RTI INTERNATIONAL
3040 E. Cornwallis Road • PO Box 12194 • Research Triangle Park, NC 27709-2194 • USA
Telephone +1.919.541.6941 • Fax +1.919.541.6936 • mko@rti.org • www.rti.org

Company A Date
ATTN: Name of company contact

Dear Contact Name:

RTI is pleased to submit this final report to Company A on our project to test the efficacy of microorganism inactivation by your air cleaner. The in-duct unit was installed in RTI's test rig, which is compliant with ASHRAE 52.2 specifications with modifications for biological sampling. The testing program included five organisms: [the following is example text based on selection of test organism] one fungus, one virus, one bacterial spore and two vegetative bacteria tested at multiple concentrations.

Organism #1. The characteristics of the organism and the justification for its selection are based upon appropriateness after discussion with the company for the claims that the company wishes to make.

Organism #2. The characteristics of the organism and the justification for its selection are based upon appropriateness after discussion with the company for the claims that the company wishes to make.

Organism #3. The characteristics of the organism and the justification for its selection are based upon appropriateness after discussion with the company for the claims that the company wishes to make.

Organism #4. The characteristics of the organism and the justification for its selection are based upon appropriateness after discussion with the company for the claims that the company wishes to make.

Organism #5. The characteristics of the organism and the justification for its selection are based upon appropriateness after discussion with the company for the claims that the company wishes to make.

TEST METHOD

Single Pass In-duct Test

The testing was conducted in the test duct shown schematically in Figure 1. The test section of the duct is 0.61 m by 0.61 m (24 in. by 24 in.). The locations of the major components, including the sampling probes, the device section (where the device is installed), and the aerosol generator (site of bioaerosol injection) are shown. The test duct is operated following procedures in the ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers)

Standard 52.2-2007, *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.*

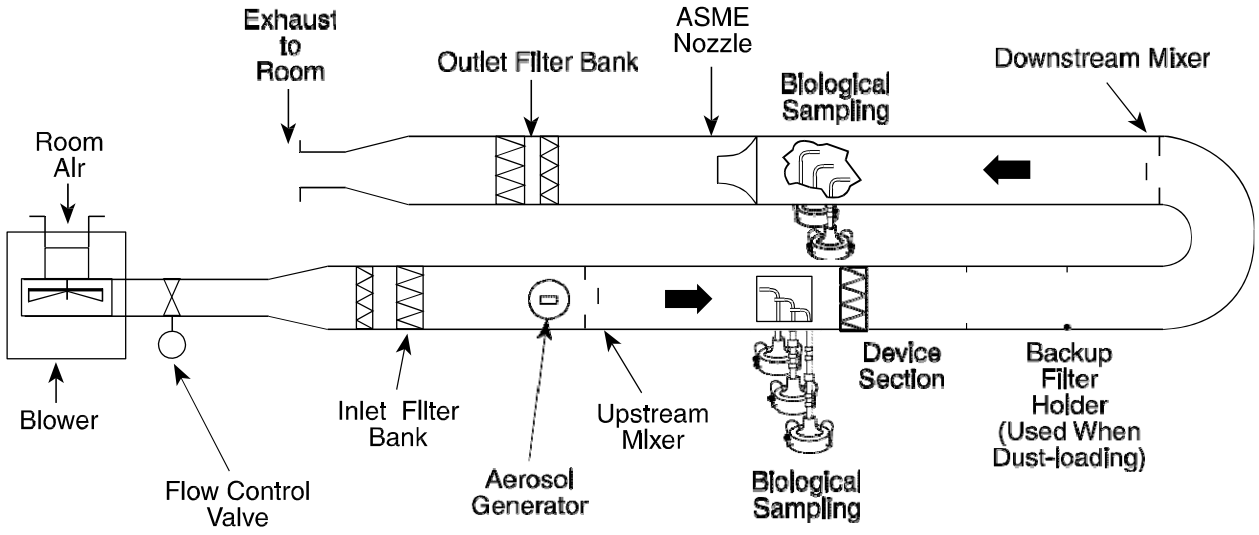

Figure 1. Schematic of Test Duct. Device is placed in device section.

The unit tested consisted of [description of test unit]. The device was visually confirmed to be working at least once during the test when visual confirmation was possible. [Test specific information included here.]

Insert photo of the device

Insert photo of the device

Figures 2 and 3. View of device installed in test duct. The device and the device installed inside the test rig.

The challenge bioaerosol suspensions were aerosolized using a nebulizer. The output of the nebulizer was mixed with clean, dry air prior to its entry into the test duct to create the dry bioaerosol challenge.

Bioaerosol samples were collected from the air stream with sampling probes positioned within the test duct at both the upstream and downstream sampling sites. Sampling of the

bacterial and fungal test organisms was accomplished using bioaerosol samplers [samplers will vary based on test organism and test specifics]. [Description of sampler used). After sampling, the organisms were plated on appropriate media and were incubated for the appropriate length of time and at the appropriate temperature. [Description of time and temperature of incubation] CFUs (colony forming units) were then enumerated and their identity confirmed.

Sampling of the virus particles was accomplished using impingers. After sampling, the impinger fluid was diluted (if necessary) and analyzed for viable viruses. Quantitation of viruses is accomplished by enumeration of plaque forming units (PFU) arising from assay of samples using a host organism.

For each run, one of the challenge bioaerosols was injected upstream of the device. A no-device transmission test was also performed for each organism, to determine the microorganism loss that would occur simply as the result of deposition in the test duct. For investigation of efficacy with respect to microbe culturability, the performance of the device is reported as the device's efficiency in inactivating the organism, corrected to account for the loss of organisms observed in the absence of the device. For each concentration of each organism, one test was performed with the unit on, and one no device transmission test was performed.

Test Protocol:
The test protocol was as follows:
1) Turn on the test duct blower and adjust flow to the design airflow rate (cfm).
2) Turn on device.
3) Turn on the nebulizer and drying air.
4) Collect upstream and downstream bioaerosol samples.
5) Turn OFF Collison and device.

For the no-device test, the test unit was removed and step 2 was omitted.

Calculations:
The efficiency of the device for inactivating airborne bioaerosols was calculated as:

Airborne Inactivation Efficiency (%) = 100 (1- Corrected Survival Rate) Equation 1

The calculation of the test organism survival rate (culturable transmission) was based on the ratio of the downstream to upstream culturable organism counts. To remove system bias, the Survival Rate was corrected by the results of the no-device transmission test. The no-device transmission rate was calculated in the same manner as the survival rate test, but using the culturable organism counts from the no-device tests.

RESULTS

<u>Single Pass In-duct Test</u>

Table 1 presents the efficacy results for the test device when operated at the design CFM. [The data are representative of what has been achieved, but are not actual data associated with any

particular device] The inactivation efficiencies were calculated as shown in Eq. 1. The average values presented were calculated using the results from the upstream and downstream measurements for each challenge. These results are also displayed graphically in Figure 4. As shown in Table 1 and Figure 4, the efficacy of the unit was dependent upon the challenge organism.

Table 1. Inactivation efficiencies for introduced bioaerosols

Inactivation Efficiency	
Test Organism	**mean**
Organism 1	12.5
Organism 2	48.0
Organism 3	87.0
Organism 4	23.0
Organism 5	63.0

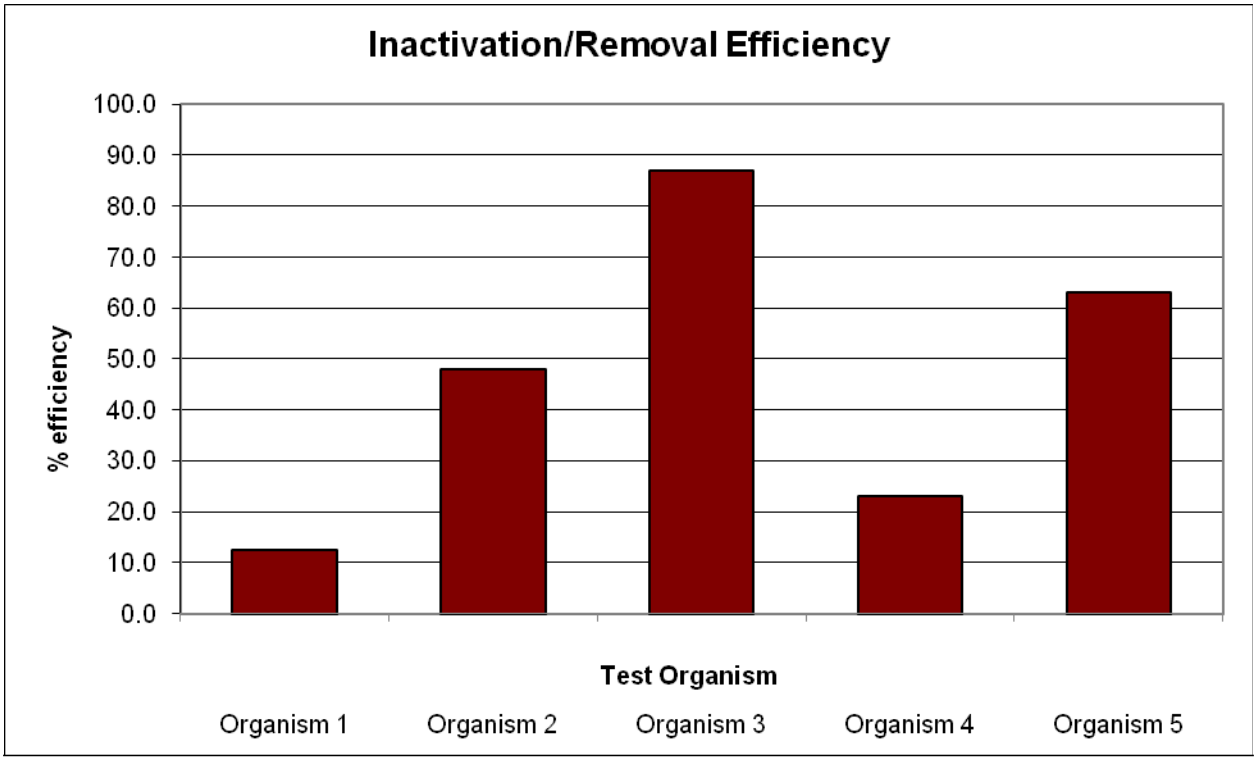

Figure 4. Inactivation/removal efficiency values for single pass efficacy tests

Please let me know if you have any additional questions, and feel free to call me at 919-541-8087 or email me at jeankim@rti.org.

Sincerely,

Dr. Jean Kim
Research Microbiologist