Indonesian Journal of Global Health Research
Volume 4 Number 4, November 2022
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

Sterilization Container Using UV-C

Safira Fegi Nisrina*, Rinayati
Universitas Widya Husada Semarang, Jl. Subali Raya No.12, Krapyak, Kec. Semarang Barat, Kota Semarang, Jawa Tengah 50146, Indonesia
*safira@uwhs.ac.id

ABSTRACT
The condition of human health can change overtime. It can be affected by lifestyle and daily diet, as well as attacks from mutated viruses and bacteria. The emerging problem is the lack of healthy living behavior practiced by Indonesia people, so that viruses, bacteria and microorganisms can stick to the human body. The purpose of this research is to design a sterilization container to sterilize items that are used daily. A sterilizer to eradicate germs by utilizing UV-C lighting and a disinfectant that can be used. An important factor to raise the public awareness about the importance of cleanliness is the necessity to pay attention to aspects affecting the public hygiene, namely access to adequate sanitation, habit of washing hands, and sterilizing goods. An attempt to sterilize goods after we use them is by using Sterilization Container. This medical device has the objective of sterilizing goods, either directly or indirectly. In this case, the container is very useful as a preventive measure and maintains cleanliness from bacteria and viruses that could stick to human body and clothes. Sterilization Container can be defined as a space that is expected to eliminate microorganisms. In this research, entitled 'Sterilization Container Using UV-C', UV-C lamp was used to modify the container with additional disinfectant spray by pressing the button according to the needs.

Keywords: health; medical devic; sterilization; uv-c lamp- virus

First Received	Revised	Accepted
10 July 2022	24 July 2022	12 September 2022
Final Proof Received		**Published**
20 October 2022		1 November 2022

How to cite (in APA style)
Nisrina, S., & Rinayati, R. (2022). Sterilization Container using UV-C. *Indonesian Journal of Global Health Research*, *4*(4), 775-780. https://doi.org/10.37287/ijghr.v4i4.1120.

INTRODUCTION

Health is the most precious gift given by God to humans. Health plays a very important role as it is difficult for humans to carry out their daily activities when their health is not in good condition. The condition of human health can change overtime. It can be affected by lifestyle and daily diet, as well as attacks from mutated viruses and bacteria. The emerging problem is the lack of healthy living behavior practiced by Indonesia people, so that viruses, bacteria and microorganisms can stick to the human body. An important factor to raise the public awareness about the importance of cleanliness is the necessity to pay attention to aspects affecting the public hygiene, namely access to adequate sanitation, habit of washing hands, and sterilizing the body.

The data obtained from the Ministry of Health revealed that the percentage of villages that implement sanitation in Central Java Province was still 70.84% (Kementrian Kesehatan Republik Indonesia, 2018), and the percentage of population with proper hand washing habits was 53.6% (BPS, 2018). From these data, it can be said that there is still a lack of awareness regarding cleanliness by Indonesian citizens, especially in Central Java Province. Prevention of viruses and bacteria can be done by maintaining cleanliness in lifestyle and surrounding environment. In addition to keeping the environment clean, the body also needs to be

protected from exposure to viruses and bacteria. Therefore, we need to sterilize our bodies from times to times.

An attempt to sterilize goods after we use them is by using Sterilization Container. This medical device has the objective of sterilizing goods, either directly or indirectly. In this case, the container is very useful as a preventive measure and maintains cleanliness from bacteria and viruses that could stick to human body and clothes. Ultraviolet (UV) light can serve as a germicidal agent. Exposure to UV type C light with a wavelength of below 260 nm can kill biological agents such as microbes and viruses (Muvianto & Yuniarto, 2020). In addition, exposure to UV rays can penetrate into the pores of the PPE material, in addition to being effective in providing an irradiating effect on the surface of the PPE material. UV is very good at destroying genetic material - either in humans or in viral particles (Muvianto & Yuniarto, 2020). This is correct, at least, until scientists discover that they can harness UV to kill microorganisms (Reza Satria Rinaldi & Ika Novia Anggraini, 2021). Sterilization Container can be defined as a space that is expected to eliminate microorganisms (Lomrah, 2017). In this research, the Sterilization Container used UV lamp based on C type ultraviolet light which aims to sterilize items that are used daily and which will be used again equipped with a disinfectant .

METHOD

There are several stages to complete the UV-C Container. These stages consists of the design and installation of electronic components, the design and installation of the UV-C Container framework, the UV-C Container testing, and the application of the UV-C Container. The UV-C Container uses the voltage source specified in Indonesia for AC power, which is 220 Volts entering through the Power Supply adapter. The Power Supply functions to convert 220 volts AC to 12 volt DC. The UV-C lamp works at 220 volts AC, while the pump motor works at 12 volts DC. The UV-C lamp circuit has a limit switch that functions as a circuit breaker (disconnect) of voltage from the power supply to the UV-C lamp when the UV-C container door is open and will be connected when the UV-C container door is closed and hits the lever switch. Within the pump motor circuit, there is a push button and a sprayer. The push button is in the Normally Close position, and when pressed it changes to Normally Open position. The sprayer functions as a dispersal of disinfectant water to objects put in the UV-C Container.

RESULTS

Limit Switch

Limit Switch is equipped with a valve that functions to replace a button. The working principle of this Limit Switch is similar to that of Push ON Switch. It will only connect when the valve is pressed at a certain pressure limit and will disconnect when the valve is not pressed (Drs. H. Mustaghfirin Amin, n.d.).

Figure 3. Limit Switch

Limit Switch is included in the category of mechanical sensors that will provide electrical changes when there is a mechanical change in the sensor. The application of the limit switch is as a position sensor of a moving object (Saleh & Haryanti, 2017).

Button Normally Open

Button Normally Open is a simple device/switch that functions to connect or disconnect electric currents with a 'lock and unlock' working mechanism operated by pressing. Button Normally Open used in this research is as shown in the following image.

Figure 4. Button Normally Open

The 'unlock' working system functions as a connecting device or electric current breaker when the button is pressed. In contrary, when the button is not pressed (released) the switch will return to normal condition (djoko, 2010).

12 Volt DC Motor

DC Electric Motor is a device that functions to convert electrical energy into kinetic energy or motion. DC Motor is also known as Direct Current Motor. As the name suggests, a DC Motor has two terminals and requires direct current (DC) to power them (B.L Theraja, n.d.)

Figure 5. Motor DC

DC Electric Motor produces a number of revolution per minute or usually known as RPM and can be made to rotate clockwise or counterclockwise if the electrical polarity given to the DC motor is reversed. DC Electric Motor is available in various rpm sizes and shapes. Usually, a DC Electric Motor provides a rotational speed of approximately 3000 rpm to 8000 rpm with an operating voltage from 1.5V to 24V (B.L Theraja, n.d.).

UV-C Lamp

UV lamp is used for its benefit to destroy microscopic bacteria and viruses without damaging the human skin and eyes.

Figure 6. UV-C Lamp

The effectiveness of ultraviolet light on power kill viruses or bacteria affected by several factors including: area of the room, light intensity used, the distance of the light source and the length of time radiation (Fitriyah et al., 2022).

Nozzle

Nozzle is a tool used to determine the direction of flow. The general function of the nozzle is to increase the velocity followed by a decrease in pressure in the fluid. Nozzle applications are very diverse, including automotive, plantation, and technology. In this study the nozzle used to spray the items in the container for sterilization ("Nozzle," n.d.).

Power Supply

Power supply is hardware that functions to supply voltage directly to Electronic Data Process (EDP) components in casings that require voltage, such as receivers, transmitters, alarms and others. The input power supply is in the form of 220 volt AC current to 12 volt DC then converting the alternating signal into a direct electrical signal (DC). One example of the simplest and most common power supply circuit in the world of electronics. Only by using several core components of the power supply, namely one diode bridge and one capacitor (Yantoro, 2015).

Figure 7. Power Supply

The grid voltage of 220 volts from PLN electricity is lowered by a transformer or voltage-lowering transformer that applies the turns ratio. Where the ratio of turns of a transformer will affect the ratio of the resulting voltage. The voltage generated by the transformer is still in the form of an AC wave and must be rectified using a rectifier. The rectifier circuit used utilizes 4 diodes that have been designed to be able to pass both AC wave cycles into one direction only (Yantoro, 2015)**.**

DISCUSSION

When the power cable is connected to the PLN grid, the voltage will enter the fuse as an overcurrent protection. Then it goes through the Power Supply Switching block. The switching power supply works by directing the 220V AC into DC using a diode bridge and filtered by a capacitor. Subsequently, the DC voltage which still has a high voltage will be forwarded by the power regulator transistor (Q1) which functions as a transformer controller, by capacitor C3 there has been charging and discharging current so that a high frequency AC voltage occurs before going to the transformer. From the transformer which still has a voltage, The AC voltage has been processed and rectified using a full wave rectifier system using a small value filter capacitor to produce a DC voltage .

The push button functions to press the setting on the disinfectant spray which is also controlled by a 12 Volts DC motor, and there is a UV-C lamp which is controlled by a

switching type. When the container is closed, the lamp will automatically turn on and when the container lid is open, the UV-C lamp C will turn off.

The Testing Result

The following image depicts the testing done on the Container Sterilization using UV-C as well as its result:

Figure 8 . The container in closed status with the button being pressed

The prototype testing result showed that as a whole, where the system had been installed, all motor movements and lamp have functioned properly when the lid was closed

Figure 9. The container in open status, installed with Aluminum Foil

Figure 10. The container in closed status, with to-be sterilized goods within

The overall prototype testing result revealed that as a whole, where the system had been installed, all motor movements and UV-C lamp have functioning properly when the lid was closed, ready to be used to sterilize goods.

CONCLUSION

By completing the manufacturing process, literature review, planning, testing, and data collection, the researcher reach the following conclusions: The sterilizer with UV lamps can be used by the public and medical personnel to sterilize goods, and this tool is equipped with push button to be pressed when needed. As a precautionary step, the users must protect themselves from exposure to UV-C rays. This research still needs further development and refinement to give a better result. It is expected that future modules can be developed, especially in terms of adding a temperature sensor, updating the interface on the IoT. These

adjustments are expected to make it easier for tool to be used and shorter the time needed to complete the whole process of sterilization.

REFERENCES

B.L Theraja. (n.d.). *ch-29-Dc-motor*. http://nit-edu.org/wp-content/uploads/2019/06/ch-29-Dc-motor.pdf

BPS. (2018). *Proporsi Populasi yang Mempunyai Kebiasaan Cuci Tangan yang Benar menurut Wilayah (Persen)* (Issue 16, pp. 2638–2642).

djoko, laras. (2010). *Penghantar listrik*. 1–84.

Drs. H. Mustaghfirin Amin, M. B. (n.d.). *L i m i t sw i tc h da n s e n s o r pa da p n e u m at i k d a n e l e k t r o p n e u m at i k*.

Fitriyah, Q., Delfiana Siahaan, Y., Prihadi, M., Wahyudi, E., Politeknik, , & Batam, N. (2022). Alat Sterilisasi Lampu UVC Portable Berbasis IOT. *Jurnal Integrasi* |, *8*(1), 2548–9828.

Kementrian Kesehatan Republik Indonesia. (2018). Informasi kesehatan indonesia 2017. *Kementrian Kesehatan RI*, *1*(1), 3–184.

Lomrah, S. (2017). *Pengaruh Cahaya Ultraviolet C (Uv-C) Dan Kelembaban Udara (Rh) Terhadap Jumlah Bakteri Escherichia Coli Pada Kulit Sepatu*. 9, 11, 12.

Muvianto, C. M. O., & Yuniarto, K. (2020). Pemanfaatan Uv-C Chamber Sebagai Disinfektan Alat Pelindung Diri Untuk Pencegahan Penyebaran Virus Corona. In *Abdi Insani* (Vol. 7, Issue 1, pp. 87–92). https://doi.org/10.29303/abdiinsani.v7i1.312

Nozzle. (n.d.). *Universitas Sanata Dharma Yogyakarta*.

Reza Satria Rinaldi, & Ika Novia Anggraini. (2021). Perancangan Sistem Disinfektan UV-C Sterilisasi Paket sebagai Pencegahan Penyebaran Covid-19. *Jurnal Nasional Teknik Elektro Dan Teknologi Informasi*, *10*(1), 57–62. https://doi.org/10.22146/jnteti.v10i1.888

Saleh, M., & Haryanti, M. (2017). Rancang Bangun Sistem Keamanan Rumah Menggunakan Relay. *Jurnal Teknologi Elektro, UniversitasMercu Buana*, *8*(2), 87–94. https://media.neliti.com/media/publications/141935-ID-perancangan-simulasi-sistem-pemantauan-p.pdf

Yantoro, Y. (2015). Fungsi Power Supply Pada Simulator Sistem Peringatan Dini Pengendalian Banjir Dengan Menggunakan Electronic Data Proces. *Power Elektronik: Jurnal Orang Elektro*, *3*(2). https://media.neliti.com/media/publications/160154-ID-fungsi-power-supply-pada-simulator-siste.pdf