



INTRODUCTION TO PHOTOCATALYTIC OXIDATION (PCO) AIR DECONTAMINATION TECHNOLOGY

Indoor air decontamination technology was developed during the SARS coronavirus outbreak in 2003. It has matured and been configured for public spaces of all kinds for over two decades.

The product range is diverse from stand-alone, to wall mounted, to desk top devices and in-duct HVAC units. All devices incorporate unique PCO technology as described here.

The **World Health Organization** categorizes the kinds of problems associated with poor indoor air into three groups: *physical pollutants* (particulate matter such as dust, pollen, pet dander and smoke); *chemical pollutants* (such as toxic gases, volatile organic compounds, fumes, and odors of all kinds); and *biologic pathogens* (airborne viruses, bacteria, mold, and fungi). PCO devices address all these

Once contaminated air enters a PCO device, it is treated through a two-stage system: mechanical filtration followed by active decontamination. Air first moves through a washable pre-filter, which traps larger particulates. It then moves through a premium, granular activated carbon filter which adsorbs most harmful gases and VOCs. Finally, a high-grade HEPA filter traps ultra-fine particulates and acts as a first line of defense against bioaerosols such as larger bacteria and fungi.

The second stage consists of active decontamination within the patented reactor chamber. Inside the Reactor Chamber is a series of hexagonal tube filters, coated with a nano-semiconductor catalyst, Titanium dioxide (TiO₂). The high-power germicidal UV-C emitters provide low-level disinfection to any viruses or bacteria that have made it through the filtration stage. However, the true active decontamination power is introduced through advanced photocatalytic oxidization, i.e., when the UV radiation meets the titanium dioxide surfaces and free radicals are formed. These free radicals oxidize bioaerosols and organic compounds in the air and convert them into trace, harmless amounts of water and carbon dioxide. This active decontamination not only provides improved air



quality, but also reduces pathogenic loads on surfaces which can act as vectors for disease transmission.

View this [video](#) for a more detailed exploration of these three mechanisms.

Efficacy Results and Safety Certification

PCO technology has been developed and specified based on the results of independent laboratory and in-field tests which ensures objective, well respected third-party data that can be relied upon.

Efficacy Against Particulate Matter

Our equipment is excellent at removing Particulate Matter as it's equipped with two premium H14 HEPA filters which remove at least 99.97% of dust, pollen, mold, bacteria and any airborne particles with a size of 0.3 microns and larger.

Efficacy Against Microorganism

Extensive laboratory tests at laboratories in the USA have proven PCO technology to reduce a host of airborne viral, bacterial, and fungal challenges, by example, machine-specific:

Microorganism	Bioaerosol	Surrogate example
RNA virus	MS2 Bacteriophage	Airborne pathogenic respiratory viruses, such as influenza and SARS-CoV-2
DNA Virus	PhiX 174 Bacteriophage	Herpes simplex and smallpox viruses
Gram+ bacteria	Staph Epidermidis	Staphylococcus aureus causing staph infection
Gram- bacteria	Pantoea agglomerans (known as Erwinia herbicola)	Yersinia Pestis causing Black plague
Fungal spore	Aspergillus brasiliensis (known as A niger)	Various toxic black mold species
Bacterial spore	Bacillus subtilus	Bacillus anthracis (Anthrax) - bioterrorism/bio warfare research; Clostridioides difficile



Microorganism	Surrogate species	Time	Reduction (log)	Reduction (%)
RNA virus	MS2 Bacteriophage	± 15min	4 log	99,99%
		90min	6.59 log	99,99997%
DNA Virus	Phi X 174 Bacteriophage	± 35min	4 log	99,99%
		45min	5.96 log	99,99989%
Gram+ bacteria	Staphylococcus Epidermidis	± 20min	4 log	99,99%
		90min	7.9 log	99,9999987%
Gram- bacteria	Pantoea agglomerans	30min	3.48 log	99,97%
		± 35min	4 log	99,99%
		60min	5.73 log	99,9998%
Gram- bacteria	Escherichia Coli	± 60min	4 log	99,99%
		90min	5.65 log	99,9998%
Fungal spore	Aspergillus brasiliensis	± 40min	4 log	99,99%
		60min	5.22 log	99,9994%
Bacterial spore	Bacillus subtilus	± 20min	4 log	99,99%
		90min	5.86 log	99,99986%

In summary, our equipment is best-in-class as it's the most powerful commercial air decontamination technology on the market.