MICROBIOLOGY REPORT

LMS TECHNOLOGIES, INC.

6423 Cecilia Circle
Bloomington, MN 55439 USA

Tel: 952-918-9060
Fax: 952-918-9061

Date: May 12, 2022
Test Requested By: Authority brands
Test Type: Multi-Pass Efficiency

Scope

Customer provided three units for multi-pass efficiency testing with MS-2 bacteriophage (ATCC 15597-B1) as the challenge aerosol. Testing was performed in a 1007 ft^3 chamber connected to ASHRAE type duct. Flow rate through the duct was 1200 cfm.

Method

MS-2 bacteriophage was harvested and titrated to 7.5E8 pfu/ml. Suspensions of the organisms were then aerosolized into the chamber using a nebulizer prior to powering the test device. The test chamber air was sampled at 5-minute intervals using a SKC BioStage cascade impactor for 1-minute sampling periods. The cascade impactors were calibrated to an airflow rate of 28.3 liters/min and the sampling inlet was situated at the midpoint of the test chambers. The recovered organisms were enumerated after 24-hours of incubation.

$$Corrected\ Removal\ Efficiency = 1 - \left(\frac{DevicePFU_{t=x}}{DevicePFU_{t=0}} * \frac{EmptyPFU_{t=0}}{EmptyPFU_{t=x}}\right)$$

Microbiologists
John Cherne & Autumn Stivers-Biscuso

Testing Approval
Al Vatine, CEO

Air Cleaner Information

Manufacturer: Aerus
Model: A1013P
Serial Number: X201445M

Figure 1: Aerus Air Scrubber

Manufacturer: PremierOne
Model: OxyQuantum

Figure 2: PremierOne OxyQuantum P1)

Manufacturer: RGF
Model: REME-LED
Serial Number: R1WRLED015

Figure 3: RGF REME-LED

Equipment
1007 ft^3 Stainless-Steel Test Chamber
SKC BioStage Single-Stage Impactors
Ozone Analyzer

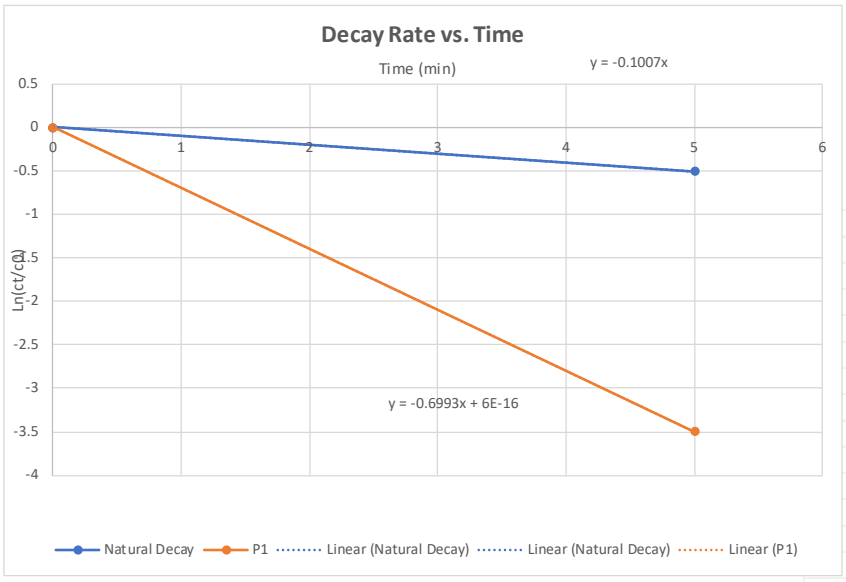
Data

Natural Decay													
Time	**0**	**5**	**10**	**15**	**20**		**30**			**45**			**60**
#1	156	108	93	60	44	0	33			26			18
#2	185	119	101	62	39	0	38			29			19
#3	172	117	105	69	36	0	33			25			20
PHC #1	197.7	125.9	105.8	65	46.6	0	34.4	0	0	26.8	0	0	18.4
PHC #2	248.4	141.2	116.4	67.4	41	0	40	0	0	30.1	0	0	19.4
PHC #3	224.8	138.4	121.8	75.7	37.8	0	34.4	0	0	25.8	0	0	20.5
ln(ct/c0)	0	-0.5035	-0.668	-1.1706	-1.6771		-1.8191			-2.0934			-2.443
Positive Hole Corrected Average	223.633	135.167	114.667	69.3667	41.8		36.2667			27.5667			19.4333

P1													
Time	**0**	**5**											
#1	175	4	0	0	0	0	0		0	0	0		0
#2	157	5	0	0	0	0	0		0	0	0		0
#3	177	11	0	0	0	0	0		0	0	0		0
PHC #1	230.2	4	0	0	0	0	0	0	0	0	0	0	0
PHC #2	199.4	5	0	0	0	0	0	0	0	0	0	0	0
PHC #3	233.7	11.1	0	0	0	0	0	0	0	0	0	0	0
ln(ct/c0)	0	-3.4965											
Positive Hole Corrected Average	221.1	6.7											

Time	0	5											
Efficiency %	0	94.99											

Chamber Volume (ft^3)	**CADR**
1007	**602.79**

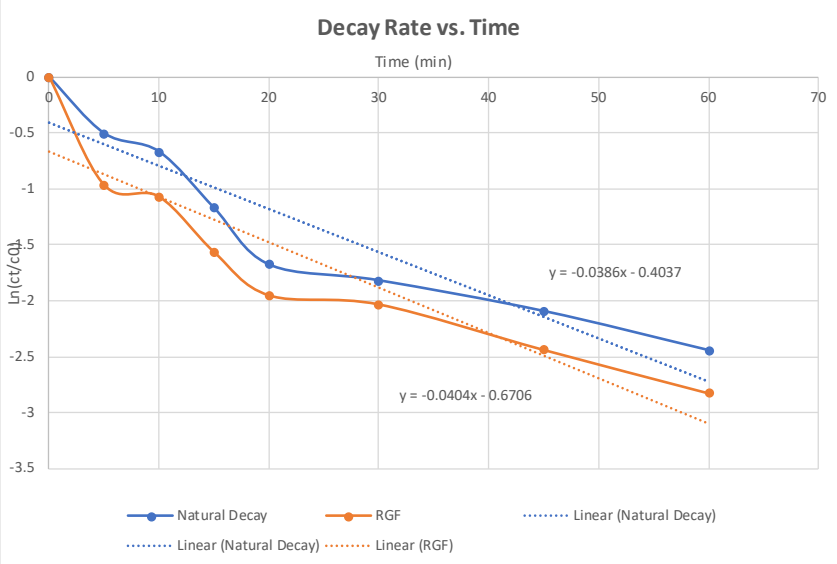


Natural Decay													
Time	**0**	**5**	**10**	**15**	**20**		**30**			**45**			**60**
#1	156	108	93	60	44	0	33			26			18
#2	185	119	101	62	39	0	38			29			19
#3	172	117	105	69	36	0	33			25			20
PHC #1	197.7	125.9	105.8	65	46.6	0	34.4	0	0	26.8	0	0	18.4
PHC #2	248.4	141.2	116.4	67.4	41	0	40	0	0	30.1	0	0	19.4
PHC #3	224.8	138.4	121.8	75.7	37.8	0	34.4	0	0	25.8	0	0	20.5
ln(ct/c0)	0	-0.5035	-0.668	-1.1706	-1.6771		-1.8191			-2.0934			-2.443
Positive Hole Corrected Average	223.633	135.167	114.667	69.3667	41.8		36.2667			27.5667			19.4333

RGF													
Time	**0**	**5**	**10**	**15**	**20**		**30**			**45**			**60**
#1	136	58	47	28	25	0	22			14			11
#2	130	58	51	33	21	0	21			18			8
#3	128	53	55	35	20	0	18			9			9
PHC #1	166.2	62.6	50	29	25.8	0	22.6	0	0	14.2	0	0	11.1
PHC #2	157.2	62.6	54.6	34.4	21.6	0	21.6	0	0	18.4	0	0	8.1
PHC #3	154.2	56.8	59.2	36.6	20.5	0	18.4	0	0	9.1	0	0	9.1
ln(ct/c0)	0	-0.9648	-1.0701	-1.5636	-1.9507		-2.032			-2.4383			-2.8259
Positive Hole Corrected Average	159.2	60.6667	54.6	33.3333	22.6333		20.8667			13.9			9.43333

Time	0	5	10	15	20	30	45	60
Efficiency %	0	36.95	33.11	32.5	23.94	19.18	29.17	31.81

Chamber Volume (ft^3)	**CADR**
1007	**1.83**



Microbiologists
John Cherne & Autumn Stivers-Biscuso

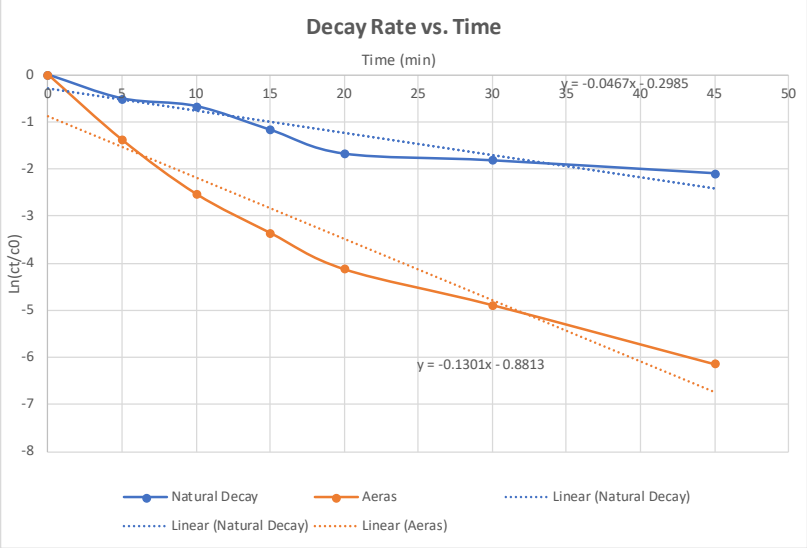
Testing Approval
Al Vatine, CEO

Natural Decay													
Time	**0**	**5**	**10**	**15**	**20**		**30**			**45**			**60**
#1	156	108	93	60	44	0	33			26			18
#2	185	119	101	62	39	0	38			29			19
#3	172	117	105	69	36	0	33			25			20
PHC #1	197.7	125.9	105.8	65	46.6	0	34.4	0	0	26.8	0	0	18.4
PHC #2	248.4	141.2	116.4	67.4	41	0	40	0	0	30.1	0	0	19.4
PHC #3	224.8	138.4	121.8	75.7	37.8	0	34.4	0	0	25.8	0	0	20.5
ln(ct/c0)	0	-0.5035	-0.668	-1.1706	-1.6771		-1.8191			-2.0934			-2.443
Positive Hole Corrected Average	223.633	135.167	114.667	69.3667	41.8		36.2667			27.5667			19.4333

Aeras													
Time	**0**	**5**	**10**	**15**	**20**		**30**			**45**			
#1	213	61	24	12	5	0	1			1			0
#2	200	75	26	9	6	0	1			0			0
#3	233	76	22	11	4	0	5			1			0
PHC #1	304.2	66.2	24.8	12.2	5	0	1	0	0	1	0	0	0
PHC #2	277.3	83	26.8	9.1	6	0	1	0	0	0	0	0	0
PHC #3	349.4	84.3	22.6	11.1	4	0	5	0	0	1	0	0	0
ln(ct/c0)	0	-1.383	-2.5294	-3.358	-4.1281		-4.8902			-6.143			
Positive Hole Corrected Average	310.3	77.8333	24.7333	10.8	5		2.33333			0.66667			

Time	0	5	10	15	20	30	45						
Efficiency %	0	58.5	84.45	88.78	91.38	95.36	98.26						

Chamber Volume (ft^3)	**CADR**
1007	**83.95**



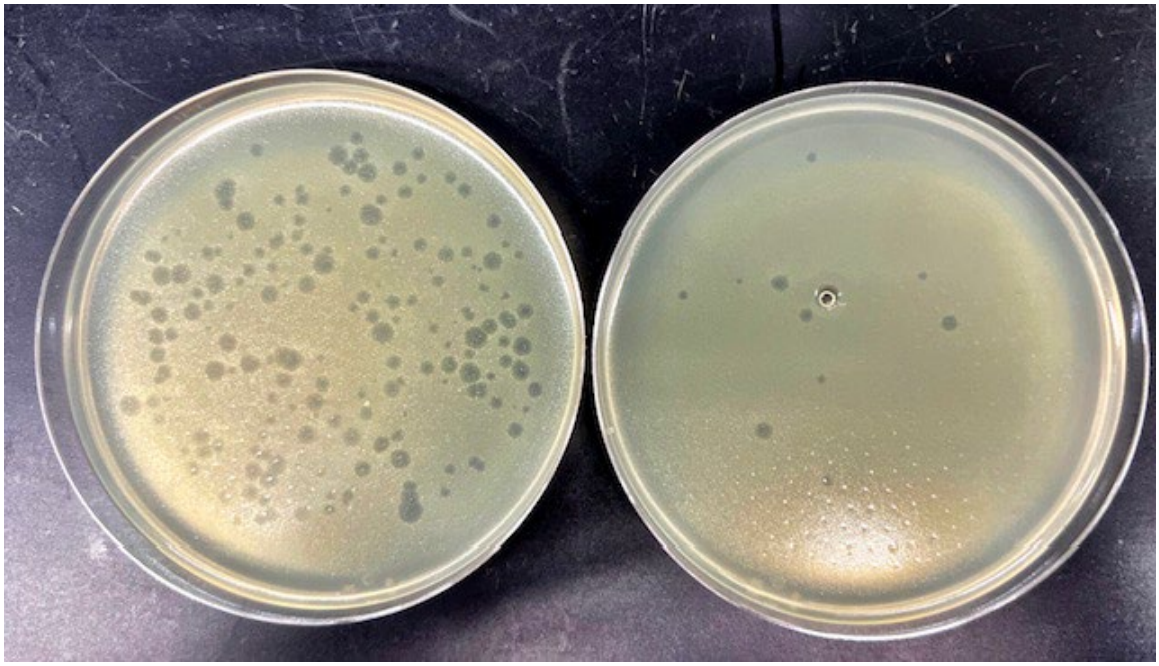


Figure 4: MS-2 Pfu at 0 min and 5 min (P1)

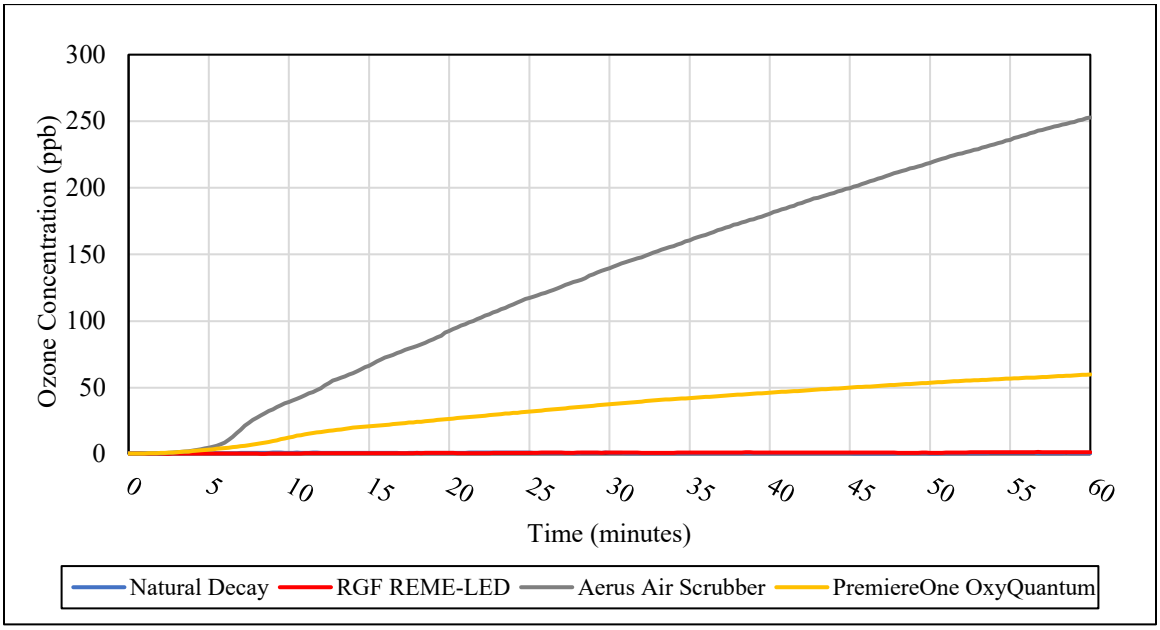


Figure 5. Ozone data for all tests