



## DESIGN & DEVELOPMENT OF ULTRAVIOLET SANITIZATION DEVICE

<sup>1</sup>Prof.A.N Madne, <sup>2</sup>S.Ajay Raj, <sup>3</sup>Prathamesh S.Jaiswal, <sup>4</sup>Pranay P.Chaple,

<sup>1</sup>Professor kdkce Nagpur, <sup>2</sup>Student kdkce Nagpur, <sup>3</sup>Student kdkce Nagpur, <sup>4</sup>Student kdkce Nagpur.

<sup>1</sup>Department of Mechanical Engineering,  
<sup>1</sup>K.D.K College of Engineering, Nagpur, India

**Abstract :** As per technical evolution and latest trends taken into consideration, here effectively created an advanced innovative system i.e. Design and development of Ultraviolet Sanitization device. The aim of the present work is to contribute in the fight against the spread of Covid-19, a novel human coronavirus, in hospitals, public transport, airlines, and any enclosed areas. In this study, we have adopted the physical disinfection method by using UVC light as agent. The UVC devices are studied and classified according their disinfectant units, complementary devices, combined disinfection agents, mobilities, and order types. Our finding shows that this device is the most efficient to inactivate microorganisms, so we have developed a device called UV-C sanitizer. The column is fixed on a base where several sensors are integrated to measure temperature and humidity on the one hand, and on the other, to detect motion plus position and to avoid obstacles. The device can estimate automatically the disinfection time. UV-C sanitizer device disinfects rooms and equipment with ultraviolet light, and shuts down when humans are around to keep them safe. The robot can kill 99,999% bacteria and various through UVC lamps led.

### I. LITERATURE SURVEY

1. UV-C light unit significantly reduced aerobic colony counts and *C. difficile* spores on contaminated surfaces in patient rooms [ William A Rutala, David J. Weber, Infection control and hospital Epidemiology August 2011, vol.32, no. 8 ]
2. There is a sample evidence that no-touch systems such as UV-C light can reduce environmental contamination with healthcare associated pathogens. [ John M.Boyce, Nancy L. Havill, Brent A. Moore, Terminal decontamination of patient rooms using an automated mobile UV light unit. Infect control Hospital Epidemiology August 2011, vol.32, no. 8 : 737-742 ]
3. Germicidal Irradiation or UVGI is very effective in decontamination of acinetobacter baumannii from contaminated surfaces was achieved with Ultraviolet C light. [ Vipin K. Rastogi ,Lalena Wallace, Lisa S. Smith. Disinfection of acinetobacter baumannii-Contaminated surfaces Relevant to Medical treatment facilities with UV-C light. Military Medicine, 172, 2007. ]
4. Ustun, C.Cihangiroglu, M. Health care workers mobile phones: A potential cause of microbial cross-contamination between hospitals and community. J. Occup. Environ. Hyg. 2012, 9, 538–542. [CrossRef]

### II. INTRODUCTION

The potential of light-based technologies to prevent COVID-19 infection and control its dissemination by direct viral inactivation The direct antimicrobial actions of solar and UV radiation, photodynamic therapy, antimicrobial blue light, and ultrafast pulsed lasers for disinfection use are considered.

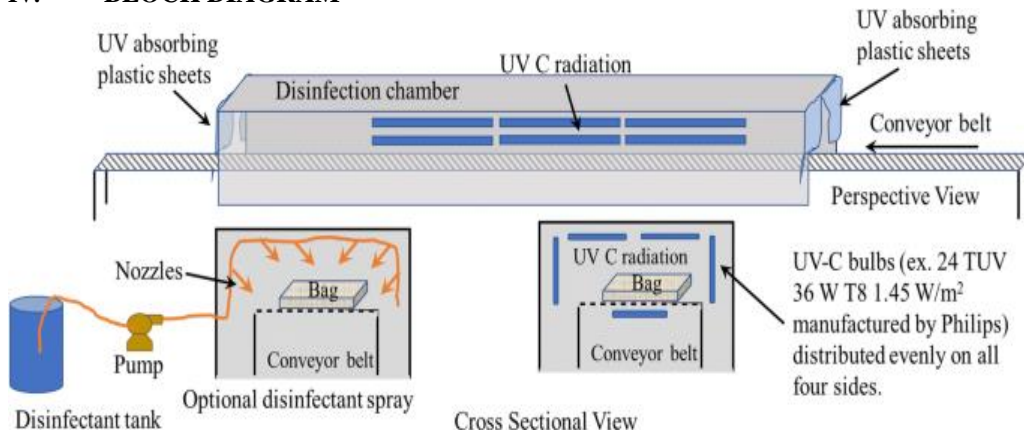
The UV-C device is designed for disinfecting personal belongings like mobile phone, tablets, purse, currency, cover of office files, etc. COVID-19 virus gets deactivated by using UVC lamps in one minute. The device is designed to deliver 100 mJ/cm<sup>2</sup> UV-C dose equidistantly .The UV lamps used in the sanitization box also emits 250-265nm which produces ozone and is able to take care of the unexposed area on the surfaces of the objects placed in the box. The system consists of a roller based conveyor carriage moving inside a chamber which is configured with UV bath of calibrated dosage. The items to be disinfected are carried on the conveyor to the chamber such that there is scanning and sanitization of the item all around the object surface. For maintaining the required exposure of the item to the UV rays on all areas as per required intensity and time for the sanitization process, the movement of the conveyor is automated, along with necessary electrical and mechanical safety interlocks. Although Far-UV-C is claimed to be harmless to human beings, sufficient precautionary measures are introduced to prevent leakage of UV beyond the chamber.

### III. OPERATION

DC motor of 12 V 60 RPM is used to drive conveyer belt. A rod is attached to the shaft of motor. When rod moves belt will move, when placed a paper or any material on belt, it passes through the UV cabinet which sanitizes the paper and comes out of belt at end. Two operations in our system

1. Paper or material sanitizer
2. Room sanitizer
  1. When it is used in paper sanitization mode, conveyer belt moves and papers passing through UV light Sanitization is carried out. Continuous operation for papers or small goods can be used.
  2. For room sanitization process we are using Arduino board with program for the operation. Normally the system works in paper mode. If we want to sanitize room, by pressing the room switch and opening the UV light to vertical position room sanitization starts. For sanitizing the room, we require 15 minutes, for that we are using Arduino in timer mode.

### IV. BLOCK DIAGRAM



### V. RESOURCES USED

1. UV-C Lamp
2. DC Motor 12V
3. Roller
4. Conveyer belt
5. PVC Foam sheet
6. Arduino circuit
7. Electric choke

### VI. ADVANTAGES

1. The equipment may be used for rapid and chemical free disinfection of office spaces and buildings. As stated earlier, UV treatment is proven to reduce air and surface contamination up to 99.99%.
2. It is environment friendly and contact free effective sanitization method.
3. Thermal heating in another way to disinfect papers, which is an essentiality for office works
4. Room surfaces and equipment decontaminated.
5. Room decontamination is rapid (15 minutes) for vegetative bacteria effective against COVID-19.
6. HVAC (Heating, Ventilation and Air Conditioning) system does not need to be disabled, and the room does not need to be sealed.
7. No consumable products so costs include only capital equipment and staff time.

### VII. APPLICATIONS

1. Objects like N-95 Masks, Mobile phones, iPad, Laptop, Currency Notes, Check leafs, challans, Passbooks, Paper, envelopes and many more items can be sanitized using UV-C Device.
2. Nursing Homes
3. Patient and waiting rooms
4. Schools – Classrooms, Locker rooms
5. Food Preparation and Processing Areas

## VIII. FUTURE SCOPE

The market for portable UV sanitizing boxes is highly competitive in nature. Key companies are focusing on expanding their product lines and are adopting innovative technologies owing to meet consumer demand for portable UV sanitizing boxes.

## IX. REFERENCES

1. UV-C light unit significantly reduced aerobic colony counts and *C. difficile* spores on contaminated surfaces in patient rooms. UV-C technology eliminate more than 3-log<sub>10</sub> vegetative bacteria (MRSA, VRE and *Acinetobacter baumannii*) and more than 2.4-log<sub>10</sub> *C. difficile* seeded onto Formica surfaces in experimentally contaminated patients rooms. [ William A Rutala, David J. Weber, Infection control and hospital Epidemiology August 2011, vol.32, no. 8 ]
2. There is a sample evidence that no-touch systems such as UV-C light can reduce environmental contamination with healthcare associated pathogens. [ John M.Boyce, Nancy L. Havill, Brent A. Moore, Terminal decontamination of patient rooms using an automated mobile UV light unit. Infect control Hospital Epidemiology August 2011, vol.32, no. 8 : 737-742 ]
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