

Indoor Air Quality Solutions

Ultraviolet technology for a healthier, safer, cleaner, and more energy efficient building environment

Advanced Technology for

Improving Indoor Air Quality
Promoting Sustainability
Reducing Energy Consumption
Instituting Green Building Solutions



Designed and Manufactured
by UVDI in California, USA



ISO 9001:2015
ISO 14001:2015



UVDI EPA Establishment
Number 73542-CA-001



Bringing over 65 years of Experience in UV Technology



UVDI Headquarters - California, USA

Trusted History

Spanning three generations, we are a family owned business that continues to look to the future.

Our mission is to make a cleaner, safer, and healthier world through advanced UV technologies.

UVDI is an Established Leader in Innovative UV Solutions

Air

Air disinfection and purification systems installed in thousands of facilities worldwide

Surfaces

Mobile UV devices for infection control deployed in hundreds of hospitals globally

Water

Providing millions of people worldwide with safe, clean water disinfected by UV

Technology Leadership

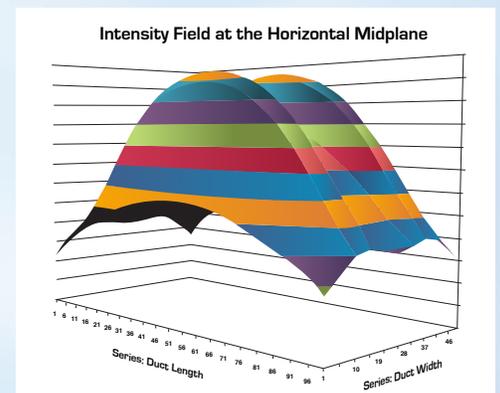
Our people, engineering experience, and R&D assets lead the industry with innovative UV solutions.



HVAC Duct System for Product Testing



UV Lamp Test Facility



Output Example of UVDI's Proprietary Engineering Modeling Software

Delivering Solutions for a Broad Range of Industries

Schools/Universities



Airports



Government



Healthcare



Gaming



Commercial/Offices



Why is Indoor Air Quality Important?

Indoor Air Quality (IAQ) directly affects our wellbeing, productivity, and happiness, whether at school, work or during our leisure time. Healthy IAQ is essential as we may spend more than 90% of our time indoors.

A simple, yet very effective way to improve building IAQ is through the application of ultraviolet (UV) light technology. This energy efficient technology is a well proven solution for removing pollutants associated with poor indoor air quality such as bacteria, viruses, mold, VOCs (volatile organic compounds), and strong odors.

UVDI's advanced solutions go beyond traditional HVAC filtration!

TECHNOLOGY	SOLUTIONS		BIOLOGICAL (Bacteria, Viruses, Mold)	GASEOUS (VOCs, Odors, Gases)
UV	COIL CLEANING	Page 6	✓	
UV	AIR DISINFECTION	Page 8	✓	
UV/PCO	AIR PURIFICATION	Page 10	✓	✓

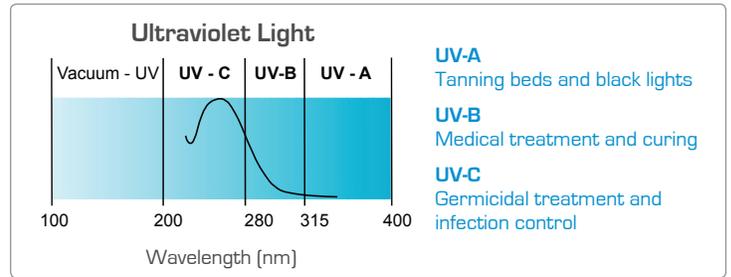
Traditional filtration alone does not eliminate all biological or gaseous contaminants.

The Power of UV

Ultraviolet Light is Lethal to Bacteria, Viruses, and Mold

Ultraviolet can be broken down into three bands:

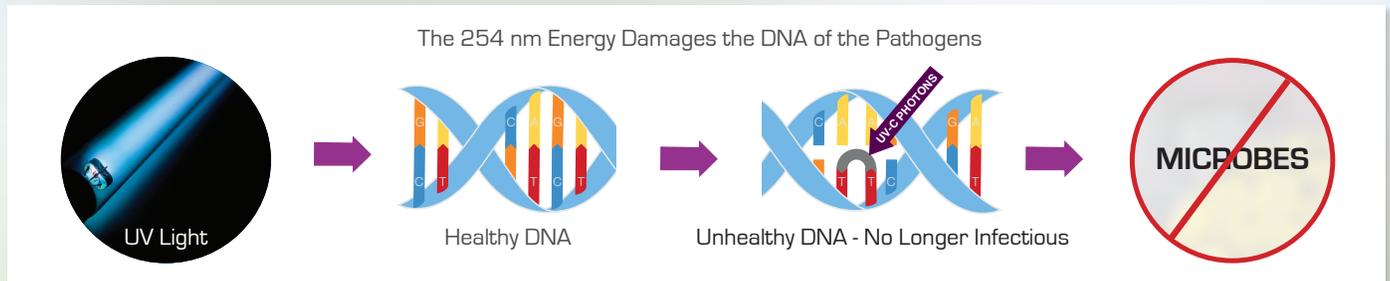
- UV-A — the most abundant in sunlight; responsible for skin tanning and wrinkles
- UV-B — primarily responsible for skin reddening and skin cancer; also used for medical treatments
- UV-C — naturally blocked by the earth's ozone layer and is the germicidal wavelength



UV-C has been safely used for disinfection of microorganisms for over 100 years.

How Does UV Disinfect?

UV-C energy alters the DNA of microorganisms preventing them from reproducing and causing them to become non-pathogenic, or incapable of causing disease.



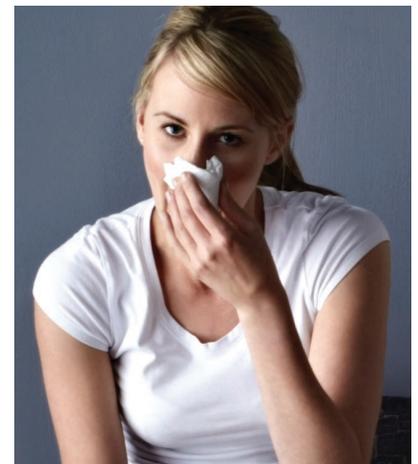
Why UV?

Because Even High Efficiency Filters Don't Remove Particles Smaller than 0.3 Microns!

HVAC filters are designed to only capture particles but not destroy the DNA of the microorganisms. Once captured, they can grow and thrive on the filter material. No other application is as effective as UV for the destruction of bacteria, viruses, and mold. These microorganisms profoundly impact HVAC system performance and building occupant safety and health.

Did You Know?

"There are various methods of infectious disease transmission, including contact, transmission by large droplets, and inhalation of airborne particles containing infectious microorganisms. The practice of the HVAC professional in reducing disease transmission is focused primarily on those diseases transmitted by airborne particles." — Source: ASHRAE Position Document on Airborne Infectious Diseases, 2014

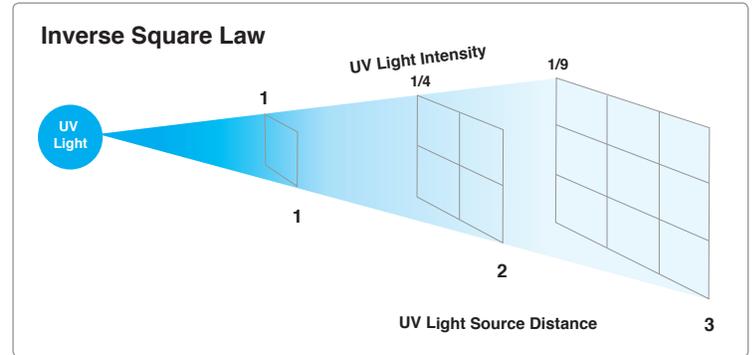


UV Dose – Critical to System Efficacy

Dose = Intensity x Time

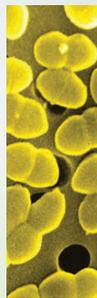
UV dose, typically expressed in mJ/cm², J/m², or μWs/cm², is the total amount of UV intensity delivered over a period of time. UV intensity is a measure of UV energy delivered on a given surface. UV intensity obeys the inverse square law: It decreases as distance from the UV source increases.

$$\text{UV Dose (mJ/cm}^2\text{)} = \text{UV Intensity (}\mu\text{W/cm}^2\text{)} \times \text{Exposure Time (s)}$$



Delivering the Correct Dose for a Specific Application

The dose required to kill biological pathogens is well documented. The application challenge is to insure the targeted organism is exposed to sufficient UV dose in the available space and time of UV exposure.



Organism UV Dose in Micro-watt sec/cm² for 99% kill factor

Organism	UV Dose in Micro-watt sec/cm ² for 99% kill factor
Bacteria	99%
Bacillus anthracis spores	46,200
Escherichia coli	6,600
Legionella pneumophila	12,300
Mycobacterium tuberculosis	10,000
Staphylococcus aureus	6,458
Pseudomonas aeruginosa	3,597

This is only a partial listing of the organisms.



Organism UV Dose in Micro-watt sec/cm² for 99% kill factor

Organism	UV Dose in Micro-watt sec/cm ² for 99% kill factor
Virus	99%
Influenza A	4,558
Coronavirus (including MERS)	1,222



Mold UV Dose in Micro-watt sec/cm² for 99% kill factor

Mold	99%
Aspergillus flavus	99,000
Aspergillus niger	330,000

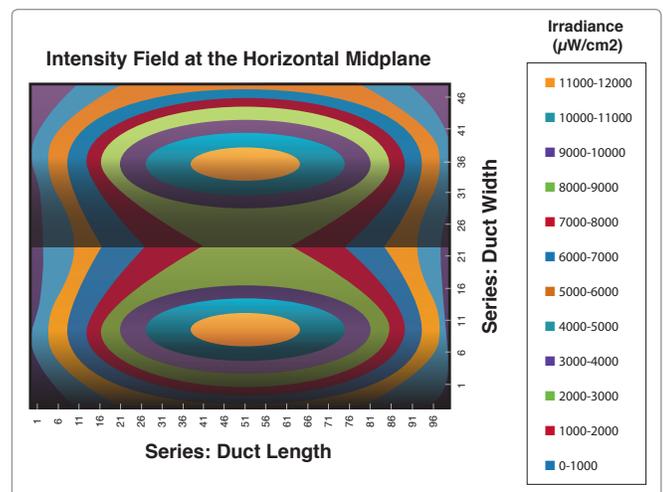
How Does UVDI Validate the Correct Delivered Dose?

Engineering Modeling Software

To ensure the proper dose is applied, our proprietary software is used to model the lamp quantity and system arrangement needed for the specific application. The output of this modeling produces a very detailed report showing intensity distribution and kill rates. Factors impacting dose include: spatial constraints, airflow volume, speed, temperature, and UV device geometry and intensity.

“ The results of the program have been **validated in a series of some 30 laboratory tests** sponsored by UVDI in which various microbes and UVGI systems were tested in two different laboratories. The results indicated **excellent accuracy**... ”

W.J. Kowalski, PE, PhD
The Indoor Environment Center
The Pennsylvania State University

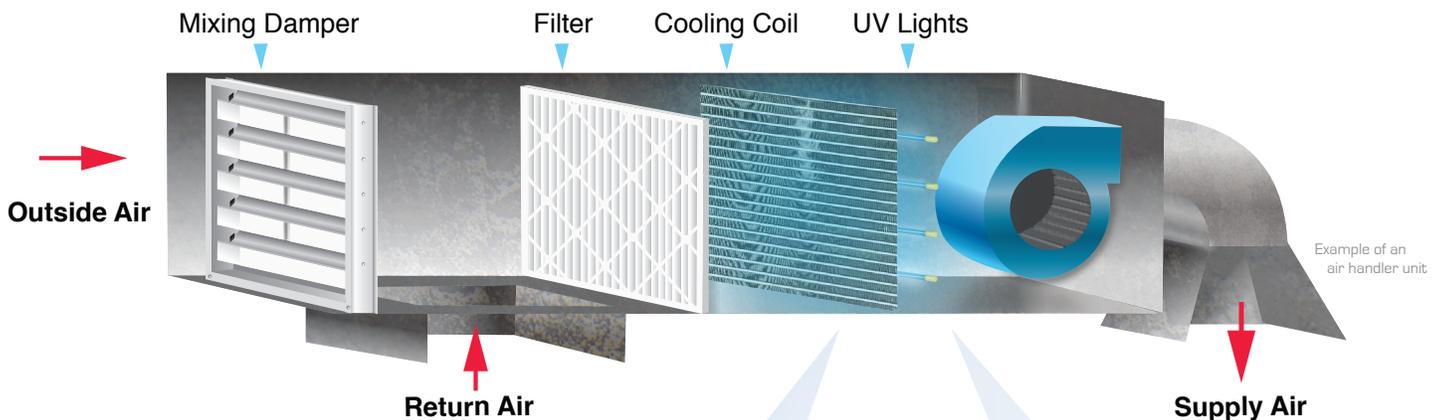


Output Example of Engineering Modeling Software

Coil Cleaning

Coil Cleaning Systems Save Energy and Money!

UV Destroys the Microbiological Biofilm that Thrives in the Moist Coil Environment



UV coil systems are typically installed downstream of the evaporator coil to destroy bacteria, mold, and organic matter that grows and collects on cooling coils and surrounding areas.

Benefits of Coil Cleaning

Healthy Air Supply

UV energy destroys bacteria and mold that grow on the moist coil and drain pan surfaces eliminating “blow-off” of these into the air supply. This ensures that clean airflow is cooled by the coil without cross contamination.

Better Comfort

Coil disinfection prevents biofilm accumulation on fins resulting in effective heat transfer with better temperature and humidity control.

Energy Savings

Maintaining a coil free of microbial growth will maximize coil heat transfer efficiency and reduce energy consumption up to 15% in some systems.

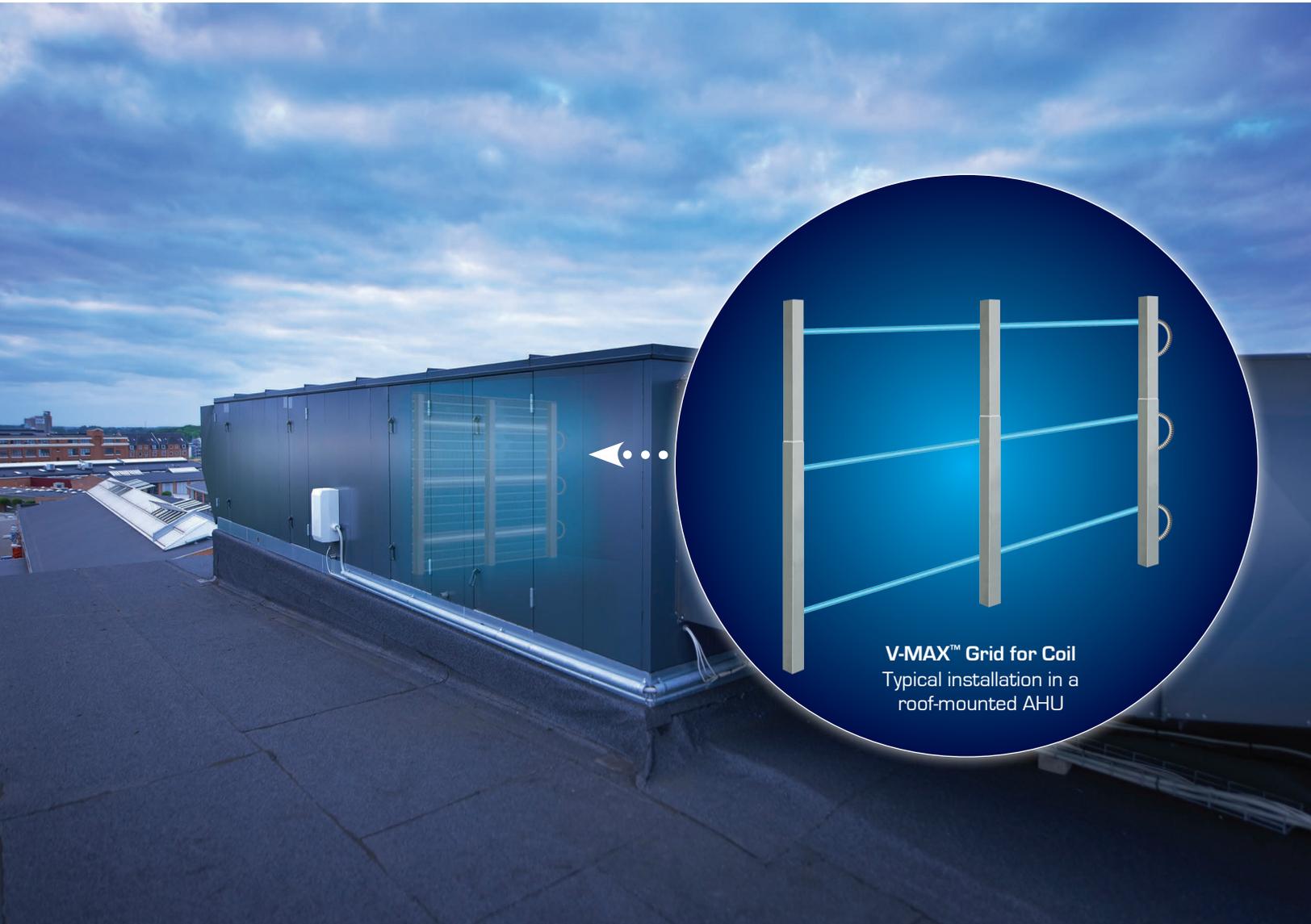
Reduced Maintenance Cost and Less Downtime

UV energy ensures the cooling coil remains clean at all times, eliminating costly coil cleaning maintenance and reducing system downtime.

V-MAX™ Coil Cleaning



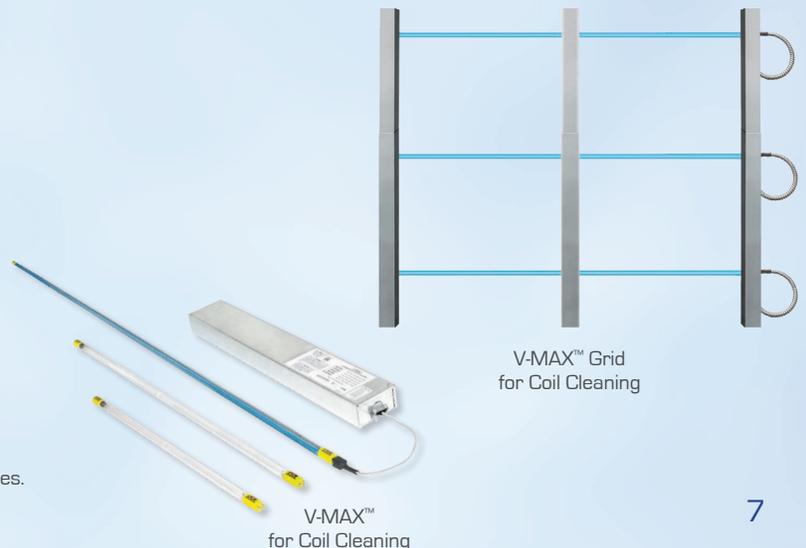
Delivers Optimum UV Dose for Coil Cleaning and Maintenance



V-MAX™ Coil Cleaning System Features

- Easy to install in both existing and new equipment
- Scalable design to fit any plenum size
- Fixtures can be mounted internally or externally
- Lamps can be easily mounted on vertical supports
- Negligible pressure drop
- Minimal space required for installation
- Low power consumption with universal voltage input

UVDI's coil cleaning systems are designed to meet or exceed ASHRAE Guidelines.



Air Disinfection

Air Disinfection Systems Kill Airborne Pathogens 24/7

Airborne Pathogens are Eliminated as Air Passes through High Intensity UV



- In facilities such as hospitals, schools, airports, and commercial buildings, airborne pathogens can spread through the air system threatening the health of occupants
- In-duct UV systems are designed to disinfect air as it passes through the HVAC system and irradiate the entire cross-section of a duct at high intensities

Eliminates Viruses & Bacteria - up to 99% Kill Rate



United States Environmental Protection Agency (EPA) Test Results

These organisms were selected as reasonable surrogates for biological warfare agents (BWAs).



Technology Evaluation Report: Biological Inactivation Efficiency by HVAC In-Duct Ultraviolet Light Systems

ref: <http://nepis.epa.gov/> [enter: uvdi]

Benefits of Air Disinfection

Provide Healthy Indoor Air

UV disinfection reduces airborne infectious microorganisms that can cause the spread of illness and decreases instances of people becoming sick due to contamination by microorganisms such as viruses and bacteria.

Better Patient Outcomes in Hospitals

Assists in reducing HAIs (Hospital-Acquired Infections) when air disinfection and surface disinfection systems are used together.

Reduced Sick Days

Healthy indoor air helps minimize absenteeism and increases employee comfort and productivity.

V-MAX™ Air Disinfection



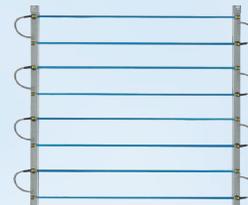
Delivers Optimum UV Dose for Eliminating Airborne Pathogens



V-MAX™ In-Duct for Air Disinfection
Typical installation in a high ambient rooftop duct

V-MAX™ In-Duct Air Disinfection System Features

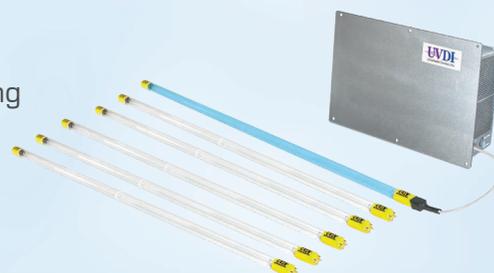
- Designed for duct-mounting with up to six 33" lamps parallel to the airstream providing optimum UV exposure
- Control box can be mounted internally or externally on the duct
- Configurable to meet airstream kill rates up to 99% which is backed by computational models to ensure performance
- Prewired lamp connection reduces installation time
- Lamp status monitoring feature can integrate with building management systems
- Single power connection with universal voltage input



V-MAX™ Grid for Air Disinfection



V-MAX™ for Air Disinfection

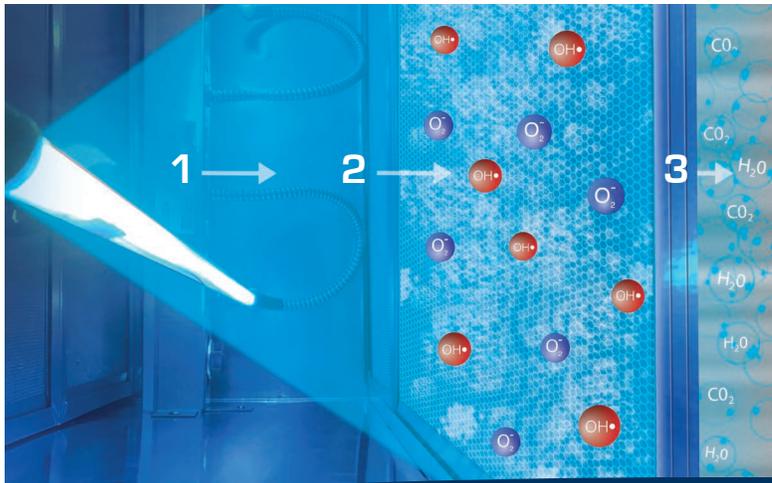


V-MAX™ In-Duct for Air Disinfection

Air Purification

V-PAC™ - The Next Generation of Air Purification

Sustainable and More Effective than Typical Filtration



- 1) When UV light illuminates our titanium di-oxide (TiO₂) coated photocatalytic oxidation (PCO) panel, an activation process begins.
- 2) The activation generates highly reactive hydroxyl radicals and super-oxide ions resulting in a strong chemical “oxidizing” reaction between the supercharged ions and gaseous pollutants such as VOCs and odor molecules.
- 3) This breaks the pollutant down into harmless carbon dioxide and water molecules, making the air more purified!

Eliminates VOCs & Odors



Benefits of Air Purification

Positive Impact on Occupant Health

Removes interior and exterior gaseous pollution sources such as tobacco smoke, cleaning solvents, off-gassing from building materials, human metabolic by-products, vehicle exhaust, jet fumes, manufacturing process emissions, and agriculture process emissions that cause illnesses.

Saves Energy

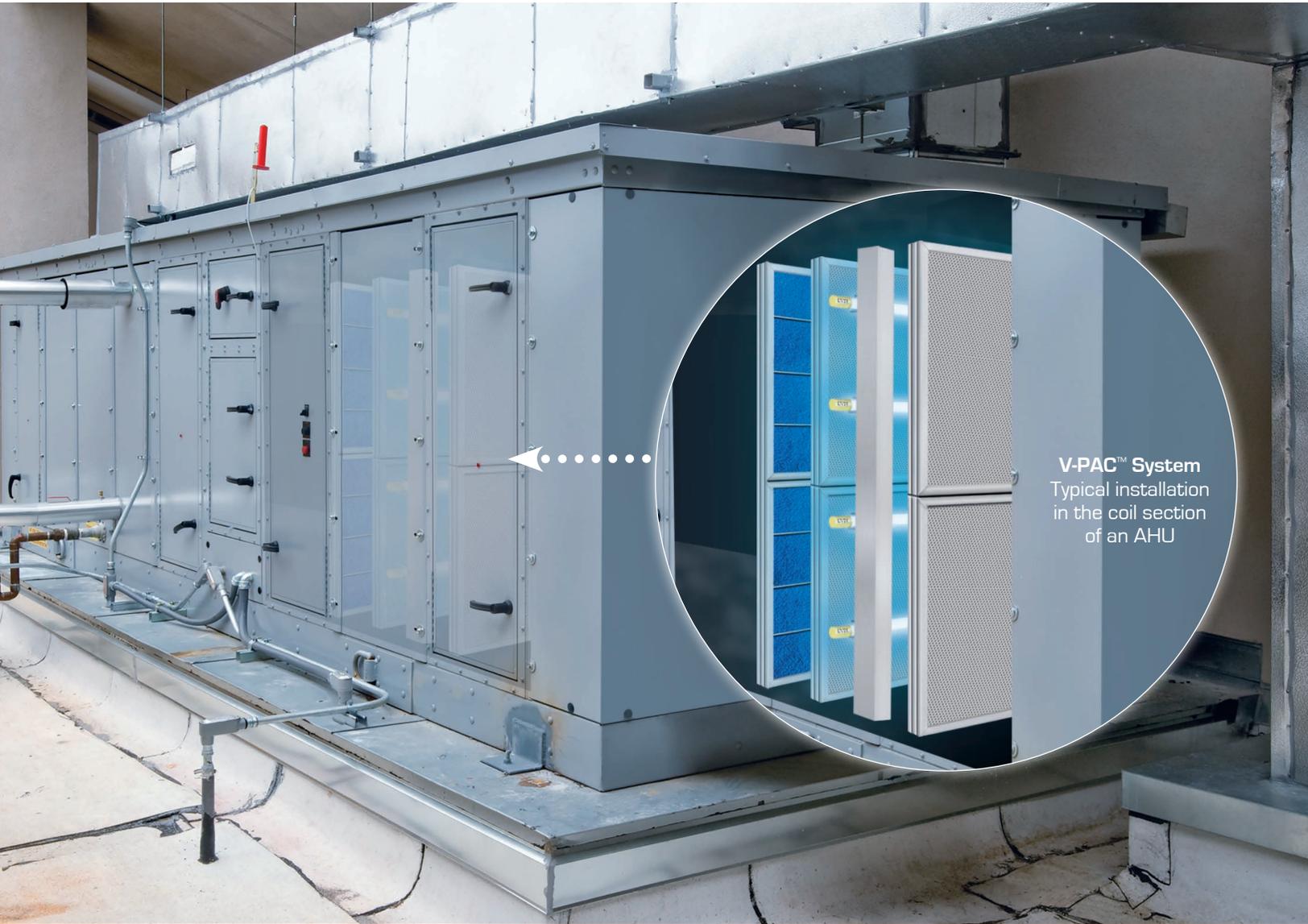
Reduces make-up air requirements for dilution and has low power consumption.

Environmentally-friendly

Chemical-free and, unlike other air purification technologies, does not produce ozone.



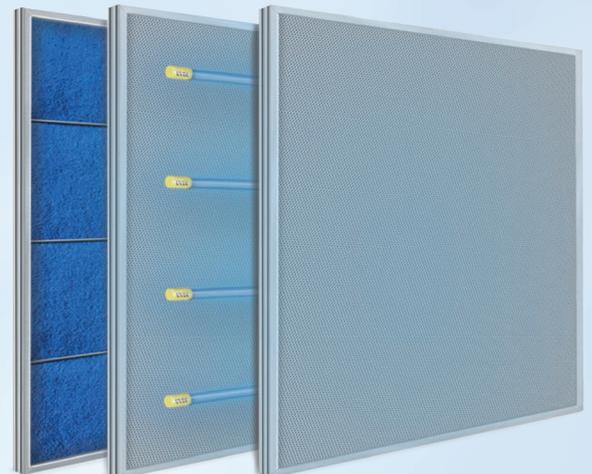
V-PAC™ Air Purification System Purifies and Disinfects Your Air



V-PAC™ System
Typical installation
in the coil section
of an AHU

V-PAC™ System Features

- Easy to install in both existing and new equipment
- Scalable design to fit any plenum size
- Photocatalytic Panels (PCO) and BPS Lite™ Activated Carbon Panels are designed for installation in standard filter tracks
- Utilizes V-MAX™ high output lamp systems
- Negligible pressure drop
- Complete system will fit in an airflow length that is as little as 9"
- Virus and bacteria reduction



BPS Lite™
Activated
Carbon Panel

PCO
Panel

UV
Lights

PCO
Panel

Our Ultraviolet Solutions Extend Globally

UVDI's mission is to make a cleaner, safer, and healthier world through advanced UV technologies

