International Journal of Scientific Research & Engineering Trends
Volume 7, Issue 4, July-Aug-2021, ISSN (Online): 2395-566X

IOT Based Disinfection and Sterilization using Temperature and Humidity

Asst. Prof. Ms. M. Nalina Sangaviya, S. Lakshmanan, M. Pavithra, G. Sasireka, G. Vahini
Department of Electronics and Communication Engineering,
Annai Mathammal Sheela Engineering College,
Erumapatty, Tamilnadu, India.
sangmvr26@gmail.com, abdlakshmanan1717@gmail.com, pavithrapavithra7808@gmail.com, sasirekaganesan2000@gmail.com, vahiniganapathi303g@gmail.com

***Abstract*- The Project is developed based on the Guideline for Disinfection and Sterilization in Healthcare Facilities, University of North Carolina Health Care System. Extrapolates quantitative data for ozone virucidal activity on the basis of the available scientific literature data for a safe and effective use of ozone in the appropriate cases and to explore the safety measures developed under the stimulus of the current emergency situation. Ozone is a powerful oxidant reacting with organic molecules, and therefore has bactericidal, virucidal, and fungicidal actions. At the same time it is a toxic substance, having abverse effects on health and safety. Instead of Ozone system, here we are proposed Temperature and Humidity based Disinfection and Sterilization system. Proposed system maintaining 37OC and 85% of Relative humidity at Disinfection and Sterilization area. Its use is being proposed for the disinfection of workplaces, public placeswith particular reference to the COVID-19 pandemic outbreak. Water mist is generated by Ultrasonic based mist maker and Temperature of the room is increased by heater attached with proposed system. It should be injected into the room that is to be disinfected until the desired Humidity and Temperature concentration is reached. After the time needed for the disinfection, its concentrations must be reduced to the levels required for the public safety. Here we are using Node MCU Esp8266 module to transfer status of the system to remote location. Electromagnetic relay is used to turn on and off the Ultrasonic humidifier and Heater.16*2 LCD display is used to display the notification to user side. The developed system improves the reliability and stability of Disinfection and Sterilization.**

***Keywords*- Health Care System , system maintaining , Heater.16*2 LCD display etc.**

I. INTRODUCTION

Although social distancing has contained the spread of virus as a passive mechanism, a pragmatic look at the method to contain the virus by disinfecting and deactivating it is necessary. Almost all areas of research have come forward on a war footing and contributed towards the know-how to mitigate the spread and restore a regular life. By the time, vaccine is developed and distributed there is a need to protect ourselves and prevent the virus from further harming people. Sanitization has so far played an important role in containing the spread and in restoring everyday life albeit on a smaller scale.

The mechanism involved in sanitization uses either one or both of these steps: (i) mechanical or thermal treatment and/or (ii) use of virucidal/anti-microbial agents to decontaminate the body part, object or surfaces. The overall sanitizing action is to weaken the virus by depleting the lipid membrane using a disinfectant and remove it from the surface.We briefly review the existing measures of sanitizing individuals, objects and spaces to inhibit the virus's life and to stop/break the spread of viruses. Gives a detailed list of methods used for sanitization and disinfection of Virus infected people, objects and spaces.

Out of the methods of Disinfection and Sterilization The fogging device spray disinfectant mist of various particle sizes and disperse into the air as aerosol (fog). It can be used for both surface and ambience sanitization. The effectiveness of the generator depends on the particle size, humidity, and contact time of disinfectant. Hoffmann et al. reported that the droplet size of the aerosol is one of the most significant factors that decide the success of spraying insecticide.

The fogging technique is frequently used in agriculture for the application of pesticide, mosquito control, and the food industry. In addition, fogging is used for generating the seeding particles (sizes 0.2–5 μm) application in particle image velocimetry technique.Safe and Effective Use of Ozone as Air and Surface Disinfectant in the conjuncture of covid-19. The present paper extrapolates quantitative data for ozone virucidal activity on the basis of the available scientific literature data for a safe and effective

use of ozone in the appropriate cases and to explore the safety measures developed under the stimulus of the current emergency situation. Ozone is a powerful oxidant reacting with organic molecules, and therefore has bactericidal, virucidal, and fungicidal actions.

At the same time, it is a toxic substance, having adverse effects on health and safety. Its use is being proposed for the disinfection of workplaces' and public places' atmosphere, and for disposable masks and personal protective equipment disinfection for reuse, with particular reference to the COVID-19 pandemic outbreak.

Ozone can be generated in situ by means of small, compact ozone generators, using dried ambient air as a precursor. It should be injected into the room that is to be disinfected until the desired ozone concentration is reached; after the time needed for the disinfection, its concentrations must be reduced to the levels required for the workers' safety. The optimal use of ozone is for air and surface disinfection without human presence, using a concentration that is effective for the destruction of viruses, but not high enough to deteriorate materials.

Influence of Meteorological Factors on the COVID-19 Transmission with Season and Geographic Location.The purpose of this study is to investigate whether the relationship between meteorological factors (i.e., daily maximum temperature, minimum temperature, average temperature, temperature range, relative humidity, average wind speed and total precipitation) and COVID-19 transmission is affected by season and geographical location during the period of community-based pandemic prevention and control. COVID-19 infected case records and meteorological data in four cities (Wuhan, Beijing, Urumqi and Dalian) in China were collected. Then, the best-fitting model of COVID19 infected cases was selected from four statistic models (Gaussian, logistic, lognormal distribution and allometric models), and the relationship between meteorological factors and COVID-19 infected cases was analyzed using multiple stepwise regression and Pearson correlation.

The results showed that the lognormal distribution model was well adapted to describing the change of COVID-19 infected cases compared with other models ($R2 > 0.78$; p-values < 0.001). Under the condition of implementing community-based pandemic prevention and control, relationship between COVID-19 infected cases and meteorological factors differed among the four cities.

Temperature and relative humidity were mainly the driving factors on COVID-19 transmission, but their relations obviously varied with season and geographical location. In summer, the increase in relative humidity and the decrease in maximum temperature facilitate COVID-19 transmission in arid inland cities, while at this point the decrease in relative humidity is good for the spread of COVID-19 in coastal cities. For the humid cities, the reduction of relative humidity and the lowest temperature in the winter promote COVID-19 transmission. Disinfection and Sterilization in Health Care Facilities.All invasive procedures involve contact between a medical device or surgical instrument and a patient's sterile tissue or mucous membranes.

A major risk of all such procedures is the introduction of pathogenic microbes that could lead to infection. Failure to properly disinfect or sterilize reusable medical equipment carries a risk associated with breach of the host barriers. The level of disinfection or sterilization is dependent on the intended use of the object: critical items (such as surgical instruments, which contact sterile tissue), semicritical items (such as endoscopes, which contact mucous membranes), and noncritical items (such as stethoscopes, which contact only intact skin) require sterilization, high-level disinfection, and low-level disinfection, respectively.

Cleaning must always precede high-level disinfection and sterilization. Users must consider the advantages and disadvantages of specific methods when choosing a disinfection or sterilization process. Adherence to these recommendations should improve disinfection and sterilization practices in health care facilities, thereby reducing infections associated with contaminated patient-care items.

II. BLOCK DIAGRAM OF PROPOSED SYSTEM

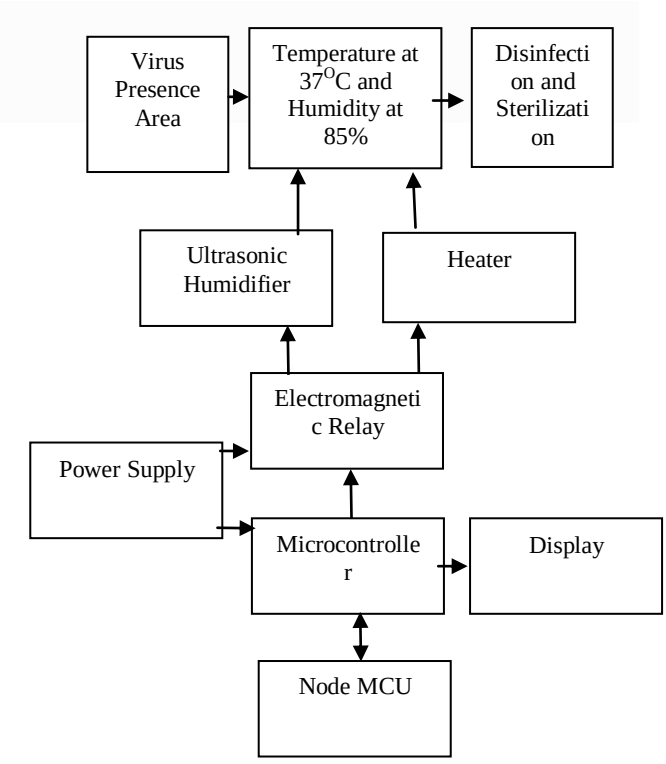

Fig 1. Block Diagram of Proposed System.

III. HARDWARE DESIGN

1. Power Supply Unit:
A Power supply unit supplies Direct Current (DC) power to the other components in a circuit. It converts general-purpose Alternating Current (AC) electric power from the mains (230 V at 50 Hz) to low-voltage (for microcontroller, Display unit and driver IC's 5 V (Regulated).Relays and Buzzer 12 V (Unregulated) DC power for the internal components of the Projects. The power supply units having various components like, Step down transformer, Rectifier, Filter capacitor, Voltage regulator IC etc.

2. Step down Transformer:
When AC is applied to the primary winding of the transformer it can either be stepped down or stepped up depending on the value of DC needed. In our circuit the transformer of 230v/15v is used to perform the step down operation where a 230V AC appears as 5V AC across the secondary winding. The current rating of the transformer used in our project is 1A. Apart from stepping down AC voltages, it provides isolation between the power source and power supply modules.

IV. ARDUINO CONTROLLER

1. Memory:
The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

2. Input and Output:
Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms.

V. CONCLUTIONS

Automation of traditional frameworks is another alternative for advancement in any field; it diminishes human exertion, save time and increase the precision of the framework. Automation of water irrigation system, IOT innovation achieves such objective.Instead of Ozone system, here we are used Temperature and Humidity based Disinfection and Sterilization system.

Proposed system maintaining 37OC and 85% of Relative humidity at Disinfection and Sterilization area. Its use is being proposed for the disinfection of workplaces, public places with particular reference to the virus pandemic outbreak. Water mist is generated by Ultrasonic based mist maker and Temperature of the room is increased by heater attached with proposed system. Entire system is monitored by IOT based Monitoring system. The entire system is implemented using Arduino controller. The superior result is observed.

REFERENCES

[1] Yoo JH. Principle and perspective of healthcare-associated infection control. J Korean Med Assoc. 2018; 61:5–12.
[2] Stokes HW, Gillings MR. Gene flow, mobile genetic elements and the recruitment of antibiotic resistance genes into Gram-negative pathogens. FEMS Microbiol Rev. 2011;35:790–819
[3] Centers for Disease Control and Prevention (CDC) Disinfection and sterilization. [Accessed 15 April 2018]. Available at: https://www.cdc.gov/ infectioncontrol/guidelines/disinfection/index.html.
[4] McDonnell G. General mechanism of action. In: McDonnel GE, editor. Antisepsis, Disinfection, and Sterilization. 2nd ed. Washington DC: ASM Press; 2017. pp. 255–269.
[5] Piyare, R. (2017). Internet of things: Ubiquitous home control and monitoring system using Android based smart phone. InternationalJournal of Internet of Things, Vol.2, No. 1, pp 5-11.
[6] Pooja N.Pawar, Shruti Ramachandran, Nisha P.Singh, Varsha V.Wagh (2016). A Survey on Internet of Things Based HomeAutomation System.