



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 Issue: IV Month of publication: April 2021

DOI: <https://doi.org/10.22214/ijraset.2021.33840>

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A Review on Development & Fabrication of Sanitization Gateway for the Purpose of Disinfection

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Abstract: *In this current world situation, COVID -19 virus is still not under control and the normalcy of the life is still far away. Globally millions of the people have been infected. The only possible way to control the virus is the availability of the vaccine to the masses. India is also suffering and the vaccine will available in few months to the major masses. In this environment there is need to generalize the safety and the hygiene standards of the country and make public sanitization feasible. This paper discusses the design and development of sanitization gateway which is cheaper and effective. The use of such gateway will ensure proper disinfection, especially in public places. This gateway will help to raise the hygiene standards and for full disinfection of the subject.*

Keywords: *sanitization, Gateway, Disinfectant.*

I. INTRODUCTION

The commence of 2021 has not been good, many lives have been affected worldwide by the COVID-19 virus and is exponentially increasing, which is originated in Wuhan China. The COVID-19 was declared as the global pandemic by the World Health Organization (WHO) in March 2020.[1] The virus has led to lots of the casualties every day. China the country were all this originated is still under the eyes of the different investigation agencies. The viruses can spread by the transmission from human to humans. The virus is transmitted through minute airborne droplets, when the person coughs or sneezes, and talks. A healthy person gets an infection, when a person comes in the close contact or in the vicinity of the person who is infected. And also if the person touches the eyes, nose, or mouth. The symptoms of the virus is very common which include fever, tiredness, dry cough and mild respiratory issues, etc. and a few other symptoms which include sputum production, headache, haemoptysis, diarrhoea, dyspnoea, and lymphopenia (Ren et al. 2020; Carlos et al. 2020).[1]

The vaccine is not available so far, we can do only thing is to guidelines the safety and precautionary measures by the government and the health experts to avoid the exponential spread. As the country started to try the economy, special attention is given to the human lives. Several disinfectant tunnels have installed in the public places to disinfectant the people and materials moving in public places. It is also very important to disinfect the various public gathering places such as malls, schools, hospital and airports. Although reopening of the schools has also been increasing the spread of the virus in our country. For this purpose, handy, compact and low-cost portable devices can prove effective and efficient in disinfecting every usable space. The suggested design of device in this paper is a improvement over the existing ones as it makes combined use of twin treatments, spraying of a disinfectant in the mist form and exposure to UV-C (ultraviolet-C) radiations, in order to increase the kill efficiency of the virus.

'Social distancing' in the public places is proven to be very useful tool for slowing down and pre cautionary in the public places. But it is very difficult in the crowded places. For reducing the effect of the COVID-19 virus, when the economy is stumbling upon to go back to normalcy, a robust disinfection system is required to break the chain of the virus from spreading in public places, regardless of the hygiene condition of people .The contactless disinfection of the exterior surfaces can be done by the automatic disinfection system to arrest further infection if one gets infected while moving/ working, and it will be an effective step against to the spread of infection. Moreover, the use disinfectant in the gas form will be more effective.

II. BELT AND PULLEY DRIVE

A belt is a loop of flexible material used to link two or more rotating shafts mechanically, most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys, and the shafts need not be parallel. here the various flat belt, V-belt, rope drive, and timing belt. The parameters we must keep in consideration to select the right kind of belt drive, depends upon:

- 1) Power to be transmitted
- 2) Direction of belt motion
- 3) Shaft's velocity and Velocity ratio
- 4) Service conditions
- 5) Distance between shafts, and space available

The belt and pulley drive offers of smooth and efficient transmission of the power in the shafts or in the conveyor systems et. Al. To transmit rotary motion between two parallel shafts or to convert the rotary motion in to the linear motion this system is used. But the common problem of this system is belt slipping and not proper tension in the belt.

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A. Types of belt Drives

- 1) Light belt drives, this type of drives is used to transmit small power and speed up to 10 m/s.
- 2) Medium belt drives, this type of drives is used to transmit medium powers and speed from 10m/s to 20 m/s.
- 3) Heavy drives, these types of drives are used to transmit large powers and speed above 22m/s. [4]

B. Types of the Material Used in the Belt Drives

- 1) Leather belts.
- 2) Cotton belts.
- 3) Rubber belts.
- 4) Balata belts

The coefficient of friction and the belt drive to remain us of the at most importance. Various test has been done on analysis of an influence of rubber V-belt physical properties on CVT efficiency. This will give us a brief idea about the type of the belt we must use. The bench tests conducted on the complete light two-wheeled vehicle drive refer to the real conditions. The examined belts are shown in figure 2, where A is the Dayco belt, B is the Malossi belt and C is the Tecnum belt. The belts are the same size 765x17,5 (length x width in mm).

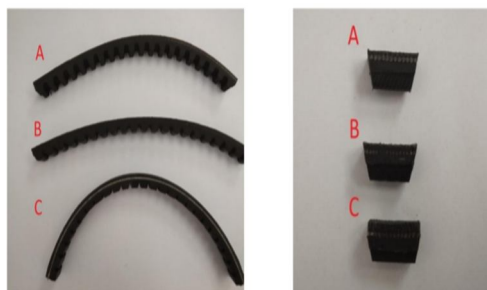


Fig. 1

In figure the results of the friction coefficient measurement between the surface of belt and belt pulley were presented. The measurement was conducted for aluminium pulley (driving) as well as Steel (driven pulley).

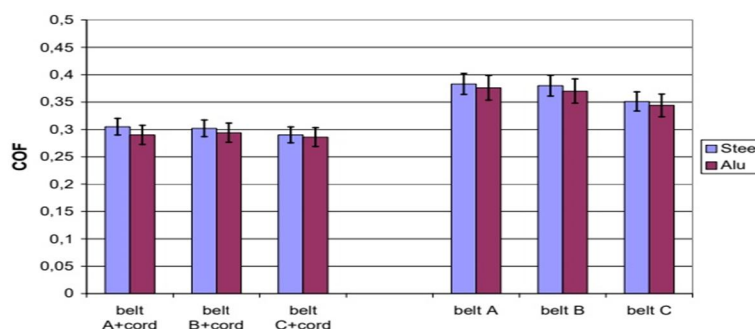


Fig. 2 Coefficient of friction of the considered belts

This shows that the A type of belt is the best suited for use. The belt and pulley system must be steady. The steady state mechanics of belt pulley system have been done by the Lingyuan Kong and Robert G. Parker. It concludes that Belt bending stiffness is included in the steady state analysis of belt-pulley systems where belt inertia is also experimented. An iterative solution is presented to determine the deflections of the belt, belt pulley contact points, span lengths, and the distributions of speed, tension, and friction along the belt.[5]

- a) When the bending stiffness is included, it leads to nonuniform nonuniform speed and tension in the spans and reduces the belt wrap angles on pulleys, for small radii. Span tensions, also which directly impact belt life.
- b) Bending stiffness decreases the wrap angles, causes earlier full slip of the belt on the pulleys, increases the power efficiency η , and decreases the maximum transmissible moment. Some of these effects are pronounced for appreciable bending stiffness and may cause poor performance in systems designed based on string model analysis.
- c) The effects of belt speed on the steady motion are reduced As the bending stiffness increases, the belt speed on the steady motion reduces.

III. SANITIZER

A substance or product that generally manufacturer to reduce or eliminate germ on skin or object is considered as sanitizer. The sanitizers can be classified into two groups based on the chemicals used as the active reagents:

A. Alcohol Based Sanitizer

The alcohol-based sanitizer may contain one or more type of alcohol along with or without bulking agent, filler and moisturizing agent to be applied on surface or body parts to kill the microbes and temporary reduce the growth. These sanitizer generally contain isopropyl alcohol, ethanol or n-propanol as active agent. ABS are found to be highly effective against broad range of germicide without need of water or drying with towel. The FDA recommends that Sanitizer should contain 60-90% of alcohol for its maximum efficiency. However, there are few drawbacks of ABS which comes with high effectiveness such as it is highly flammable & toxic thus proper care should be taken while its use. Also, it has short-lived effect & weak against protozoa, non-lipid viruses and bacteria spores.

- 1) Alcohol based
- 2) Active reagent
 - a) Ethanol
 - b) Isopropyl Alcohol
 - c) n-propanol

B. Alcohol Free Sanitizer

Alcohol free sanitizer contain benzalkonium chloride, a quarterly ammonium as an active agent. These chemicals provide antiseptic properties to give the antimicrobial effects. The concentration of benzalkonium is very low often in 0.1%. The chemical has different manner of action & function according to their chemical functional group. The alcohol-free sanitizer has the advantage over the ABS as they are non-flammable and non-toxic while providing almost same degree of protection against the pathogens. This sanitizer comes in the liquid, gel and serum form with every form having their own characteristics. Studies have shown that gel and serum form are more widely used especially as compared to the liquid form because of handling feasibility.

- 1) Alcohol Free
- 2) Active reagents
 - a) Iodine
 - b) Tridosen
 - c) Quaternary ammonium

C. Adverse effect of Alcohol based sanitizer on human health and environment:

Sanitizer can damage the skin which include dryness and itching that can vary from mild to debilitating. It can harm the body parts and cells through several mechanics; deterioration of the spractum corneum proteins, alternation of intermolecular lipids, decrease in corneocyte cohesion and reduction of spractum corneum water binding capacity Among all the ABS ethanol has the least skin irritant property , However it can cause poisoning if person drank more than two mouthful, in case of isopropyl alcohol based sanitizer its disposal is major concern due to its environment effects while hydrogen peroxide overcomes this disadvantage but the injection of hydrogen peroxide causes some serious damage to gastrointestinal track as well as to respiratory track.

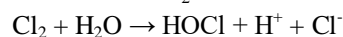
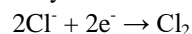
D. HOCL as a Sanitizing liquid:

Hypochlorous is an oxidizing agent occurring naturally which is generated by WBC (White blood cells) within the human body. It plays an important role in the immune system by destroying the disease forming pathogens. However, HOCL can be synthesized in the laboratories through chemical reactions mentioned below:

1) Hydrolysis of the chlorine gas



2) Electrolysis of the salt solution



3) Acidification of hypochlorite:



A proper concentration of HOCl with H₂O has been widely used as the disinfectant. HOCl has been found effective against the broad range of the micro-organisms. As well as its non-toxic, non-corrosive and non-flammable nature overcomes the limitations and the disadvantages of the ABS and all other sanitization liquid.

IV. MOTOR

Nasser Hashernnia (2008): has studied in their paper, different types of electric motor and which will be most suitable for the Electric vehicles (EV), applications. From this study we will get a brief idea about which motor must be used for our purpose.

There are five types of the motors mainly:

A. DC Motors

DC motors are used widely because of the simple construction and easy control and decoupling of flux and torque, it poses problems in maintenance. As the Vector control of the ac motor have risen, DC motors attraction in traction application has diminished.

B. Induction Motor

Use of induction motors are increasing significantly in various industrial, residential applications. Variable frequency drive could be a special kind of convertible speed drive. Ac drive, variable speed drive, adjustable frequency drive, inverter drive etc. are the opposite variety of names of variable frequency drive. Various sorts of operations and different multispeed functions are executed by regulating the speed of motor. The benefits provided by induction motors making a large difference compare to other electrical motor. Some of the benefits are listed below:

- 1) The induction motors are very cheap compare to dc motors.
- 2) The efficiency of induction motors is better than any other motors.
- 3) It is cheaper than any other motor.

C. Permanent magnet synchronous (PMS) motors (or brushless AC(BLAC)):

This motor gives tough competition to the induction motor. Many of the manufacturers have used this in their vehicles already. These motors have good advantages such as high-power density, higher efficiency and the most effective dissipation into the surrounding. The disadvantage of these type of the motor is that due to heat or armature reaction they get demagnetized.

D. Switched reluctance motors (SRM):

Switch reluctance motors are use much in the HEV systems in use. Simple and rigid construction, fault tolerance, simple control and excellent torque-speed characteristic are the major advantage of these type of the motor. high noise, high torque ripple, special convertor topology and electromagnetic interference have been mentioned for this motor are the major disadvantages.

E. Brushless IX motors (BLOC):

This motor is the modification of the DC motor by reversing the stator and rotor of permanent magnet DC motors. Their main advantages are the deletion of the brushes, their compactness, high efficiency and high energy density. Six Factors have been evaluated in the traction systems commonly used in EVs are evaluated.

It is concluded that based on these factors, the IM and PM motors are more suitable. However, in the following section the DC and SRM motors are not taken into consideration due to their disadvantages. PM motors have the highest power density due to the presence of high-power density permanent magnets. Moreover, they have the highest efficiency because of the absence of rotor losses. DC and induction motors have the best controllability and their flux and torque control can be easily decoupled. The induction motor has the best reliability due to its robust and rigid construction.

From all this induction motors will best for our use because of the robust, less costly, mature in technology and need less maintenance.

V. CONCLUSION

From all the above study it is clear that there is a need of a machine which can be used in various public places for general disinfecting purpose. All the components of the machine have also been studied the best one is taken into consideration. Thus, the development of the sanitization gateway will ensure the proper sanitization of the subject. This machine will kill the airborne particulates and microbes' effectively.

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