



TRIO 3-in-1 Air Purification System – Biological Test Report

Multi-pass Efficiency

Date: January 18, 2024
Test Type: Multi-pass Efficiency
Test Requested by: Field Controls
LMS # 8874

SCOPE:

Customer provided a TRIO 3-in-1 air purifier unit for multi-pass efficiency test with MS-2 bacteriophage (ATCC 15597-B1) as the challenge aerosols. Tests were performed in the 4000ft³ chamber at 400 cfm. This translates to 6 air exchanges per hour.

METHOD:

MS-2 was harvested and titrated to 5E7 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- 48hours of incubation.

Computational Formula

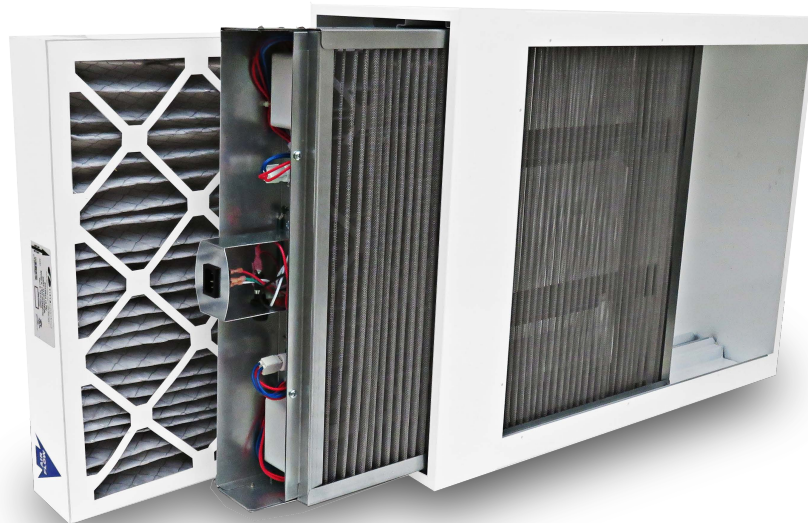
$$\text{Corrected Removal Efficiency} = 1 - \left(\frac{\text{DevicePFU}_{t=x}}{\text{DevicePFU}_{t=0}} * \frac{\text{EmptyPFU}_{t=0}}{\text{EmptyPFU}_{t=x}} \right)$$

RESULTS:

>85% reduction of virus MS-2 bacteriophage in a in a 4000ft³ chamber in less than 20 minutes



Figure 1. Large Testing Chamber



TRIO air Purifier

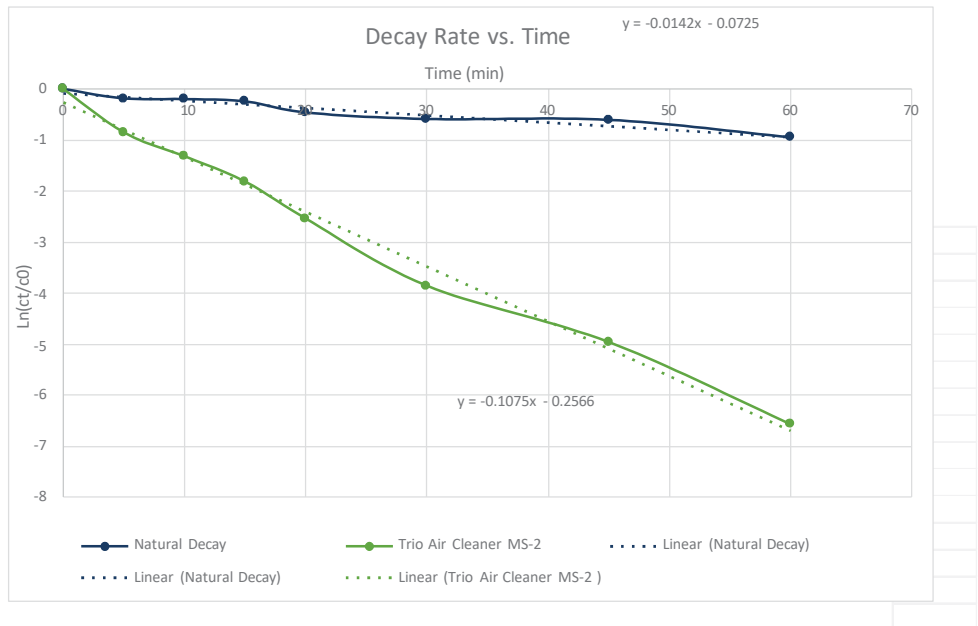
Data: MS-2

Natural Decay													
Time	0	5	10	15	20	30	45	60					
#1	311	257	259	268	223	199	198	154					
#2	290	278	271	237	215	202	203	167					
#3	255	246	246	250	224	207	200	147					
PHC #1	601.2	411.4	417.1	443.5	326.2	0	275.3	0	0	273.3	0	0	194.4
PHC #2	516.4	475	452.6	359.1	308.4	0	281.3	0	0	283.3	0	0	216.2
PHC #3	405.9	381.8	381.8	392.4	328.4	0	291.5	0	0	277.3	0	0	183.2
ln(ct/c0)	0	-0.1834	-0.1967	-0.2429	-0.4587		-0.5858			-0.6027			-0.9422
Positive Hole Corrected Average	507.833	422.733	417.167	398.333	321		282.7			277.967			197.933

Trio Air Cleaner MS-2													
Time	0	5	10	15	20	30	45	60					
#1	172	82	55	40	13	9	4	0					
#2	172	93	58	31	21	2	1	1					
#3	195	94	64	40	21	4	0	0					
PHC #1	224.8	91.8	59.2	42.2	13.2	0	9.1	0	0	4	0	0	0
PHC #2	224.8	105.8	62.6	32.2	21.6	0	2	0	0	1	0	0	1
PHC #3	267.4	107.2	69.7	42.2	21.6	0	4	0	0	0	0	0	0
ln(ct/c0)	0	-0.8554	-1.3202	-1.8163	-2.5426		-3.8604			-4.9656			-6.5751
Positive Hole Corrected Average	239	101.6	63.8333	38.8667	18.8		5.03333			1.66667			0.33333

Time	0	5	10	15	20	30	45	60				
Efficiency %	0	48.93	67.49	79.27	87.56	96.22	98.73	99.64				

Chamber Volume (ft ³)	CADR
4000	372.98



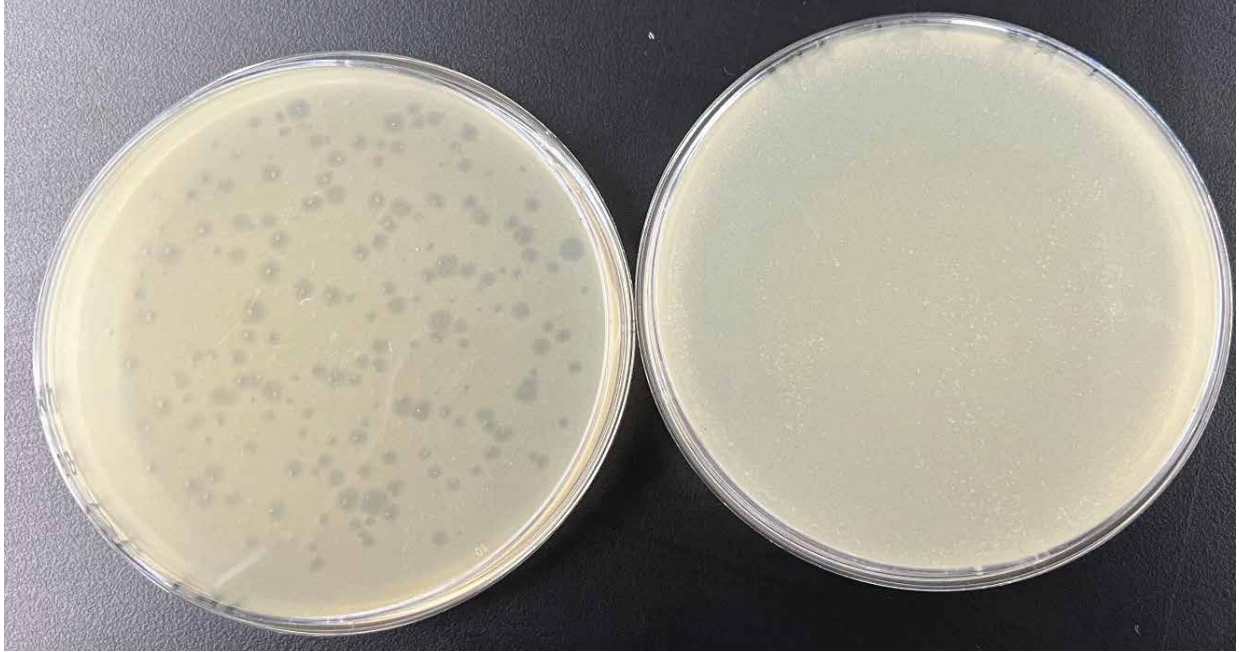


Figure 2: MS-2 at 0 minutes and 60 minutes