisms or microbes that live on cutlery with a radius ofwavelength of 4 nm to 400 nm where the highest efficiency in controlling microorganisms is at 365 nm in an area of about 50 cm in about 10 seconds [6].

[Figure 3 about here.]

Arduino Nano

Arduino Nano on this tool functions as a controller with a sophisticated programming language and Integrated Development Environment (IDE). IDE is software that can be used to write programs, convert into binary code and upload programs to a microcontroller memory connected to a computer via a Mini B USB port [7].

[Figure 4 about here.]

ESP8266 . Module

Esp8266 functions as a media for sending notifications to the telegram application when the tool finishes carrying out all work instructions.

[Figure 5 about here.]

LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) has a function as a medium for displaying characters for each tool's instructions that take place from the input-output process.

[Figure 6 about here.]

III. RESEARCH METHODS

Field Study

The field study includes activities to collect relevant data and surveys as well as collect field supporting documents about the problems that will be used in the design of this tool.

Study of literature

Literature study includes activities of retrieval & searching for data from the correct source in collecting

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material to be used as a reference for system design in developing the technology applied to the tool.

System planning

System design contains activities for determining input/input, process/control, and output/output of this tool system. The data is used from each research and must be based on the existing theoretical basis. There are 2 design systems, namely:

Hardware design

This design consists of 3 parts input, process, and output.

[Figure 7 about here.]

1. Input: Keypad functions as a medium for providing work instructions for tools provided by the user
2. Process: The microcontroller used is Arduino Nano which functions as a controller of the entire system on this tablespoon sterilizer.
3. Output: UV lamp functions to carry out irradiation in the sterilization process, Blower functions as a tablespoon dryer to be sterilized, LCD functions as a code display for the ongoing process, and Telegram notifications serve as additional notifications for users when the sterilization process has been completed.
4. Actuator: Servo motor functions as a driving spoon into the sterile drawer.

[Figure 8 about here.]

The framework of the spoon sterilizer is made using a material made of plywood with a thickness of 2 mm. here's the explanation:

1. Servo
2. UV lamp
3. Spoon Cross
4. blower
5. Water Container
6. Selenoid door lock
7. Sterile Drawer
8. System minimum box
9. Keypad
10. LCD

Software Design

[Figure 9 about here.]

From the system flowchart in the picture, the user first gives work instructions via the keypad, after that the lock on the door will open then input 10 tablespoons of clean conditions (wet and dry) stacked in cross section then close the door the door lock will be active, after the lock is active the user enters the time for blowers and UV work. Minimum 1 minute for blower, 5 minutes for UV. If the instruction fails, it will return to the time setting process. If the timer instruction is fulfilled then the blower is on. After the drying process is complete, UV on. If the interrupt fails, it will return to the time setting process. After the sterilization is complete, the LCD will display that the tablespoon is sterile and the user will get a notification on the Telegram Application.

Tool trial

The instrument test is carried out to ensure whether the entire set and hardware of the sterilizer is working properly or not.

Evaluation

Evaluation is carried out to ensure that the entire set of components and tool systems is running as desired.

Tools & Materials

There are several tools & materials needed, including:

[Table 1 about here.]

IV. RESULTS AND DISCUSSION

Hardware design

[Figure 10 about here.]

Figure 10 is a design box that was designed where the box contained a mini ATMega328 storage box along with other input and output components. The framework of this tool is made of 2mm thick iron plate with a length of 80 cm, a width of 45 cm, and a height of 35 cm.

[Figure 11 about here.]

Figure 11 the overall circuit design of this tool system that has been compiled and put together for later testing the tool's performance.

The following steps must be taken to test the system:

[Figure 12 about here.]

1. Install and operate the Arduino IDE software using a laptop.
2. Create program code for the work of the tool system to be made.
3. Connect the downloader from the laptop to the minimum system ATMega 328.
4. When it is connected, select the Arduino Nano Board.

[Figure 13 about here.]

5. Select the COM3 port detected by the laptop.
6. Next compile the program.

7. Upload the program to the minimum system ATMega 328.

The following table is the result of the analysis of the Tool

System Data test:

[Table 2 about here.]

The following are the results of the microbial development test:

[Table 3 about here.]

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSION

Based on the results of research conducted from the beginning of the field study process, literature study, system planning to testing, the following results were obtained:

1. This tablespoon sterilizer can help traders reduce the risk of transmission of several diseases, especially covid-19 by using UV exposure automatically with the Arduino Nano system control. Sterilization which takes quite a short time with a minimum of 5 minutes and a maximum of 15 minutes.
2. With a spoon sterilizer, it is safer to use because it has been tested at the UPT Ponorogo Regional Health Laboratory to reach 100% hygienic.
3. This tablespoon sterilizer is equipped with an ESP8266 board, making it easier for the user to know whether the sterilization process has been completed. The use of this ESP8266 is to provide tool responses via Telegram notifications.

SUGGESTION

As a suggestion for the development and improvement of future works, things that need to be done include:

1. Making sterilizers with a more minimalist and transparent size.
2. Can be added a tableware washing section.
3. The test results can be added to the description of the bacteria on the tableware.
4. Telegram notifications are carried out on each tool's work process

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Table 1 Materials Used

No	Component Name	Specification	Amount	Utility
1	NodeMCU Esp8266	Voltage : 5V	1	Microcontroller enhancements
2	Arduino Nano	Voltage : 5V	1	Microcontroller
3	Servo Mg996	Voltage : 5V	1	mover
4	UV lamp	15 Watt	2	Bacteria Killer
5	Bl\ower	Cooling fan 220V	3	Dryer
6	Keypad Membrane	4x4	1	Keypad
7	16x2 Character LCD Display	16 characters	1	Data viewer
8	*door lock solenoid*	Voltage 12VDC	1	Door Lock

Table 2 Test Results of the Mechanism of the Tool

Hardware	Action	Test result
Esp8266	Function	Success
LCD	Function	Success
UV lamp	Function	Success
blower	Function	Success

Table 3. Sterile Level Test Results

No	Long exposure time	Number of colonies	Percentage (%)	Conclusion
1	No irradiation	18 colonies/cm2	100%	Not eligible
2	1 minute	7 colonies/cm2	38.8%	Not eligible
3	5 minutes	0 colony/cm2	0%	Qualify
4	10 minutes	0 colony/cm2	0%	Qualify
5	15 minutes	0 colony/cm2	0%	Qualify

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Figure 1. Tablespoon

Figure 2. Servos

Figure 3. UV lamp

Figure 4. Arduino Nano

Figure 5. ESP8266 Modul

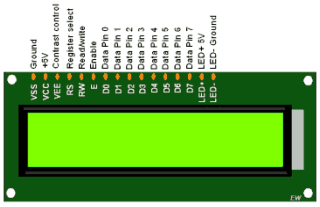

Figure 6. LCD (Liquid Crystal Display)

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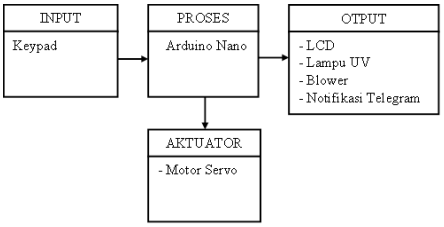

Figure 7. Block Diagram

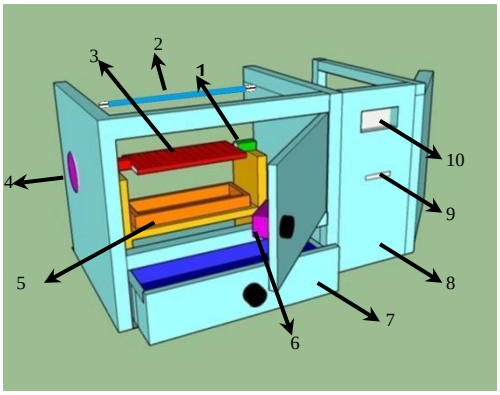

Figure 8. Tool Design

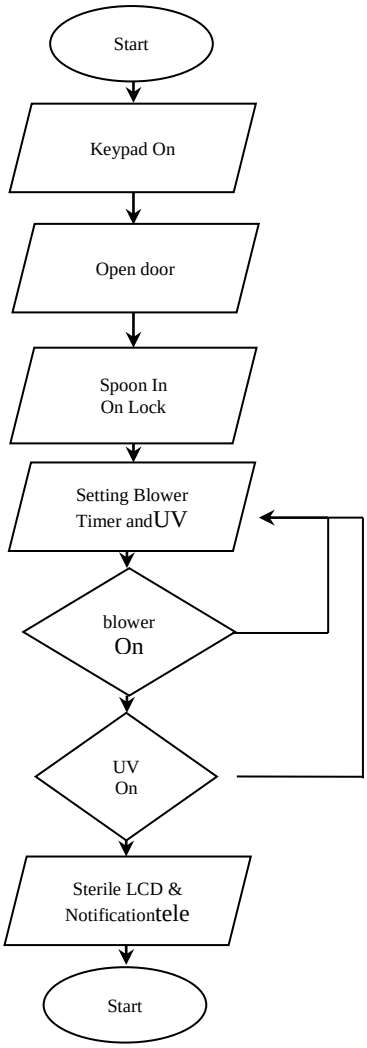

Figure 9. Flowchart

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Figure 10. Box Of Sterilizer

Figure 11. Box Of Sterilizer Circuit

Figure 12. Arduino IDE

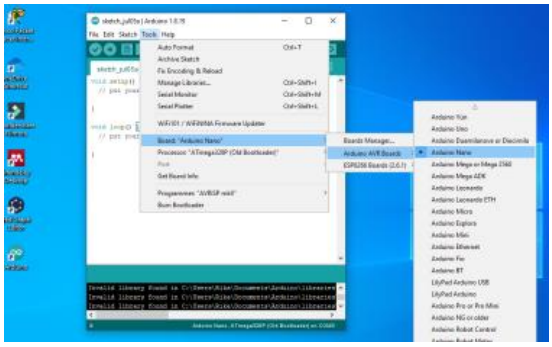

Figure 13. Arduino Nano Port Selection