



# Design and Manufacturing of Automated Sanitization Machine

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**Abstract** - Hand Sanitization machine is very much need in the pandemic situation. It comprises of an angle frame, which is acting as an entrance gate. Detection of person will be done with the help sensor camera. After detection person will be sanitized for 10 seconds through two types of spray nozzles. 4-way nozzle is kept at top and other two nozzles at middle. Pipe is connected through reducer which is connected to a pump. Elbow and joints are needed as per the requirement. Basically, it is very much useful to the people.

**Keywords** – Sanitization, Pump, nozzles, reducer

## I. INTRODUCTION

We know that at the present time all the world getting influence by covid-19 pandemic. So many peoples are getting affected to this disease. To control this COVID-19 disease the special team of scientists from every nation are trying to develop the vaccine on this covid-19 disease. For prevention from this disease everyone should have to prevent themselves by taking preventive measures such as social distancing, use of masks, sanitization etc. The sanitization of the body plays an important role in this preventive measures, proper sanitization of body can reduce

the spread of this disease to greater extent but manually sanitization of peoples at crowded places is a very tedious job. Sanitisation of the goods is also plays an important role in such situation. So the problem statement so to develop a machine which sanitize the human body and the goods automatically for an efficient sanitization and to preventing the spread of COVID-19 [1].

Amid the coronavirus pandemic, health experts have been emphasising on the importance of keeping the human being are germ-free, by using hand sanitizers. Due to this reason we will think to develop automated sanitization machine. Project aim is to help and reduce contact and prevent the chances of infection, we developing a touch-free automated sanitization machine using sensor-based smart electronics [2].

There is the growing problem of virus spreading due to infected people. As much as hand sanitizer and hand washing are recommended, the virus can remain in other body parts in addition to the face and hands. Disinfection tunnels are currently being employed in various regions of

Research Paper – Peer Reviewed  
Published online – 9 September 2021

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Cite this article – Pramod Sahare, Abhishek M. Shastrakar, Manoj N. Nibrad, Ankush M. Dongre, Piyush B. Betal, Shubham S Hanumante, Mayur R. Landge, “Design and Manufacturing of Automated Sanitization Machine”, *Journal of Thermal and Fluid Science*, RAME Publishers, vol. 2, issue 2, pp. 93-97, 2021.  
<https://doi.org/10.26706/jtfs.2.3.20210713>

the nation to achieve this goal in diverse ways. Some of these systems spray a mist of sodium hypochlorite solution on you as you pass through them. This machine will sanitize the whole body of a person as well as the goods with the help of the automated sanitization machine [3].

In the COVID – 19 scenario, all should take care of without any human touch. A Sanitization Machine with a Door and Tunnel Design has two sides enclosed with sheeting and the other two sides open for access and exit.

A. Objective/Aim

Amid the coronavirus pandemic, health experts have been emphasizing on the importance of keeping the human being are germ-free, either by using hand sanitizers. due to this reason, we will think to develop automated sanitization machine. Project aims is to help reduce contact and prevent the chances of infection; we will developing a touch-free automated sanitizer machine using sensor-based smart electronics.

B. Motivation

Corona virus is spreading rapidly around the globe, but there is no vaccine maker in India, therefore the only way to keep protected and safe is to take measures, such as wearing personal protective equipment (PPE) such as masks, hand gloves, and washing/sanitizing hands at regular intervals. Coronavirus has a highly lethal effect, therefore taking precautions is really important.

Cross-contamination risks remain severe as the COVID-19 Pandemic rages on. Asymptomatic people have a higher chance of spreading the disease, even if they don't show any symptoms. The Novel Coronavirus is recognized for its ability to survive for a long time on dead surfaces. Poor hygiene and sanitation might contribute to a spike in the number of infections. There is a three-hour time limit on the virus' activity in aerosols, and a four-hour time limit on copper surfaces, as well as a three-day time limit on steel surfaces and a twenty-four-hour time limit on cardboard surfaces.

Hence, it is urgent to create devices capable of eradicating the virus and preventing its fast spread. Infection and infection hazards in heavy traffic areas may

be effectively eradicated using the "Full Body Sanitizing Machine", a Personnel Sanitization Enclosure (PSE).

II. HARDWARE DESCRIPTION

While echolocation is used by bats for navigation, ultrasonic sensors employ sound waves above the 20 kHz range for detection. While it comes to ADAS (Advanced Driver-Assisting Systems), ultrasonic sensors are commonly employed to identify barriers when a vehicle is parked. Four to sixteen sensors are utilized to detect impediments when parking a car. Laser sensors are utilized in the industrial sector for robotics and other applications that need dependable presence or location detection (such as telemetry). Ultrasonic time-of-flight sensors, system concerns, and other variables are discussed in this application report.

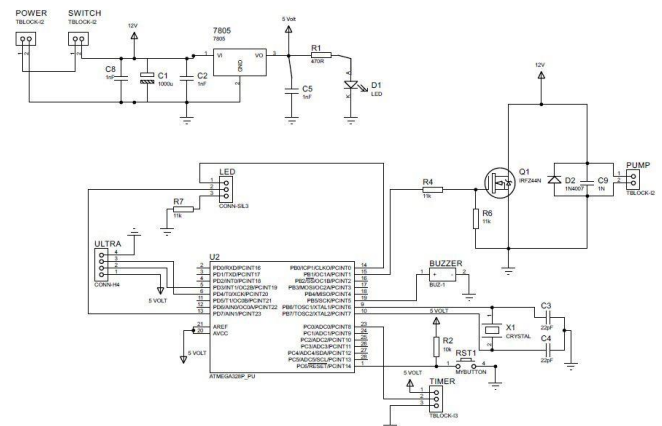


Fig -1: Ultrasonic Sensor [3]

Using ultrasonic sensors, it is possible to measure distance and detect the existence of an item without establishing physical touch with the object. They accomplish this by creating and measuring an ultrasonic echo. This can be anywhere from several centimeters to several meters in air, depending on the sensor and object characteristics. Transducer or ultrasonic sensor emits ultrasonic waves that are reflected back to the sensor by an item in the sensor's field of vision [4].

Materials of any form, transparency, or color can be detected using ultrasonic sensors. As long as the target substance is solid or liquid, ultrasonic sensing works. It's better to utilize ultrasonic sensors for non-contact detection of:

- Presence
- Level
- Position
- Distance



Fig -2: Ultrasonic Time-of-Flight Measurement



Fig -3: Ultrasonic Transmitter & Receiver



Fig -4: ATmega8 microcontroller

It's an 8-bit CMOS-based microcontroller from the AVR family of microcontrollers, which was created in 1996 and is based on CMOS technology. Built on the reduced instruction set computer (RISC) architecture, it's a high-performance machine. Main benefit is that it has no accumulator register and the result of any operation can be stored wherever, as long as the instruction specifies it [5].



Fig -5: Sanitizer tunnel

The main and important part of our project is frame. 1×1 square bar is used to made this frame. The size of the sanitizer tunnel is 7 feet high, 6 feet long and 3 feet wide. It is suitable to every human with perfectly transfer from it and go through it. To avoid the rust to the frame, the tunnel has coated with black oil paint and plastic to covered all the frame. The components used to design and manufacture sanitizer tunnel are available in table 1.

TABLE 1  
LIST OF COMPONENTS

Particulars	Quantity
Pump+ motor	1
Circuit & components	1
Nozzles	6
Reducer	1
Pipe	10 m
Elbow and T-joint	10
Square pipe (for frame)	1 mm thickness
Electric wire	20 m
Plastic cover	1

### III. CONSTRUCTION AND WORKING

At the tunnel entrance the sensor is located which detects the motion. The tank containing sanitizing solution will be placed besides the tunnel wall. The tank will have a Pump on it with pipefittings and with the proper power supply. Inside the tunnel the Mist spray nozzles will be situated on roof and walls in such a way that the mist will get spray on the person's whole body.

The system works by the motion detection technology which is an aerosol mist with an extremely fine spray technique, using very little but equally effective disinfectant. The tunnel system that is produced in a ready form, is installed very quickly. Full coverage is created within the tunnel by spraying disinfectants from 6 points. It is provided to reach disinfectant on all areas on a person by spraying under the droplet size. It is sufficient for people to be in this disinfection area for 5-7 seconds to homogeneously cover with disinfectant solution. it creates a moisture that dries immediately without wide and very wetness. In addition to that, it reduces the consumption amount of the disinfection solution and increases its

effectiveness. For disinfectants used in a ratio of 1 to 100, in one pass, 1.6 ml of consumption is per person.

#### IV. ANALYTICAL DISCHARGE

To calculate discharge through nozzle and how many persons will get sanitize in 10 lit tanks.

Let

$Q_1$ - discharge of pump

$Q_2$  – total discharge through nozzle

$A_1$  and  $A_2$ - area of nozzle at section 1& 2 respectively

$D_1$  and  $D_2$ - diameter of nozzle at section 1& 2 respectively

We have,

$$Q_1 = 5 \text{ lit/min} = 0.083 \text{ lit/sec}$$

$$D_1 = 2 \text{ mm}$$

$$D_2 = 4 \text{ mm}$$

Therefore

$$A_1 = 3.14 \text{ mm}^2$$

$$A_2 = 12.56 \text{ mm}^2$$

We know,

$$Q_1 A_1 = Q_2 A_2$$

$$Q_2 = (Q_1 A_1) / A_2$$

$$Q_2 = (0.083 \times 3.14) / 12.56$$

$$Q_2 = 0.020 \text{ lit/sec}$$

The spray will last for 5 sec,

Therefore

$$Q_2 = 0.10 \text{ lit/person}$$

As tank size is fixed to 20 lit

Therefore

No of person sanitize at one fill = 200 persons

Therefore,

It can sanitize 200 persons in 20-liter tank capacities with a total discharge of 100 ml of sanitizing solution through 6 nozzles.

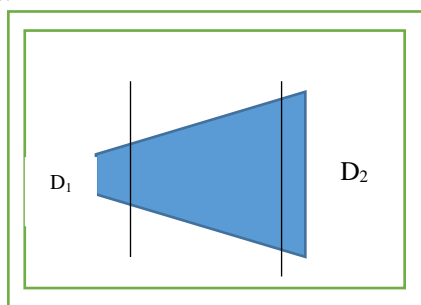


Fig -6: Cross Section of nozzle

#### V. USEFULNESS/ BENEFITS

Some features and benefits are offered by automated sanitization machine,

- Economical as compared to market
- Easy to operate
- Prevent from bacteria and virus
- This is used in any area like rural, village at any places like hospitals, colleges offices etc.
- Low power consumption required
- Maintenance cost is low

#### V. ADVANTAGES AND APPLICATIONS

##### A. Advantages

When triggered, the fogging method of the disinfection tunnel system provides a rapid and inexpensive option for human disinfection in your offices, factories, shopping malls and public spaces. As soon as a human enters the tunnel, the fogging is started automatically by the sensor detecting system. It is possible to neutralize germs by fogging disinfecting liquid that comes from the nozzles.

- This system is light in weight, easy to install and ergonomically designed.
- All body surfaces are cleaned, and the disinfection procedure at facility entrances and public areas ensures optimum hygiene.
- It provides advances results in the fight against epidemics and in the prevention of epidemics

##### B. Applications

This tunnel had been designed to be used in areas where there is a high flow of people like the airports, bus stations, even schools, halls, Malls, Theaters, offices, hospitals, hotels, industries etc.

#### II. CONCLUSION

At the end of the report, we can conclude that this tunnel could be very helpful in tackling the Covid-19 pandemic during the unlock period when all the businesses and shops are open for the general public and there is a greater chance of community spread among the people. This cannot be as effective as a vaccine to Covid but it

could be a very good tool in tackling this pandemic. Hospitals have started to use Robots to cater Covid -19 patients during the treatment to reduce the human intervention and to also reduce the risk of further transmission of the virus.

The possibility is endless in these machines, we can also include an infrared camera to detect the body temperature of people entering and if temperature is above recommended temperature a buzzer will sound and person can be stopped from entering and transmitting the virus.

#### REFERENCES

- [1] Keshav Kumar Jha, "Full body sanitizing tunnel to tackle COVID-19", *Journal of University of Shanghai for Science and Technology*, Volume 23, Issue 5, May - 2021 Page-155.
- [2] Akshay Sharma A S, "Review on Automatic Sanitizer Dispensing Machine", *International Journal of Engineering Research & Technology (IJERT)*, Vol. 9 Issue 07, July-2020.
- [3] Pandya, S., Sur, A. and Kotecha, K., "Smart epidemic tunnel: IoT-based sensor-fusion assistive technology for COVID-19 disinfection", *International Journal of Pervasive Computing and Communications*, Vol. ahead-of-print No. ahead-of-print, 2020. <http://dx.doi.org/10.17577/IJERTV9IS070307>
- [4] Goda Vasantharao, S k Arifunneesa, "Temperature Detection and Automatic Sanitization and Disinfection Tunnel-COVID 19", *The International journal of analytical and experimental modal analysis*, Volume XII, Issue VI, June/2020, Page No: 1175.
- [5] Enerst Edozie, Wantimba Janat, Zaina Kalyankolo, "Design and Implementation of a Smart Hand Sanitizer Dispenser with Door Controller using ATMEGA328P", Vol. 4, Issue 6, June – 2020, Pages: 14-18.