TECHNOLOGIES TO TACKLE COVID-19 PANDEMIC FROM IIT KANPUR FOR INDIA & THE WORLD

IIT Kanpur (IITK) is working round the clock to combat the COVID-19 pandemic. It's faculty from across its engineering departments and the incubated companies of its Technology Business Incubator (SIIC -Startup Innovation Incubation Centre) have been assiduously working to develop rapidly scalable range of products and services for COVID-19 prevention, protection and management. IIT Kanpur is also part of group called Caring Indians that has gathered innovation enthusiasts from across the country where IITK is providing both technical and business mentoring through its alumni and their connects in whatever way possible.

We offer an integrated set of end to end industrially scalable and commercially viable solutions to deal with various challenges at every stage of the COVID-19 pandemic. The proposed technologies can be deployed nationally and across the ASEAN region wherever needed through technology transfer.

PREVENTION:

Contact tracing and fake news verification App

The users of social media apps like WhatsApp or Twitter can easily check whether a news received is fake or not (in a much simpler manner than the usual apps).

What makes our solution stand out from the other such detectors is that the checking methodology is extremely simple. The users do not need to open a different app or google the news to find this out, it will happen by just forwarding the message to a saved contact. The ease of use is the biggest impact that this project wants to create for fake news detection.

This can be used with non-smart phone also and thus deployable in areas of limited telecom connectivity.

Alternative to current Surgical and N-95 masks

Our primary goal is to test various available filter media and develop a low-cost protective respirator which is equivalent or even better than N95. We have to quickly set up a filter testing rig equipped with an aerosol laser spectrometer and identify a non-woven polypropylene based 3-4layer material as the likely candidate to make such mask. Its efficiency must be equal to N95 and it offers much lower resistance to the air passage.

Scalability:

After identifying the appropriate material the mask will be made manual because the ultrasonic welding machine and automatic manufacturing machines are also a bottleneck at this lock down period. We will identity few profession stitches who have prior experience in textile and mask fabrication. Initially for few days we would be able to manufacturing 500 piece/day. Slowly we will ramp up the production to 2000/day.

CONTAINMENT:

Personal Protective Equipment Kits for medical staff and essential workers

IITK has designed a PIPES Kit based on thin cylindrical rolls/pipes of polyethylene, which is non-porous & commonly used in the industry for packaging & making plastic-bags. Polythene material makes airtight and will provide required protection. It can be easily mass manufactured and transported at scale. The technology is made open source for anybody to make it. Easy to scale, cost effective and relevant particularly as imported kits are difficult to get.

SURAKSHA KIT - WHOLE BODY PROTECTION WEARABLE by Aarna Biomedical Products

A holistic full body disposable wearable kit (named as SURAKSHA) for self-protection of personnel in vulnerable environments such as the security guards, municipal workers, sanitization workers, personnel involved in testing patient samples, health professionals and paramedics employing a user-centric approach, in-house development and production skills for the larger benefit of our nation. The wearable kit would comprise of a full-face shield, face mask, a coverall with fused head coverage, shoe covers and hand covers. We aspire to make this holistic wearable kit at an affordable price for the masses and aspire to reduce the price further with growing demand. The above is tenable and implementable after immediate funding support and approvals for logistics and manufacturing.

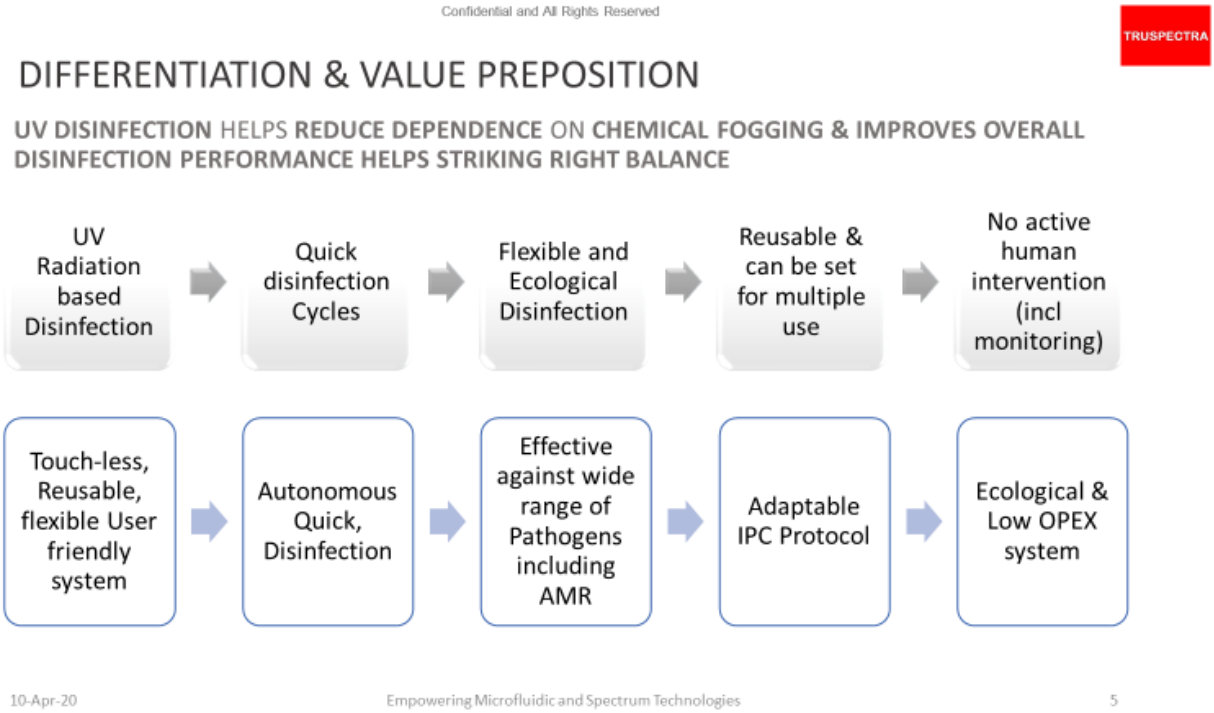
MANAGEMENT:

Disinfection chamber: Two-stage Innovative Process for Human Disinfection for Controlled Access

Majority of the approaches of individual disinfection process focuses on exposing human touch surfaces like fingers, hand, etc. to soap based solutions and covering faces with masks to prevent droplet-based spread. However, residual germs residing on clothes, sleeves, masks, etc. are not eliminated by this process.

This proposal focuses on innovatively combining two common disinfection approaches followed across the world to achieve a new and cost-effective disinfection process that is safe for human beings.

Autonomous Robotic UVC hospital room disinfection system with sensor navigation with an option for Manual affordable UV disinfection systems



Using Vacant Buildings as COVID-19 Recovery Facilities:

In India, there is an urgent need for temporary COVID-19 recovery facilities with ICUs to boost the current capacity of hospitals.

The governments of various states including Gujarat have done a lot of work towards this. However we will need more. The situation is more worrisome in Northern and Eastern states. According to the National Health Profile – 2019, there are only 0.11 government hospital beds in Bihar, while states such as Jharkhand, Uttar Pradesh, Madhya Pradesh, Odisha, Assam, Manipur and Maharashtra are also below the national average of 0.55 government beds per 1000 population. Only 5% to 8% of these are ICU beds.

We propose a solution of rapidly scaling up COVID-19 recovery facilities by utilizing existing hard infrastructure – buildings that are government owned, community owned, or private – and refurbishing them to provide COVID-19 recovery facilities with ICUs. The proposed structures are

— Community halls owned by local municipalities

— Community or private owned community or marriage halls

— Completed but not occupied private commercial buildings

— Newly constructed, completed but vacant residential buildings

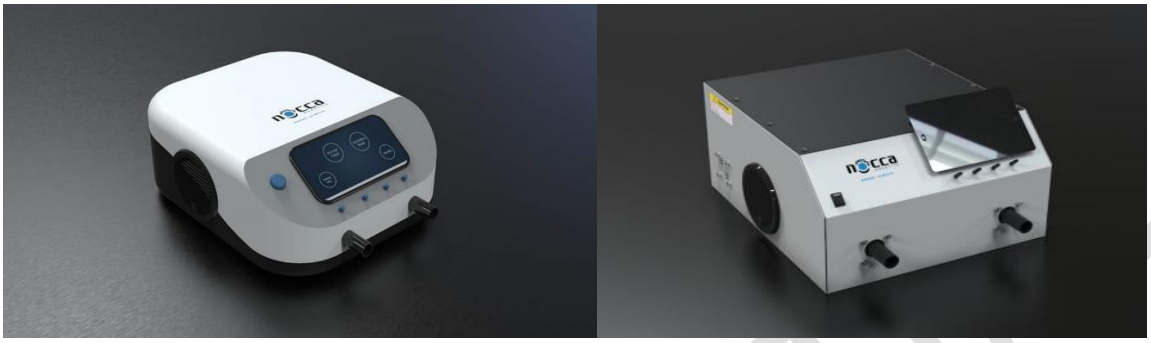
Census 2011 recorded 330,835,767 houses, of which about 7.5 percent (24,812,682) of the houses are Vacant. 95% of these vacant houses are in good and livable condition.

Vaccine: VSV based live attenuated recombinant vaccine against Novel Coronavirus infection

We aim to develop replication-competent vaccines against Novel coronavirus (SARS-CoV-2) based on attenuated recombinant vesicular stomatitis virus (rVSV) vectors expressing the novel corona virus spike (s) glycoprotein (rVSV-SARS-CoV- 2S). Vaccines, designed on live attenuated recombinant VSV template have been highly effective in animal models and are particularly appealing because they can be administered mucosally. Additionally, VSV rarely infect human and the chance of infection due to VSV is negligible. Recently, recombinant VSV based Ebola virus, Marburg virus and Lassa virus vaccine has been developed and tested effective in nonhuman primates model. The rVSV-ZEBOV-GP vaccine against Ebola had been 97.5% effective at stopping Ebola transmission, relative to no vaccination, approved by WHO in 2019 for vaccination

CRITICAL CARE TREATMENT:

Indigenous Invasive Ventilator solution



- Modular design, high end ventilator suitable for COVID-19 patients
- Rapidly manufacturable at large scale across India
- Low Power
- Pressure controlled (Version 1), Pressure and Volume Control (Version 2)
- Versatile operations: works with both medical air / ambient air + oxygen
- Safe invasive and non-invasive ventilatory modes
- IoT-based system to create a Ventilator Management System
- Remotely control & monitor multiple ventilators remotely with one IoT device
- Inlet filter to prevent viral entry in the circuit
    - Expiratory flow filter to contain the viral load
- Microprocessor-based with active exhalation
- Automatic calibration system on startup
- Easy transition from invasive to noninvasive ventilation
    - Price - Version 1 - INR 50,000 and Version 2 - INR 1,00,000 (subject to cost of components not increasing in the interim)

For More details and Videos regarding " Innovations on COVID – 19 ": << Click Here >>