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### ActiveAir Solutions Test Reports\* Summary – Efficacy of Bi-Polar Ionization

- **MOLD TEST** - Green Clean Air, Reston, Virginia. Steven Welty CIE, CAFS, LEED® AP – **Independent Mold Reduction Report**: in conjunction with AeroBiology Laboratory Associates Inc. Dulles, Virginia. Suzanne S. Blevins, B.S., SM (ASCP) Laboratory Director.

**Airborne Mold Test performed at Re: 9201 Messina Drive Ft. Washington, MD, October 26<sup>th</sup>, 2011** – On October 26, 2011 prior to ActiveAir/GPS ionization device installation, the lab report results show that there were:

- 335,518 total airborne mold spores per cubic meter in the main room of the basement.
- 356,912 total airborne mold spores per cubic meter in the back bedroom of the basement.

On November 10, 2011 post installation of ActiveAir/GPS ionization devices, the lab report results show that there were:

- 9,212 total airborne mold spores per cubic meter in the main room of the basement.
- 2,667 total airborne mold spores per cubic meter in the back bedroom of the basement.

The predominant species that were captured are chaetomium, cladosporium, aspergillus and penicillium. The airborne samples included several other mold species but they are in much lower levels. Therefore, the total airborne mold spores per cubic meter in the main room of the basement were reduced by 97.5% and, the total airborne mold spores per cubic meter in the back bedroom of the basement were reduced by 99.5%.

When we visited the property on 10/26/11 and I first took air samples inside the basement, it had very pungent mildew odor which would be indicative of high airborne mold levels. The lab results supported this by showing that there were 335,518 to 356,912 airborne mold spores. That was not the case when I returned to the property on November 10. The mold levels dropped to 9,212 and 2,667 respectively. The strong mold odors were totally absent. It is my understanding that you installed two ActiveAir/GPS Systems DM/RN units on November 6th, so they had been operating for 4 days. These units produce cold plasma ionization fields and it is significant that this cold plasma technology was able to affect the drop in airborne mold levels by 99.5% and 97.5%. *"In my professional career of taking airborne mold samples, I have never seen such a reduction as this within such a short period of time except by a total mold remediation. That this technology was able to produce such significant results post-facto a mold remediation, is unknown to me up till now. As the chairman of the nonprofit Indoor Environmental Standards Organization (IESO.org) committee which is writing the first mold investigation standard for educational facilities, it is my business to be aware of effective mold reduction technologies like cold plasma. Had the Lab results not have confirmed what my nose had no longer smelled, I would never have believed that this was possible."*

The other significant feature of the second lab report was how the cold plasma had reduced the airborne stachybotrys levels. Stachybotrys mold is considered to produce one of the most toxic mold chemicals (mycotoxin) and the reduction to negligible levels was an important health benefit, along with the large drops in aspergillus and penicillium species which produce also mycotoxins.

- **VALENCIA COLLEGE IONIZATION PERFORMANCE EVALUATION** - Green Clean Air, Reston, Virginia. Steven Welty CIE, CAFS, LEED® AP – **Independent Laboratory testing. Re: Bi-Polar Ionization System – Post-installation Assessment, Valencia College, 12350 Narcoossee Road, Orlando, FL 32832, April 4<sup>th</sup>, 2013.** The IAQ evaluation was conducted to evaluate what impacts on the indoor air quality at Valencia College were as a result of the presence of bipolar ionization/plasma air cleaning equipment installed within the building's air handling units (AHUs). An additional objective was to determine the IAQ impacts of reducing the outdoor air supply to approximately 5 cubic feet per minute (cfm) per person using ASHRAE's (American Society of Heating, Refrigeration and Air Conditioning Engineers) Standard 62.1 Indoor Air Quality Procedure (IAQP). 5 cfm is a reduction from the amount of 17 cfm per person as calculated per ASHRAE's Standard 62.1 Ventilation Rate Procedure (VRP), which required in this application using 10 cfm per person plus 0.12 cfm per square foot and taking into account the ventilation effectiveness of the air distribution system. Using the IAQP procedure required that indoor air quality sampling would need to be performed in several fully occupied areas while the BPI/plasma air cleaning equipment was activated. In addition, outdoor air quality samples would need to be taken as a reference point by which to evaluate the building's Indoor Air Quality.

Findings and Conclusions: The purpose of the investigation was to evaluate what impacts on the indoor air quality at Valencia College were as a result of the presence of bipolar ionization/plasma air cleaning equipment installed within the building's air handling units. Multiple and exhaustive air quality samplings were taken to ascertain this purpose. The sampling results reported herein demonstrate that the Bipolar Ionization/plasma system is likely not having any negative effects on the IAQ, and moreover it is likely having positive effects on the building's IAQ.

- **SCHOOL CLASSROOMS IAQ PROCEDURE COMPLIANCE TEST WITH IONIZATION** - Green Clean Air, Reston, Virginia. Steven Welty CIE, CAFS, LEED® AP – **Independent Laboratory testing. Indoor Air Quality Investigation. REPORT NO. 48962A. Report Scope:** Compliance testing in order to prove acceptable indoor air quality while reducing outside air in accordance with ASHRAE Standard 62 Indoor Air Quality Procedure by utilizing needlepoint bi-polar ionization technology. Standards Used: ASHRAE Standard 62, Lab Analysis Standard TO-15 Project Location: Bay St. Louis, Mississippi Project Type: Educational – Classroom IAQ Evaluation Testing Date: 10/7/2009 & 4/22/2010 Product Description: One AAS/GPS-IN needlepoint bi-polar ionization generator mounted in each Mitsubishi ductless mini-split system per classroom.

#### **Test Facility**

Commercial Educational Building – Pre-K through 6th Grade  
Average Room: 800 square feet  
Average Occupancy: 25 people  
Average Air Flow: 800 CFM

#### **Results 10/7/2009 & 4/22/2010**

Analyzing the Centek Laboratories, LLC lab data and the ammonia levels yields a conclusion that the air quality is acceptable per ASHRAE Standard 62 IAQ Procedure at the reduced outside air flows. When the collected samples are compared to ASHRAE guidelines, which reference OSHA and NIOSH, they are all acceptable and below the threshold values. The results also confirm that AAS/GPS Solutions' IAQ software conservatively predicts the indoor contaminant levels under steady state conditions. There were a few anomalies based on the fact that oil based painting took place before the samples were collected on 10/7/2009. The standard off gassing that occurs from oil based paint was observed in the results of the indoor analysis, but was all below threshold values.

- **Bacteria: Clostridium difficile Test - EMSL Analytical, Inc.** – Independent Laboratory testing. EMSL NO: 371208933. Efficacy of a Bipolar Ionization System. Challenge Bacteria: Clostridium difficile ATCC 70057. June 2011.  
**Conclusions/Observations:** The efficacy of the AAS-AirRail/GPS-IBAR-36, a bipolar ionization system, to disinfect a solid surface against C. difficile was tested. It was observed that the Log Reduction was 0.88 for 30 min, refer to Table 1. In conclusion, the AAS-AirRail/GPS-IBAR-36 demonstrated the ability to disinfect C. difficile on a solid surface with an observed percent reduction of 86.87% in 30 minutes.
- **Bacteria: Escherichia coli Test - EMSL Analytical, Inc.** – Independent Laboratory testing. EMSL NO: 371106420. Efficacy of a Bipolar Ionization System. Challenge Bacteria: Escherichia coli ATCC 8739. July 2011.  
**Conclusions/Observations:** The efficacy of the AAS-AirRail/GPS-IBAR-36, a bipolar ionization system, to disinfect the air of E. coli was analyzed. After correcting for the natural rate of decay it was observed that there was a 2.34 log reduction after 30 min exposure and a 2.11 log reduction after 60 min exposure (Table 1). Furthermore, a D-value was calculated using the reciprocal of the slopes in Figure 1 and a linear regression was computed from log D-value versus time giving us a D-value of 22.72 min. In laymen terms with the use of the bipolar ionization device an expected 90% reduction (1 log) of E. coli will occur every 24 min, until a maximum reduction is achieved. In conclusion, the AAS-AirRail/GPS-IBAR-36 demonstrated the ability to disinfect E. coli from the air with a 99.54% reduction after 30 min exposure and a 99.23% reduction after 60 min exposure. Furthermore, these results demonstrate that the bipolar ionization system tested does not require direct line of sight to produce kill rates like ultraviolet light. The bipolar ionization system's kill rates are indicative of those in the entire space.
- **Bacteria: Methicillin Resistant Staphylococcus aureus (MRSA) Test - EMSL Analytical, Inc.** – Independent Laboratory testing. EMSL NO: 371106420. Efficacy of a Bipolar Ionization System. Challenge Bacteria: Methicillin Resistant Staphylococcus aureus (MRSA) ATCC 33591. June 2011.  
**Conclusions/Observations:** The efficacy of the AAS-AirRail/GPS-IBAR-36, a bipolar ionization (cold plasma) system, to disinfect the air of MRSA was analyzed. After correcting for the natural rate of decay it was observed that there was a 1.43 log reduction after 30 min exposure (Table 1). Furthermore, a D-value was calculated using the reciprocal of the slopes in Figure 1 and a linear regression was computed from log D-value versus time giving us a D-value of 24 min. An expected 90% reduction (1 log) of MRSA will occur every 24 min. In conclusion, the AAS-AirRail/GPS-IBAR-36 demonstrated the ability to disinfect MRSA from the air with a 96.24% reduction after 30 min exposure. Furthermore, these results demonstrate that the bipolar ionization system tested does not require direct line of sight to produce kill rates like ultraviolet light. The bipolar ionization system's kill rates are indicative of those in the entire space.
- **Bacteria: Mycobacterium terrae Test - EMSL Analytical, Inc.** – Independent Laboratory testing. EMSL NO: 371106420. Efficacy of a Bipolar Ionization System. Challenge Bacteria: Mycobacterium terrae ATCC 15755. July 2011.  
**Conclusions/Observations:** The efficacy of the AAS-AirRail/GPS-IBAR-36, a bipolar ionization system, to disinfect the air against M. terrae was analyzed. After correcting for the natural rate of decay it was observed that there was a 0.38 log reduction after 30 min exposure and a 0.51 log reduction after 60 min exposure (Table 1). In conclusion, the AAS-AirRail/GPS-IBAR-36 was observed to reduce M. terrae by 69.09%. Furthermore, these results demonstrate that the bipolar ionization system tested does not require direct line of sight to produce kill rates like ultraviolet light. The bipolar ionization system's kill rates are indicative of those in the entire space.
- **Bacteria: Vancomycin-Resistant Enterococcus (VRE)-Enterococcus faecium Test - EMSL Analytical, Inc.** – Independent Laboratory testing. EMSL NO: 371215126. Efficacy of a Bipolar Ionization System. Challenge Bacteria: Vancomycin-Resistant Enterococcus (VRE)-Enterococcus faecium - (ATCC 700221). September 2012.  
**Conclusions/Observations:** The efficacy of the AirRail/I-Bar system to disinfect a solid surface against Vancomycin-Resistant Enterococcus (Enterococcus faecium) was tested. It was observed that the Log Reduction was 0.25 for 15 minute and 0.11 for 1 minute (Table 1). In conclusion, the AAS-AirRail/GPS-IBAR-36 demonstrated the ability to disinfect Enterococcus faecium on a solid surface with observed percent reduction of 22.43% for 1 minute and 43.78% for 15 minutes. Extrapolating to 60 minutes, the disinfection rate would be over 99%.

#### **Compelling Results of AAS/GPS' Needlepoint Ion Technology**

Unlike UV light technology, AAS/GPS' needlepoint ion technology reaches down into the space and kills pathogens at the source before they can infect healthy occupants, see Figure 1 below. Based on the recent data provided by the world renowned testing agency, EMSL Laboratories, AAS/GPS' technology provided the following extraordinary results:

#### **Pathogen Time Exposed Kill Rate Using Needlepoint Bi-Polar Ionization**

E.coli	15 minutes	99.68%
MRSA	30 minutes	96.24%
Noro Virus	30 minutes	93.50%
Feline Calicivirus	30 minutes	93.50%
c. Diff	30 minutes	86.87%
TB	60 minutes	69.01%

- **UL867 Peak Ozone Chamber Test** - Intertek Laboratories – UL867 “Peak Ozone Chamber Testing”. Report Number: G100145818CRT-002. Model Number: AAS-DM2400/GPS-RN.  
**Summary**  
The test sample(s) documented in this report were tested in accordance to the standard(s) and Certification Requirement Decision(s) (CRDs) referenced in the first page of this report. The representative sample(s) have been tested, investigated, and found to comply with the requirements of the UL Standard 867 Section 37.1.2 criteria of emitting a maximum ozone concentration of less than 0.050 ppm. Furthermore a second sample was not required to be tested as the first sample's maximum emissions were less than 0.030 ppm to satisfy the exception in the Section 37.1.1. This report completes our evaluation covered by Intertek Project No. G100145818CRT-002. If there are any questions regarding the results contained in this report, or any of the other services offered by Intertek, please do not hesitate to contact the undersigned. Please note; this Report does not represent authorization for the use of any Intertek certification marks.

#### **AAS/GPS Excels During UL 867 Ozone Testing**

*"The new UL 867 ozone test proves that if an electrostatic air cleaner (bi-polar ion generator) does not produce ozone in excess of acceptable levels of 0.05 PPM in a closed chamber, it will not produce ozone above acceptable levels in a duct. AAS/GPS has set the new standard for negligible ozone generation. The peak ozone test revealed a maximum ozone level of 0.0033 PPM! That is 15 times lower than the limit allows!"*

#### **Additional Independent Full Copy Test Reports Available Upon Request:**

- Naval Study on Exposure to CO2 and other gases in Submarines.
- Office Pollutant Reduction Using AAS-DM2400/GPS-RN technology.
- Proof of Bi-Polar Ionization Efficacy Attained Through Collaborative Research with Organizations Globally.
- Report on Titanium Dioxide from CDC.
- The Effect of Ionization on the Deposition of Airborne Bacteria.
- TiO2 the New Asbestos - PCO Technology Caution.
- Air ionizers' wipe out hospital infections - 03 January 2003 - New Scientist.
- AnnistownES-September30, 2010Survey.
- GPS Ions vs PCO.

Full copy test reports for each above are available upon request.

*\*Note: References to "GPS" and testing reflect that at the time of testing, laboratories and test facilities were commissioned and ordered by ActiveAir Solutions LLC affiliate company and manufacturing partner, Global Plasma Solutions (GPS).*