Automated Disinfection for public and private spaces

Deploying autonomous robotics to control the spread of pathogens

Bishop™ Cleanbot™ UV-C Disinfecting Robot

MADE IN CANADA
FABRIQUE AU CANADA

The Current Landscape

As the world is witnessing with the COVID-19 pandemic, contagious viruses are capable of spreading at exponential rates through public spaces and far beyond. Confirmed cases in Italy, for example, doubled in just four days between March 11 and March 15, 2020.

Spread of COVID-19

Cases reported by health agencies. A change in reporting methodology on Feb. 13 caused a one-day spike.
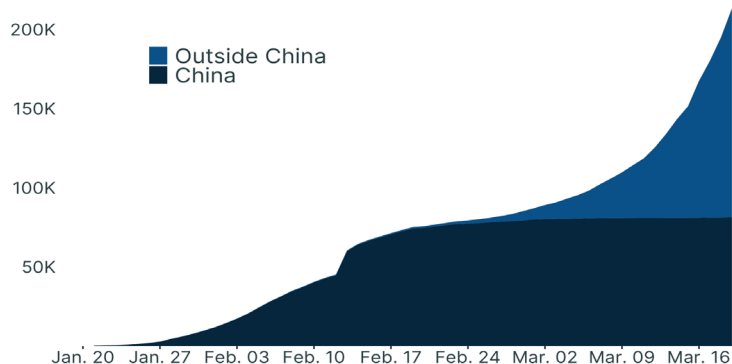
Source: European Center for Disease Prevention and Control, Our World In Data.
*Graphic by David H. Montgomery | MPR News*

Even within healthcare facilities where disinfection is a top priority, data illustrates an enormous level of contagion among Italy's vital medical personnel. Since the onset of the outbreak through to March 19, 2020, an astonishing 2,898 Italian healthcare staff have been infected — approaching 10% of their COVID-19 cases.

As traditional disinfection methods and staffing limitations fail to stop the spread of COVID-19, governments have turned to extreme measures in attempts to slow contagion rates which are now threatening to overwhelm health facilities globally. States of emergency, including severe restrictions on gatherings in public spaces, have been declared in Canada and throughout the world.

The incredible toll on the global economy is only beginning to be quantified. Service-based industries such as retail, banking, travel and hospitality, as well as community and cultural venues such as gyms, sports arenas, and theatres cannot sustain prolonged closures and cancellations. *A robust, self-monitoring, automated system of disinfection for all such public and private spaces including offices, building elevators and corridors is urgently needed.*

How the world is reacting

Organizations around the world are scrambling to find effective ways to disinfect their environments. Janitorial staff are cleaning more frequently and paying special attention to common surfaces that see high rates of contact such as doors and handles, handrails, elevator buttons, counter-tops — and especially the undersides of edge-areas of tables/desks and arm-rests on chairs of all types.

E protein

S protein

M protein
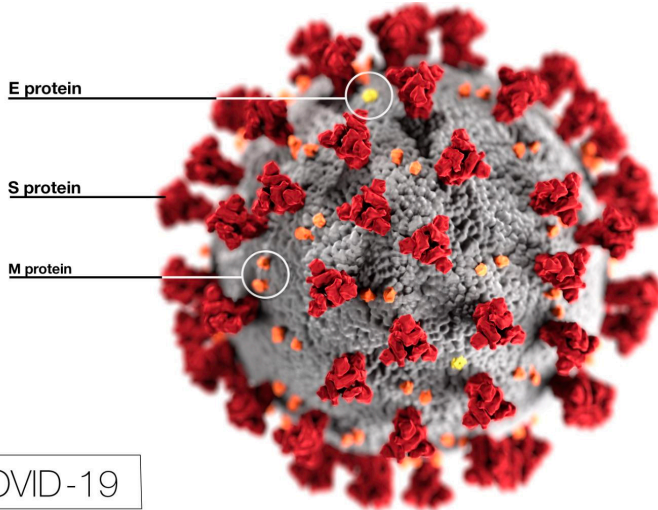
COVID-19

With the declaration of this global pandemic, hospitals, airports, transit systems, and all other public facilities are being challenged to disinfect surfaces, while businesses are also attempting to find new ways to expedite the process. Business continuity plans demand that reliable disinfection operations must continue unabated, regardless of qualified staff availability.

Thoroughly disinfecting surfaces by hand takes a trained person far longer than the time previously allotted for routine cleaning. Such disinfecting operations are demanding increased staffing, prompting many organizations to consider the use of mist or fog systems to distribute chemical disinfectants throughout a room to speed this process, at the risk of reduced efficacy.

Considerations and risks

The CDC recommends closing infected areas used by ill persons (suspected or otherwise) and then deferring the commencement of a manual disinfection process for 24 hours — which is not possible in many situations. In addition, the CDC lists extensive Personal Protection Equipment (PPE) required to carry out disinfection, and provides instructions on the critical disposal processes of the PPE itself before leaving each room.

Stamina and dexterity are a finite resource. Due to limits in human ability, tiredness and discomfort among disinfection teams lead to mistakes and possible omissions that present dangers to the team and compromise the disinfection process. Ultimately subsequent patrons are also vulnerable to these omissions.

**Mist and fogging systems are not able to cover all areas.** Cracks, tight spaces, and particularly critical areas underneath the edges of tables and desks, as well as under armrests and surrounding equipment, are difficult areas to reach. If these issues go unaddressed, the efficacy of the entire disinfection process is nil. Any forgotten or otherwise omitted surfaces, especially if they are commonly touched areas, significantly increase risk of a local or systemic outbreak.

Efforts to disinfect are only as good as the condition of the resources doing the work.

The way forward

With the rapid transmission and crippling effect of COVID-19, here at CrossWing we are able to leverage our expertise in robotics and automated systems to deliver a fully autonomous solution to assist in the fight against the spread of pathogens. Equipped with disinfecting capabilities delivered through short-wavelength ultraviolet (UV-C) light, our autonomous robot destroys microorganisms by disrupting their DNA.
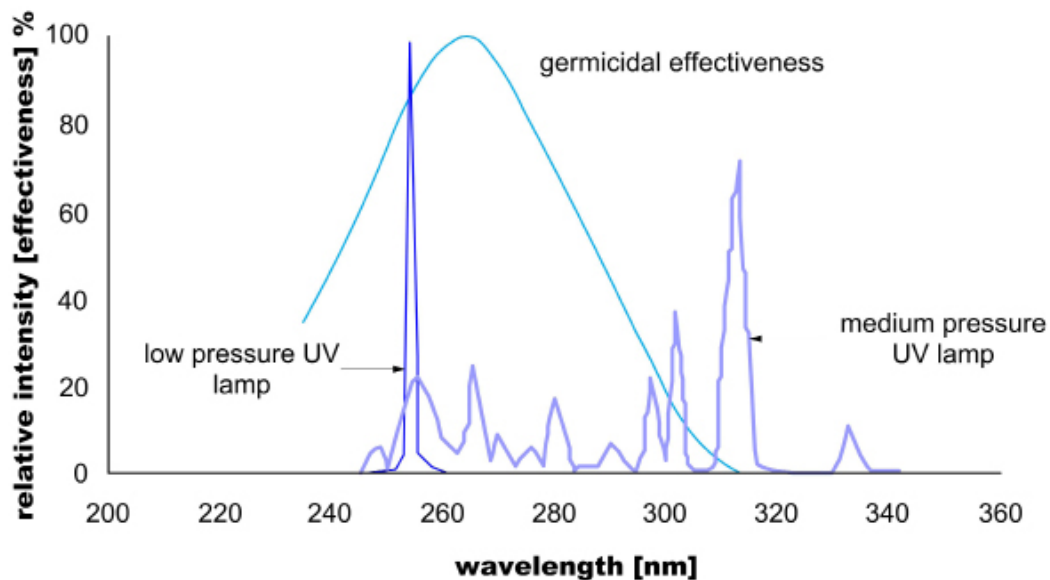
US National Library of Medicine & National Institutes of Health

Ultraviolet germicidal irradiation (UVGI) has been proven to be extremely effective against bacteria, viruses, molds, and other pathogens, and is currently used around the world in air and water disinfection, wastewater treatment, laboratory hygiene, food and beverage protection, and more.

Automation & Robotics

Legacy UV-C disinfection systems have been used in several ways. Two of the most common are powered UV-C torches (a wheeled rack or cluster of UV bulbs/lamps) that radiate disinfecting energy outwards from a Xenon lamp or other source and, UV-C bulbs fixed to walls or ceilings to disinfect surfaces directly in line with such UV sources.

A major drawback of legacy UV-C equipment effectiveness is that it is highly dependent on staff training and infrastructure layout. While ceiling and wall-mounted UV-C bulbs are an effective solution in hospital operating rooms, they are not practical for most organizations to retrofit thoughout a facility, nor do they address many common pathogen hot spots like the underside of the front lip of tables, desks, counter-tops or armrests. Using a wheeled UV-C torch also has limitations for disinfecting applications including the need for staff to locate the torch, exit the room (requiring PPE removal and discard), then start and stop the torch from outside the room (UV-C rays are damaging to personnel) before re-entering and relocating the torch manually in multiple spots within a room (each time requiring the donning of a new suit of PPE and then its disposal) to cover shadow areas; an inability for torch solutions to address many common pathogen hot spots like the underside of the front lip of tables, desks, counter-tops or armrests; and the challenge of appropriate disinfection of extension cables which should be fully disinfected before leaving the room — every single time a room is treated. For this method to be effective, staff must be attentive and follow protocols to the letter during each application.

The best way to execute repetitive tasks is through automation — and the best alternative to human decision making and execution of dynamic tasks is artificial intelligence. Robotics is the best of both worlds. We can automate the execution of strict protocols while allowing for the versatility of dynamic decision making, all while keeping staff safe from the risk of infection resulting from a mistake or an unforeseen situation.

The
Bishop®
Cleanbot UV™

Our Bishop® line of robots is a zero-compromise approach to autonomous systems. We've designed this configuration with state-of-the-art UV-C LED panels to provide UV-C disinfection of public and private spaces and facilities. With advanced connectivity protocols, Bishop® is also able to gather, assess, and distribute data in real-time to operators and site supervisors. Eliminating all the downsides of manual human-operated UV-C technology, the Bishop® is not prone to fatigue and follows a set of defined procedures to ensure efficacy.

TELESCOPING PAYLOAD

360 DEGREE VISION

ARTICULATING UV-C LED DISINFECTING PANELS

MODULAR DESIGN

ADVANCED SENSORS

MILITARY GRADE BATTERIES

OMNIDIRECTIONAL MOVEMENT

	Manual Labour	Mist/Fog Systems	Manual UV-C	Bishop ® UV-C Robot
Coverage	Varies	Medium	Low	**Maximum**
Efficacy	Varies	Medium	Low	**Maximum**
Fatigue & Error Free	No	No	No	**Yes**
Automated	No	No	No	**Yes**
Self-Disinfection	No	No	No	**Yes**
Precision Reporting & Logging	None	None	None	**Yes**

The added benefit of CrossWing Bishop® series of robots is their ability to integrate with emergency services and incident response teams to deliver a comprehensive solution with a focus on public and personal safety. With powerful real-time response measures, organizations are able to handle rapidly-changing and volatile situations such as:

- Detection of falls and injuries (with visual and sensor-driven assessments of health and condition)

- Hazards (fire, flooding, spills, materials, and objects)

- Intrusion and breach of a facility or designated area

Hospitals, schools, transit systems, and other public and private spaces can now minimize the transmission of pathogens and reliably enhance the safety and security of their communities.

Full autonomy, 360-degree vision, omni-directional movement, full remote-control capabilities, and the option to monitor air quality means you can limit the risk of exposure to pathogens while optionally performing security patrols, thereby ensuring the safety of personnel, first responders, and the general public.

Let's
Connect

Contact us today and join us in the fight against the spread of viruses and pathogens. We strive in providing safe spaces in which communities can thrive.

CrossWing's mission is to provide autonomous solutions to address the wellbeing of our ever-changing society. We have partnered with Canadian universities to develop a robust, robotics platform that is not only used in teaching and research, but will also assist Canadians in their daily lives.

We are founding partners of both the National Sciences and Engineering Council of Canada's Canadian Robotics Network (NCRN) and of the SENTRYNET project: a cutting-edge Canadian endeavor to identify and develop solutions building trust among autonomous robots, civilians, and security teams. CrossWing is the exclusive robotics platform provider for this Defense Research and Development Canada (DRDC) project.

Our Research Partners

YORK U UNIVERSITÉ UNIVERSITY

UOIT UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY

UNIVERSITÉ DE SHERBROOKE

McGill UNIVERSITY

UNIVERSITY OF WATERLOO

UNIVERSITY OF TORONTO

NSERC CRSNG
Natural Sciences and Engineering Research Council of Canada

Ontario Centres of Excellence

CrossWing®

Cleanbot™ UV

Autonomous Disinfection System

Model Range – March 2020 (v3.3)

CrossWing

CrossWing Cleanbot™ UV-C Robot Specifications	Pilot Cleanbot Units	Model 1: Cleanbot Companion	Model 2: Cleanbot Intuition	Model 3: Cleanbot Cybernetic
1. **Disinfection System**	120° Advanced LED UV-C	120° Advanced LED UV-C	120° + Articulating Advanced LED UV-C	120° + Articulating Advanced LED UV-C
2. **Room to Room Control System**	Follow-Me & Manual Wireless Control	Follow-Me & Manual Wireless Control	Follow-Me & Semi-Autonomous Control	Follow-Me & Semi-Autonomous Control + Full Autonomous Operation
3. **Head/Panel Motion**	AI Auto Pan/Sweep (Includes Retracting Head)	AI Auto Pan/Sweep (Includes Retracting Head)	AI Auto Pan/Sweep & 4 Up/Down Projecting LED Panels with Tilt/Elevation (Includes Retracting Head)	AI Auto Pan/Sweep & 4 Up/Down Projecting LED Panels with Tilt/Elevation (Includes Retracting Head)
4. **UV-C Coverage**	Manual Coverage	Manual Coverage	Semi-Autonomous Coverage (with Poster Maps)	Full Autonomous AI Coverage (with Dynamic Memory)
5. **Power Systems & Energy Source**	AC Plug (Disinfection) Lithium Batteries (Motion)	AC Plug (Disinfection) Lithium Batteries (Motion)	Super Capacitor or Lithium/Lithium Titanate Batteries (Disinfection & Motion)	Super Capacitor or Lithium/Lithium Titanate Batteries (Disinfection & Motion)
6. **Charge-Station Navigation**	Sightline Docking	Sightline Docking	Semi-Autonomous Docking	Fully Autonomous Docking & Site-Wide Navigation
7. **Compute & Sensors**	Vision, UV, IR Proximity & Motion Detection	Vision, UV, IR, Proximity & Motion Detection	Vision, UV, IR, Proximity & Motion Detection	Vision, UV, IR, Proximity & Motion Detection
8. **Real-Time Status & Video**	Smart App & Web Optional Hand-Held Remote Control	Smart App & Web Optional Hand-Held Remote Control	Smart App & Web Optional Hand-Held Remote Control	Smart App & Web Optional Hand-Held Remote Control
9. **Self-Disinfecting**	UV Self-Disinfecting Wheels	UV Self-Disinfecting Wheels	Full UV Self-Disinfecting	Full UV Self-Disinfecting
10. **Logging & Reporting**	N/A (Optional Operator Pods w/Remote Logging)	Wireless Operating Status (Auto Dosage & Distribution Reports – Optional Operator Pods w/Remote Logging)	Wireless Operating Status & Location Reporting + 3D Point Cloud Visualizer (Auto Dosage & Distribution Reports – Optional Operator Pods)	Wireless Operating Status, Location & Detailed Disinfection Reporting (Auto Dosage & Distribution Reports – Optional Operator Pods)
11. **Platform** (Motion & Power/Charge Sub-Systems)	CrossWing Nav2/Ultra (Holonomic, Bishop Series)	CrossWing Nav2/Ultra (Holonomic, Bishop Series)	CrossWing Nav2/Ultra (Holonomic, Bishop Series)	CrossWing Nav2/Ultra (Holonomic, Bishop Series)

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