**A Proposal on Installation of Disinfection Chamber to Reduce Transmission of COVID-19 in Bangladesh**

**Introduction**

***Installation of Disinfection Chamber*** is an inclusive program in response to **COVID-19** epidemic to ensure safety and limit the spread of dangerous pathogens in public and private facilities such as hospitals, academic institutions, shopping malls, mosques, banks, garments, industrial complex, airport, bus & railway stations, and other crowded areas. Our inclusive program aims to serve our customers in a sustainable manner through a market-led approach. The distinction of this program lies in the clear identification of potential customers to create opportunities in the post-**COVID** world.

**Our Objectives**

Followings are the key objectives of our project:

1. To promote operational health and safety in every possible public and private institutions in the post **COVID** world;
2. To encourage the mass people to revitalize the economic activities throughout the country by ensuring a safe and sound environment that is free of dangerous pathogens.

**About the Disinfection Chamber**

The number of **COVID-19** positive cases is increasing by day. Various ways of prevention are carried out to break the chain of transmission, one of them is disinfection method. Recently, innovative approaches have been generated in the disinfection process to assist in reducing the transmission of **COVID-19**. A variety of approaches has been invented to execute the disinfection process that is expected to eliminate pathogenic microorganisms using chemicals, physically via box, chamber, tunnel, partition, confined space or gate. Automatic dispersion of disinfectant to individuals is activated once a person steps in or passes through the box, chamber, tunnel, partition, booth or gate, which is made possible by an infra-red sensor or motion sensor embedded in the device. The disinfection chamber is very easy to use, simply enter it, turn on the switch and rotate your body 360 degrees as disinfectant is sprayed inside the chamber. The spraying process takes approximately 20 to 30 seconds in each round of disinfection. The antiseptic spray used in the chambers resembles hand sanitizer fluid in its composition. It's different from the disinfectant liquid used to spray public facilities and will not irritate your skin or eyes.

There is a claim that this technology could prevent and limit the spread of bacteria and virus in the current **COVID-19** pandemic. The box used is modular designed, and can be transported, easily installed and uninstalled. This technology has been used in Turkey, India, China, Thailand in a variety of settings, namely hospital, market, industrial complex and administrative buildings. Disinfectants being used in the device will vary as per the classification of bacteria and viruses. As claimed, this device can be installed at every entrance of high-risk areas, such as hospitals, airports, train stations, bus stations, supermarkets, factories, schools, and other crowded areas.

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| **Sl. No.** | **Solutions for Mixer in Spray in Booth** | **Solution Preparation** | **Ratio** |
|  | Isopropyl Alcohol (Best) (IPA)+Glycol | 0.5% + Water | 70/30 |
|  | Hydrogen Per Oxide (Moderate) | 0.5% + Water | 60/40 |
|  | Viodin (Good) | 0.5% + Water | 60/40 |

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| **Capacity** | |
| Jar Capacity | 50-liter jar |
| Person Capacity | 1000 Nos. for 50-liter |
| Persons Pass at a Time | 3 – 4 Nos |

**Evidence on Effectiveness and Safety**

The effectiveness of disinfection chamber depends on the disinfectant used. Research on **SARS-CoV** and **MERS-CoV** revealed that coronavirus is sensitive to ultraviolet and heat. Exposure to 560C for 30 minutes and lipid solvents such as ether, 75% ethanol, chlorine-containing disinfectant, peracetic and chloroform can effectively inactivate the virus. Chlorhexidine has not been effective in inactivating the virus. The **USCDC** guidelines recommend the use of **USEPA** registered disinfectant to clean and disinfect facilities. The **USEPA** has listed out disinfectants that can be used against **SARS-CoV-2**. Among them are thymol, quaternary ammonium, Isopropanol, ethanol, L-lactic acid, glutaraldehyde, hydrogen peroxide, phenolic, sodium hypochlorite, sodium chlorite, sodium dichloroisocyanurate dehydrate, hypochlorous acid, citric acid, silver, peroxyoctanoic acid, peroxyacetic acid, peracetic acid and octanoic acid. According to the USEPA, these products are for use on surfaces, not humans. Most of the products listed are suitable for hard non-porous surfaces e.g. glass and metals.

Clothing’s are considered as porous surfaces / materials and **USCDC** recommends to launder / wash the items using the warmest appropriate water setting and dry it completely. Otherwise, products that are suitable for porous materials and listed in **EPA** registered for use against **SARSCoV-2** list can be used. However, the products that are listed, as of **7 April 2020** (contain quaternary ammonium) need five to ten minutes contact time (to be use as laundry presoak) to be effective in deactivating human coronavirus. Most of the spraying process in the disinfection chamber takes approximately 20 to 30 seconds in each round of disinfection which is not enough to deactivate coronavirus.

**Features of Disinfection Tunnel:**

* Protects against any type of virus, including the deadly corona virus;
* When a person enters this disinfectant tunnel, the disinfectant is automatically sprayed with the sensor at a 360-degree angle;
* Sanitizing carpet destroys the virus in the feet and shoes;
* Automatically detects people;
* Auto / manual, and rust free;
* Dust and water-resistant design;
* Low maintenance;
* Energy efficient;
* AC / DC mode and low power consumption; and
* Internationally recognized.

**Important and Warning Notice:**

* The use of disinfectant tunnels is not harmful but if it is sprayed with harmful chemicals then it is definitely a health risk;
* Spraying the external part of the body with alcohol or chlorine does not kill the virus inside the body of an infected person and can be harmful to mucous membranes (i.e. eyes, mouth);
* The chemical used in our "disinfectant tunnel" has already been tested by SGS, an international chemical testing company, which does not contain any health hazards;
* The disinfection tunnel must be free from fire, and any kinds of combustible substances;
* Smoking should be prohibited in and around the disinfection tunnel;
* Chemicals banned by **WHO** or Bangladesh Health Department such as chlorine, bleaching powder (hypochlorite) cannot be used in this tunnel.

**How it Works**

The disinfection chambers are being used to serve people working in areas affected by covid-19. The chamber works automatically with green light turning on to let the user step into the chamber and undergoes a disinfection period tice within 15 minutes. The antiseptic solutions of salt ions can help avoid skin irritation and sterilize the user’s nose and throat during inhalation without causing breathing difficulty.

It is known that it only takes 15 to 20 seconds to clean a person’s body before entering the clinic area. In addition, the system is designed as a module so it can be easily removeable and transported. A complete installation system can meet the capacity of dissection up to 1,000 people/day.

The system consists of two chambers. One sprays electrolyzed water in the form of droplets and the other directs heat and ozone onto the body of the person. Produced by electrolyzing ordinary tap water containing dissolved sodium chloride, it can even clean the respiratory system.

**Mobile Disinfection and Sterilizer Chamber Equipment’s list:**

* Tent/Enclosure (size depends on how many people will use at a time)
* Spray Nozzle-Sprinkler Type (2-3 USGPM capacity)
* Vertical spray pipe (orifice dia 2-3 mm, actual depends on sanitizer materials)
* Mixing machine/compressor (air/water to sanitizer)
* Distribution pipe (cPVC/uPVC/MS/SS)
* Valves (manual operated)
* Valves (automatic 24V DC operated - optional)
* Occupancy sensor/PIR sensor
* Timer (20-30 seconds counter)
* Visual notifier – light/strobe (220V AC or 24V Dc operated)
* Electrical control unit (ECU)
* Hand nozzle
* Sanitizer tank/container/vessel
* Waste sanitizer collection PIT/drain/reservoir

**Sterilizer Agents:**

1. Bleaching Powder (need proper mixing as per WHO guided)
2. Hydrogen Peroxide (as per EPA/WHO guided)
3. Alcohol Base (proper mixing guide required)
4. UV Light (specific time and wave length)
5. Soap Water (need proper proportion)
6. Salt Ion Water (need ionization electrolyte circuit)
7. Proper Electrical Panel with HMI Panel (with software)

**Sanitizer Properties: Option 01 (Chemical Substance)**

The product contains the following substances:

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| **Chemical name** | **CAS-no** | **EINECS-no** | **Wt/Vol %** | **symbols** |
| Water | 7732-18-5 | 231-791-2 | 99.7-99.8 | H2O |
| Sodium chloride | 7647-14-5 | 231-598-3 | 0.1-0.2 | NaCl |
| Hypochlorous acid | 7790-92-3 | 232-232-5 | 0.01-0.02 | HOCl |
| Sodium chlorate | 7775-09-9 | 231-791-2 | 0.002 | NaClO3 |

**Sanitizer Properties: Option 02 (Bleaching Mixture)**

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| **Area or item to be cleaned** | **Bleach amount** | **Water amount** | **Cleaning steps** |
| Mold growth on hard surfaces (examples: floors. Stoves, sinks, certain toys, countertops, flatware, plates, and tools). | 1 cup (8 ounces) | 1 gallon | 1. Mix 1 cup (8 ounces) of bleach in 1 gallon of water. 2. Wash surfaces with the bleach mixture. 3. If surfaces are rough, scrub them with a stiff brush. 4. Rinse surfaces with clean water. 5. Allow to air dry. |

**Sanitizer Properties: Option 03 (Alcohol Base)**

**Part A: Guide to Local Production**

Part A is intended to guide a local producer in the actual preparation of the formulation.

**Material Required (Small Volume Production)**

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| **Reagents for Formulation 1** | **Reagents for Formulation 2** |
| * Ethanol 96% * Hydrogen Peroxide 3% * Glycerol 98% * Sterile Distilled or Boiled Cold Water | * Isopropyl Alcohol 99.8% * Hydrogen Peroxide 3% * Glycerol 98% * Sterile Distilled or Boiled Cold Water |

* 10-litre glass or plastic bottles with screw-threaded stoppers
* 50-litre plastic tanks (preferably in polypropylene oxide, polyethylene, translucent so as to see the liquid level)
* Stainless still tanks with a capacity of 80-100 liters water (for mixing without overflowing)
* Wooden, plastic, or metal paddles for mixing
* Measuring cylinders and measuring jugs
* Plastic or metal funnel
* 100 ml plastic bottles with leak-proof tops
* 500 ml glass or plastic bottles with screw tops

**Final Products:**

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| **Formulation 1** | **Formulation 2** |
| Final Concentrations:   * Ethanol 80% (v/v) * Glycerol 1.45% (v/v) * Hydrogen Peroxide 0.125% (v/v) | Final Concentrations:   * Isopropyl Alcohol 75% (v/v) * Glycerol 1.45% (v/v) * Hydrogen Peroxide 0.125% (v/v) |

**Sanitizer Properties: Option 04 (Others)**

Guidelines for preparation of **1% Sodium Hypochlorite** Solution:

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| **Product** | **Available chlorine** | **1% percent** |
| Sodium Hypochlorite – Liquid Bleach | 3.5% | 1-part bleach to 2.5 parts water |
| Sodium Hypochlorite – Liquid | 5% | 1-part bleach to 4 parts water |
| NADCC (Sodium Dichloroisocyanurate) Powder | 60% | 17 grams to 1-litre water |
| NADCC (1.5g/tablet) Tablets | 60% | 11 tablets to 1-litre water |
| Chloramine – Powder | 25% | 80g to 1-litre water |
| Bleaching Powder | 70% | 7g to 1-litre water |
| Any Other | As Per Manufacturer’s Instruction | |

**Sanitizer Properties: Option 05 (H2O2)**

**Can we use Hydrogen Peroxide (H2O2)?**

***Hydrogen Peroxide*** is typically sold in concentrations of about 3%. It can be used as is, or diluted to 0.5% concentration for effective use against coronaviruses on surfaces. It should be left on surfaces for one minute before wiping. 0.5% peroxyacetic acid, 3% Hydrogen Peroxide, or 500 mg/L chlorine dioxide can be adopted for air disinfection, by way of aerosol spray, with 10-20 ml/m3. Windows should be closed before disinfection, and the surface and the space shall be evenly sprayed, starting from up-down, and then from left to right. Windows can be opened for ventilation after 60 minutes of reaction. After spray disinfection, the surface of objects may be wiped (swept) in the way of daily disinfection.

**Unit Costing of the Product**

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| **Sl. No** | **Particular** | **Qty** | **Unit Rate (BDT)** | **Special Discount** | **Remarks** |
|  | Disinfectant Booth including all materials | 1 Nos | **1,15,000** | Only Applicable for Academic Institutions, Hospitals, Govt. Offices, Shopping Mall, Mosque, Banks and References | **Dimension:**  **6.5’ X 4.0’ X 5.0’** |
|  | Disinfectant Chemical | 50 ltr. |
|  | Installation & Service Charge | 1 Nos. |
|  | Sensor (Automatic) | 1 Nos. |
|  | Sprinkler Flash (Automatic) | 1 Nos. | 5% on Unit price |  |
|  | Lighting (Inside LED) | 3 Nos. |  |
|  | Automatic Pump | 1 Nos. |  |
| **Total Price** | | | **1,15,000** | | |
| **VAT (15%)** | | | **17250** | | |
| **Net Price** | | | **1,32,259** | | |

**Terms & Condition:**

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| **VAT and Tax** | : | Offers Includes VAT |
| **Mode of Payment** | : | 100% Advance with Work Order |
| **Payment Mode** | : | Cash  or  On Favor to  ABU JUBAYER, BRAC Bank Limited, New Eskaton Corporate Branch,  AC. No: 1520104191982001 |
| **Delivery** | : | 10 working days after the payment. |
| **Client Service** | : | One-year product related full consultancy support. |
| **Offer Validity** | : | 60 Days |

**Conclusion**

The effectiveness of disinfection chamber in reducing the COVID-19 transmission, in addition to, and not replacing existing strategies and control measures (such as hand washing and social distancing) to combat the spread of coronavirus is still uncertain. The type of disinfectant used in the devices plays a major role in determining the effectiveness of the devices.

**Photography:**







