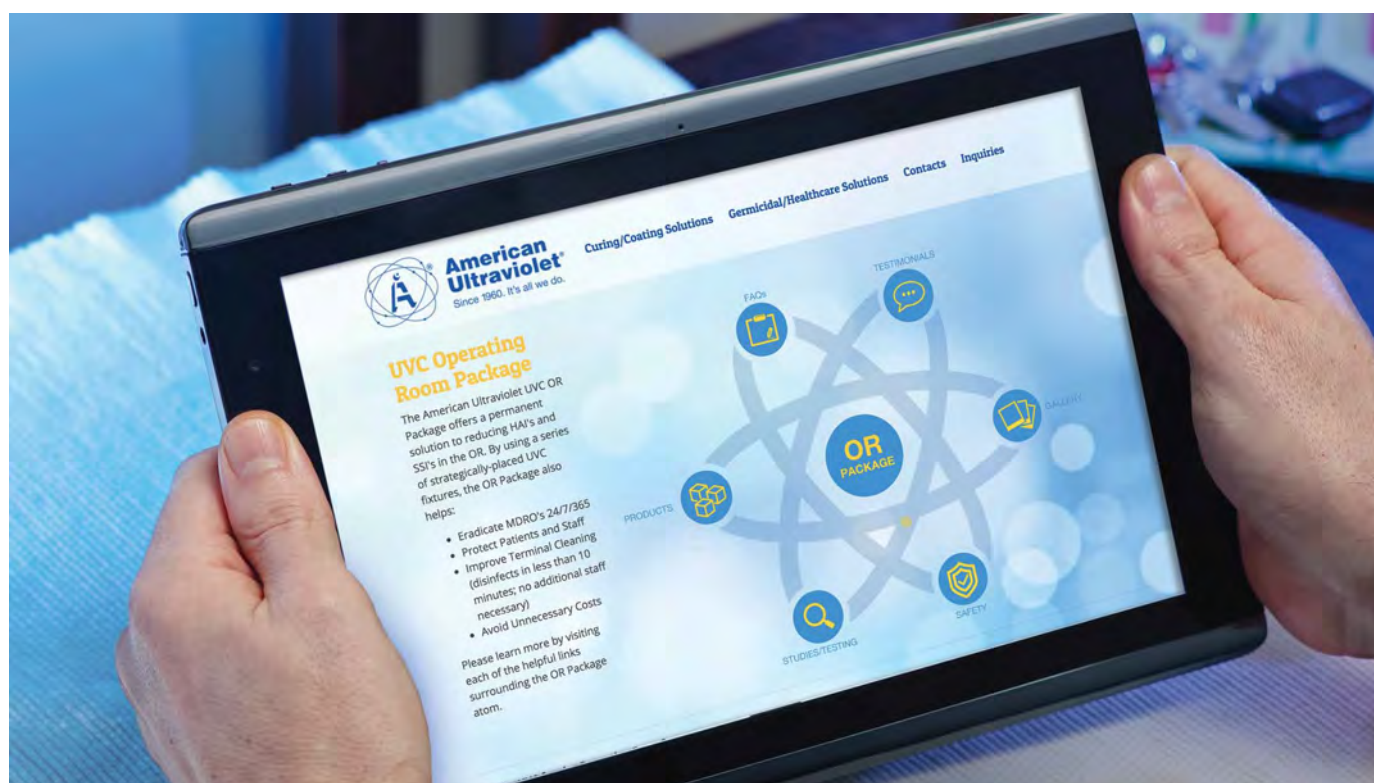


# American Ultraviolet provides global leadership in UVC disinfection

American Ultraviolet rapidly expands its innovative UVC product solutions portfolio during the pandemic



**I**T all started with healthcare during the tuberculosis crisis. In 1960 American Ultraviolet® began providing healthcare institutions with ultraviolet (UV) germicidal disinfection equipment designed specifically to control the spread of airborne tuberculosis (TB). These TB Series wall mount fixtures, along with other upper air UV light disinfection solutions, are manufactured specifically for continuous upper air UVC irradiation and are still in use today, over half a century later. These trusted ultraviolet light fixtures effectively control the spread of airborne microorganisms and bio-aerosols in hospitals, prisons, clinics, laboratories, clean rooms, government buildings, and many other environments – any place where air disinfection

is a concern. Since 1960 American Ultraviolet has been designing and manufacturing UVC solutions for healthcare; heating, ventilation and air conditioning (HVAC); food and beverage industries; and workplace solutions for many other industries, all with the goal to safely reduce pathogens within these environments. Germicidal light (UVC) fixtures recently have been most well known for HVAC applications, as they prolong HVAC equipment life, increase efficiency, and improve indoor air quality by keeping cooling coils clean of biofilm buildup and provide air stream disinfection. UVC light is known to inactivate mould spores, bacteria, bacterial spores, and viruses by breaking the DNA and RNA structures within living pathogenic organisms rendering

them harmless. It is just a matter of applying the proper UVC dosage.

## How does UVC work?

Ultraviolet energy has wavelengths shorter than visible light; and the UV spectrum is commonly divided into UVA (wavelengths of 400nm to 315nm), UVB (315nm to 280nm) and UVC (280nm to 200nm). UVC provides the most germicidal effect at 265nm, as this is the optimum wavelength for destroying the nucleic acid chains. The majority of applications utilise UV lamps that primarily generate UVC energy at 253.7nm near-optimal 265 nm frequency by electrical discharge through low pressure gas enclosed in quartz tubes. Even though UVC is invisible to the human eye, these lamps produce

small amounts of energy released at visible wavelengths producing the blue glow commonly seen with these lamps. The effectiveness of the UVC depends primarily on the UV fluence or dose (Duv, microJ/cm<sup>2</sup>) delivered to the microorganism which is a simple equation:  $Duv = I \cdot t$ , where I is the average fluence rate or irradiance in microW/cm<sup>2</sup> (Note: 1W = 1J/S) and t is the exposure time in seconds.

The application of this equation is not so simple however; and can be rather complex. The survival fraction (S) of a microbial population exposed to UVGI is an exponential function of dose:  $S = e^{-kDuv}$ , where k is the species-dependent inactivation rate constant (cm<sup>2</sup>/microJ). The species-dependent inactivation rate (k-values) have been established for many species of viruses, bacteria, bacterial and fungal spores. Viral and vegetative bacteria are generally most susceptible to UVC followed by mycobacteria, bacterial and fungal spores. Variations in measured k-values may relate to differences in conditions such as testing in air, water or surfaces under which the UVC k-values were established; and American Ultraviolet designs all applications with a conservative approach with safety and the application goals in mind.

UVC solutions can be custom designed to disinfect air, liquids, and surfaces, but with our current range of products and services we may have a solution already designed. "If it can be thought of, we most likely have engineered and built it and there is not much we haven't seen, or manufactured a solution for," says Meredith Stines, owner and CEO of American Ultraviolet. "Our breadth of product is unmatched and our solutions are unequalled, because, unlike other UV manufacturing companies, we had 60 years to gain the knowledge and proficiency needed to deal with the unique requirements and challenges across the various markets. We believe this gives our team the ability to provide the exact solution our customers are looking for. We maintain a full staff of engineers dedicated to UV technology and also house our own sheet metal shop in our Indiana manufacturing facility. This combination allows American Ultraviolet to manufacture custom equipment to our customers' exact specifications. Custom fabrication that takes competitors months and doubles or triples their selling price, takes us weeks, and costs the customer far less."

### Rapid growth from the beginning; ready for ramp-up to meet global demand

American Ultraviolet was founded by Harrison O Stines in 1960. Since that time, American Ultraviolet has been continuously operating as a leading manufacturer of ultraviolet technology. American Ultraviolet is a privately held company, currently owned by Mr Meredith C Stines, who has served as company owner and CEO since

1980. American Ultraviolet saw great success in its first eight years; and by 1968, the company grew to the point where it became necessary to relocate to a 2,000 square foot facility in Chatham, New Jersey. In 1970, American Ultraviolet increased the size of that facility to 5,500 square feet to meet production demands. In 1986, due to rapid expansion it again became necessary to upgrade the production facility and the company relocated to a 30,000 square foot building in Murray Hill, New Jersey. Within a few years American Ultraviolet outgrew this space and in September of 1995 the company relocated to its current state-of-the-art, 70,000 square foot manufacturing facility in Lebanon, Indiana.

Since the relocation, the company has experienced continued strong growth by expanding its product portfolio in the UV curing sector via strategic acquisition. With the acquisitions in 2000 of UV Source, a leading manufacturer of UV spot curing equipment, and in 2002 of Aetek UV Systems, a leading manufacturer of shuttered and specialty UV curing systems, these two divisions fortified American Ultraviolet Company's position as the leader in UV technology. This expansion led to an additional manufacturing plant in Romeoville, IL. In 2005, American Ultraviolet acquired LESCO, a leading manufacturer in spot curing and custom curing applications and integrated its manufacturing facility, which continues to be based out of Torrance, California. In 2015, with the purchase of an additional UV coating company, American Ultraviolet became a 'one stop shop' for print companies. Along with Lesco UV and Aetek UV Systems divisions, American Ultraviolet offers remarkable curing results, whether for spot curing applications for medical device manufacturing, UV curing equipment including feeders and stackers, screen printing conveyors, industrial floor coating equipment, narrow and wide web shuttered curing, LED UV curing and more. Offering this unmatched UV product portfolio has cemented American Ultraviolet's global leadership covering the entire range of UV solutions.

### A company driven by innovation: UVC Healthcare Solutions - designed and manufactured in the USA. Reliable performance matters!

UVC disinfection systems by American Ultraviolet are designed to help reduce and even eliminate pathogens in the environment that can otherwise lead to illness. UVC disinfection has been applied in healthcare environments such as small private practice locations, hospitals, workplaces, nursing homes, residential homes, airports, restaurants, factories – the applications are endless. During the current COVID-19 pandemic it has been critical for our partners in all industries to be supplied with solutions that work as advertised.

Reliable performance and meeting delivery demand for UVC disinfection products has been a key issue in the UVC industry but American Ultraviolet was prepared to meet the demands. "When you are the largest manufacturer in the market you learn how to quickly adapt and navigate in times of high demand. Products that were considered of less interest suddenly become most sought after and with our in-house manufacturing we are up to the challenge to meet the sudden high customer demand for all our healthcare related products on a global scale," says Stines.

### Just like Lego building blocks - the four pillars of UVC disinfection

American Ultraviolet uses the most comprehensive approach to UVC disinfection to cover all areas in a building safely with a focus on reducing pathogens in the environment. This is the core concept of the 'four pillars of UVC' approach. Since it is known that UVC reduces pathogens in air and on surfaces, a multi-pronged approach can be used inside a building; such as treating air coming through the HVAC system, in room air with continuous upper air disinfection, treating air and surfaces at the same time with mobile UVC solutions or direct surface mounted systems. The four pillars of disinfection are a logical step for any indoor environment. Just like Lego building blocks, the environment can be outfitted over time with 100% UVC protection custom designed to the specific environment and application.

### A closer look at the four pillars of UVC disinfection for healthcare

The American Ultraviolet 'four pillars' approach to UVC disinfection for healthcare looks at the entire facility and identifies the main routes of transmission for pathogens, as part of American Ultraviolet's efforts to provide a complete disinfection solution for your application to facilitate the implementation of an effective and efficient UVC disinfection programme. The four pillars of UVC disinfection for healthcare provide layers of protection to safeguard building occupants and staff.

Healthcare facilities can quickly become a breeding ground for pathogens, hence the prevalence of healthcare-acquired infections (HAIs). Environmental Services, often overwhelmed with daily tasks and trying to keep up with proper touchpoint cleaning to reduce HAIs, often miss the 100% clean mark. Time is money in healthcare settings, where it is mandatory to clean a patient's room as quickly as possible, resulting in many areas missed and not properly disinfected. The same is true in all other environments, where cleaning staff are often overwhelmed and simply cannot clean all surfaces to prevent transfer of pathogens from surfaces to hands. Sick people and their



caregivers, including many with suppressed immune systems, are often grouped together in close quarters; office workers share breakrooms, restrooms, and meeting rooms, making them highly susceptible to community-acquired infections. Healthcare facilities worldwide must therefore be cognisant of these ‘flashpoints of infection’, which include:

- Common areas where people gather and then disperse;
- Areas used repeatedly by infected hosts;
- Equipment used to treat, transport or house infected hosts; and
- Air circulating and recirculating, throughout facilities which are shared by patients, staff, and other occupants.

Each flashpoint needs specific attention designed to mitigate the risk of infection. American Ultraviolet developed the necessary UVC disinfection solutions for each flashpoint with its unique approach: the ‘four pillars of UVC disinfection for healthcare’ programme.

Concern over healthcare-associated infections is now being replaced with the fears of COVID-19 overwhelming the healthcare industry on a global scale. To help reduce the spread of infection, and associated costs, healthcare facilities worldwide are using ultraviolet disinfection at all their flashpoints of infection as a preventative action, by implementing the four pillars in combination or in phases. Depending on budget and highest risk, the four pillars of disinfection are often integrated in various orders:

### **Pillar One - upper air disinfection**

The first of American Ultraviolet’s four pillars of UVC disinfection for healthcare is the upper air disinfection unit. These units provide a UVC blanket of protection over waiting rooms, conference rooms, exam rooms, patient intake areas, common areas, and other ‘flashpoints’ where infected hosts can spread the contamination. This style of fixture is designed to be safely used while occupants are in rooms or areas of congregation. The installation is at a minimum height of 7.5 feet off the floor; and the UVC lamps are shielded to direct the UVC energy upward and outward creating a high intensity UVC zone in the upper portion of the room while minimising UVC levels in occupied spaces. These fixtures are designed to inactivate airborne microorganisms as air currents move them into the path of the UVC energy.

History has taught us that common areas where people gather and disperse, whether inside or outside a facility, have proven to be areas where disease can quickly transmit. The 1918 influenza pandemic – the most severe pandemic in recent history – was caused by an H1N1 virus with genes of avian origin. An estimated 500 million

people (one third of the world’s population) became infected with this virus and the number of deaths was estimated to be at least 50 million worldwide. The high mortality rate in healthy people was a unique feature of this pandemic. Control efforts at the time were limited to isolation, quarantine, good personal hygiene, use of disinfectants and limited public gatherings. No vaccine was available for this virus; and we are facing the same challenges today with COVID-19. However, since the introduction and availability of UVC equipment environments can be quickly and safely disinfected and kept at a much-reduced pathogen load continuously.

In addition to new pathogens such as COVID-19, tuberculosis (TB) remains a severe, contagious disease which primarily affects the lungs. It is usually transmitted from person to person via airborne particles that contain the TB bacteria. One of the major concerns for healthcare workers is the potential for transmission of TB, and many other airborne pathogens, at worksites from undiagnosed or unsuspected cases. Upper room ultraviolet germicidal irradiation (UVGI) systems are considered a supplement, or adjunct, to other airborne infection control measures such as ventilation, in settings where persons with undiagnosed airborne-transmittable diseases could potentially contaminate the air – for example in waiting rooms, conference rooms, exam rooms, patient intake areas, common areas, and all flashpoints of disinfection.

### **Pillar Two - mobile room UVC robots for surface disinfection**

The US Centers for Disease Control and Prevention (CDC) estimates that HAIs account for 1.7 million infections annually in American hospitals alone. Hospital patient rooms, recovery rooms, operating rooms, triage rooms, and any other locations in a healthcare facility that are used repeatedly to house infected hosts, are known to be flashpoints of infection from person to person. Patients in healthcare setting are at increased risk of HAIs from exposure to organisms that are transmitted between patients and healthcare workers. And surfaces in areas touched by infected hosts can leave infectious residue waiting to transfer and incubate, in new hosts. This process will continue infecting unsuspecting patients and healthcare staff.

American Ultraviolet’s second pillar of UVC disinfection for healthcare is its mobile room disinfection robots. American Ultraviolet has designed these robots with the goal of targeting zero infections in the environment around the patient. Sam Guzman, American Ultraviolet’s Global Healthcare Sales Director, states: “Having the most comprehensive USA-made product offering for mobile UVC ‘robots’ has been a great advantage for our customers to choose exactly the right size mobile unit for their respective



environment. Our mobile UVC fleet covers all sizes of environments and their high performance, user friendly, rugged, and non-intimidating designs have made them true customer favourites – plus they are affordable!”

No matter the UVC mobile device size, they all have several important features in common: medical grade certified high performance UVC lamps, coupled with on-board pre-programmed pathogen inactivation cycles, remote control and 360-degree safety features. There are four mobile solutions to choose from, namely the Mobile Room Solution (MRS) series, MRS14, MRS33, MRS45; and the state of the art Automatically Reliably Targeting Zero (ARTZ2.0).

The ARTZ2.0 has rapidly been growing into a new customer favourite for applications where pathogen inactivation speed is critical. Equipped with 24 medical grade UVC lamps designed to run continuously at maximum intensity, allows for a very quick disinfection turnaround even in larger spaces. Time savings mean cost savings. ARTZ’s sophisticated and intuitive controls package includes data logging, monitors productivity and its internal diagnostics make it very user friendly and it can easily be controlled and operated by any wifi-enabled device. A hard case covering the lamps for protection during transportation can also be used as a quick setup if a barrier to a room or location is needed.

Allowing the mobile UVC robots to perform their disinfection job to inactivate the desired pathogen(s) and validating methods has been a

critical component to establish device efficacy. American Ultraviolet empowers clients with the use of Dosimeter indicator cards to validate that sufficient UVC dosage was delivered. All environments are unique and offer various reflective surfaces but also absorbing surfaces need to be considered during device operation. What this means is that, without a radiometer or Dosimeter placed at or near critical surfaces during commissioning of a device, it will be unclear whether the target dose has actually been delivered. This validation step should be performed for all UVC mobile robots, no matter what detection methods the device manufacture claims.

A current market demand is to have a fully autonomous version of mobile UVC disinfection devices. As the industry leader, American Ultraviolet has the opportunity to work with some of the most advanced robotic and automation companies on the planet developing new solutions. The latest innovative result is 'Techi UVC', a fully automated, autonomous disinfection robot. In a joint development with Techmetics Corporation and Clear Focus LLC, American Ultraviolet has once again set the standard for most innovative UVC equipment on the global market by introducing the Techi UVC autonomous robot. Techi UVC has the longest battery life available, offers multiple cycle settings, and is designed to minimise the need for human interaction and as with all products manufactured by American Ultraviolet safety and performance were paramount during the design phase.

### Pillar Three - heating, ventilation, air conditioning

Unfiltered, contaminated air circulating and recirculating through a healthcare facility can be another prime flashpoint of infection. Though HVAC systems include all the equipment used to ventilate, heat/cool, and humidify/dehumidify, most do not address the disinfection of the air in a facility. Improper operation and maintenance of an HVAC system is one of the most common problems that impact a workplace's indoor air quality (IAQ).

The third American Ultraviolet UVC disinfection pillar consists of equipment that disinfects critical air streams circulating and recirculating throughout healthcare facilities. Infectious airborne microbiological agents, too small to be captured by filtration, can be disinfected as they pass through the blanket of UVC energy. Custom sized in-duct UVC systems are one of American Ultraviolet's most popular applications. American Ultraviolet developed dedicated sizing software that allows for the selection of the appropriate UVC dosage levels for air and surface disinfection in-duct and on the cooling coil. The surface disinfection in an HVAC system is to help reduce any microbial growth on the internal surfaces of the HVAC system, which includes cooling coils, plenum walls, and drain pans. Air disinfection, also called 'on-the-fly'



inactivation of microbes suspended in air as they move through the ducting, is currently what most clients are looking for. Good filtration generally removes the larger microbes like fungal spores which are more resistant to UVC, while susceptible organisms such as bacteria and viruses are inactivated more quickly.

### Pillar Four - fixed mount systems / UVC operating room (OR) package

The fourth pillar is American Ultraviolet's 'Fixed Mounted Packages'. The most popular fixed mount package is the UVC OR package for operating theatres. These systems are designed to combat easily preventable complications and pathogen transmissions during surgeries. Surgical site infection (SSI) - defined by the CDC as 'an infection related to an operative procedure that occurs at or near the surgical incision within 30 days of the procedure, or within 90 days if prosthetic material is implanted at surgery' - is among the most common preventable complication after surgery. SSIs occur in 2% to 4% of all patients undergoing inpatient surgical procedures. They are also the leading cause of readmissions to the hospital following surgery. Approximately 3% of patients who contract an SSI will die as a result.

The OR and other fixed mounted packages consist of a variety of permanently mounted fixtures that can be retrofitted to an existing OR Suite or critical area. The systems are computer controlled and designed to be utilised for entire room disinfection before and after gathering or meetings in highly populated spaces, and in between surgeries and even during surgeries for various orthopaedic procedures. The goal is to reduce pathogens on surfaces and in the air quickly and safely without the need for additional staff.

While the primary product in this series is the UVC OR package, the system was designed to be

modular, meaning the components can be configured to achieve your disinfection goals in any space. Labs, isolation rooms, exam rooms and meeting rooms are all places where a hard-mounted system makes sense.

### American Ultraviolet: the global solutions provider for all healthcare environments

The four pillar solutions designed and developed by American Ultraviolet will continue to evolve as the global market demands solutions that fit individual needs. American Ultraviolet offers the most complete portfolio of UVC disinfection products and is continuously exploring new product solutions to meet global market demands. Staying on the cutting edge and exploring new products as they are being developed, such as LED and excimer technology, continues to drive American Ultraviolet to stay ahead and always provide the best solutions for all customers.

Research and development initiatives are ongoing; and currently a line of low cost UVC fixtures are being designed to help combat disease in developing countries. Helping make a difference in reducing disease worldwide was the goal of Harrison O Stines - and it continues to be the mission of Meredith C Stines, who has become the global UVC trailblazer.



**American Ultraviolet®**

Insightful Solutions. Remarkable Results. Since 1960.

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