



TECHNICAL BRIEFS

Catalyx technologies, llc • PO Box 137 • Media, PA 19063 • Ph 610-892-9405
Fax 610-892-9407 • www.catalyxtech.com

Volume 4 Fall 2003

Recent Air Disinfection Data with Medium-Pressure UV

Catalyx technologies has conducted testing of its in-duct UV disinfection lamp using medium-pressure (MP) technology. MP technology is considered *Broad-Band*, or having an UV emission throughout the UV-A, UV-B, and UV-C (185 to 400 nm) spectra, as compared to a single peak emitted in the UV-C range at 254 nm by low-pressure UV lamps. UV-C is characterized by the “germicidal” effect of splitting a microorganism’s DNA structure, rendering it unable to replicate and grow. Research has indicated that absorption of large doses of UV-A and UV-B by microorganisms causes other photobiological effects, leading to the death of the cell. Other life-sustaining portions such as nucleic acids, proteins, and cytoplasm absorb the broad-band UV and are subsequently damaged to prevent proliferation. A particular publication had shown cell rupturing because of the large temperature spike in the cell due to heavy doses of UV-A and UV-B.

We utilized a single MP lamp for a study of its disinfection efficiency. Since a standard quartz lamp will emit all wavelengths, there is the potential for ozone generation with the wavelengths less than 240 nm. Therefore, we included a non-ozone (<240 nm wavelength filtering) lamp in the study. They have less UV-C efficiency, however, it may become compensated by the UV-A and UV-B emissions.

Table 1 summarizes our results to date on the air testing. Samples were taken by an air impactor and sent to a certified laboratory for analysis.

Table 1			
Summary of In-Duct MP Lamp Disinfection			
Date	Type of Lamp	Pre-UV Results	Post-UV Results
		Type	% Inactivated
7/18/02	Standard Quartz	Bacillus	100
7/18/02	Ozone-Free Quartz	Bacillus	100
8/31/02	Ozone-Free Quartz	Bacillus	100
8/31/02	Ozone-Free Quartz	Unidentified Colony	100
8/31/02	Ozone-Free Quartz	Unidentified Colony	100
11/01/02	Standard Quartz	Gram Negative Bacteria	100
11/07/02	Standard Quartz	Gram Positive Cocci	100 (4 tests; including 2 @ 60% lamp output)

Catalyx technologies, llc • PO Box 137 • Media, PA 19063 • Ph 610-892-9405
 Fax 610-892-9407 • www.catalyxtech.com

12/09/02	Ozone-Free Quartz	Gram Positive Cocci	100
12/09/02	Ozone-Free Quartz	Bacillus	100

The process parameters for the in-duct pilot demonstration are contained in Table 2.

Table 2	
Summary of Process Parameters for In-Duct Pilot	
Air Flow Rate	450 to 500 cfm
Relative Humidity	50-60%
Air Temperature	67 °F
UV Exposure Time (along arc length)	0.07 seconds
Average UV Dose (along arc length)	100% Output – 3.0 mJ/cm ² 60% Output – 1.8 mJ/cm ²

The average dose for 99.9% inactivation of bacillus species from published literature is about 11 mJ/cm². This published data is typically based on plate studies. Generally, when disinfecting the same microorganism in air, the corresponding required UV dose is only 1/4th of that for plate testing. From Tables 1 and 2, we have also concluded that a UV dose of only 3.0 mJ/cm², or about one-fourth of published literature date, was sufficient for complete inactivation of the bacillus species.

An option that was used for the test that is not generally found in low-pressure UV systems is a variable output UV ballast. We were able to readily adjust the lamp output to determine a minimum threshold for inactivation of the present microorganisms. The lamp output has capability to receive a 0-10 Vdc input, such as that from a flow sensor, a UV sensor, a timer, etc., to vary its output, based on the process requirements, while conserving on energy costs.

The MP technology for in-duct disinfection has opportunities for reducing bioburden in HVAC duct and filters servicing Clean Rooms, improving infection control in healthcare facilities, and reducing airborne biocontamination in food and beverage processing plants.

Feel free to contact Catalyx directly for more information at (610) 892-9405.

Catalyx's Titan Aire™ Air Purification systems are manufactured to ISO 9001 standards and meet the European CE guidelines for electrical components. To the best of our knowledge, the information contained herein is accurate, however, we do not assume any liability whatsoever for the accuracy or completeness of the information contained herein. Titan Aire™ is a trademark of Catalyx technologies, LLC.