

V100 w/R2S Air Sampler and MAS 100 Air Sampler Comparison Summary

Testing Summary

A brief study was performed comparing the EMTEK V100 Controller operating the EMTEK R2S Microbial Air Sampler, to the EMD MAS 100 Air Sampler. Testing occurred over two test days, by two different technicians. This included testing of a MAS 100 w/300 hole inlet cover (MAS 300), a MAS 100 w/400 hole inlet cover (MAS 400), (both calibrated for use at sea level) and two V100 w/R2S air sampler assemblies. One V100/R2S assembly calibrated for use at sea level (0 Feet or Meters) (R2S 100) and the other for use at 5000 feet (1524 Meters) (R2S 83) (See Flow Rate and Capture Speed Discussion). The devices were set up on a wire cart at 4 locations approximately 12 inches (30cm) apart with the inlets of the devices at the same height. The V100 controllers were below the air samplers on the same cart (See example set up images next page). During testing the device locations were rotated every 2-3 test runs Test plates used in testing were sterile 100mm (90mm) Trypticase Soy Agar (TSA) media plates from Becton, Dickson and Company (BD™), part number 222205. The devices (and test cart) were disinfected prior to testing with 0.25% bleach, followed by 70% sterile alcohol using sterile wipes and purged until dry. Between each location change, devices inlets were cleaned in the same manner and purged prior to loading of test plates. All devices were set for test periods and sample rates of 10-minutes and 100 LPM, for a total volume of 1000Liters (or 1 cubic meter). Although, the actual sample volumes captured were 17% higher for the MAS devices and R2S 100 due to the altitude of testing. Test plates were incubated at 30-35°C for 3-4 days and then CFU counts were performed and documented.

Flow Rate and Capture Speed Discussion

V100 and R2S Assemblies

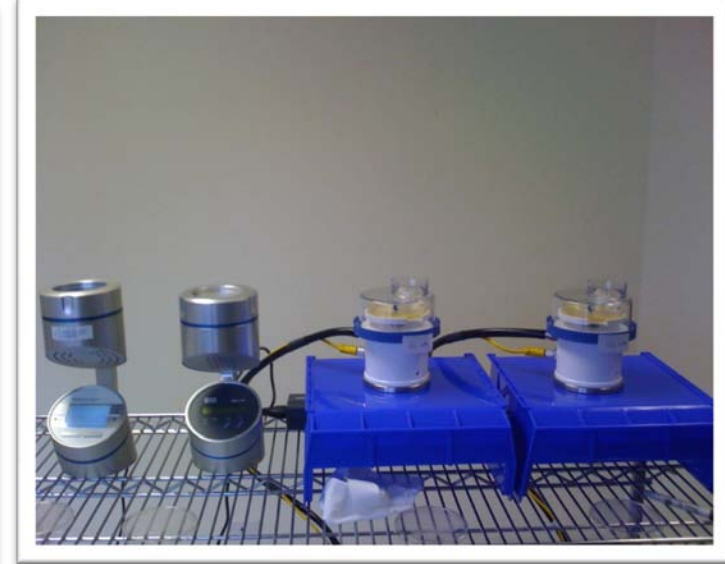
As the MAS devices were sampling at 117 LPM (volumetric), one of the V100/R2S sampling assemblies was operated at a mass air flow rate of 100 SLPM (R2S 100), for a volumetric rate of 117 LPM and the other assembly was operated at a mass air flow rate of 83 SLPM (R2S 83), or volumetric flow rate of 100 LPM. The higher volumetric flow rate moves the R2S out of its designed capture rate of 40 meters per second (MPS) achieved at 100 LPM mass flow at sea level, or 83 SLPM mass flow at 5000 feet (the altitude at which testing was performed. The 100 SLPM mass flow rate was tested to allow for an easier volume comparison to the MAS 100 devices which were both calibrated for use at sea level at a 100 SLPM mass flow rate. But, this moved the V100 R2S a little outside of its optimal capture speed, moving it from 40 MPS to approximately 44 MPS.

MAS 100 Devices

Both of the MAS 100 devices had been calibrated for use at sea level for 100 SLPM (mass flow). At 5000 feet both the MAS 100 with 300 hole inlet cover (MAS 300) and the MAS 100 with 400 hole inlet cover (MAS 400) were drawing in approximately 117 LPM volumetric. This increased the capture speeds of both devices by approximately 17%, or from just under 20 MPS to approximately 24 MPS for the 300 hole inlet device and from approximately 11 MPS to about 14 MPS for the 400 hole inlet device. This increase in capture speed moved both MAS 100 devices closer to an optimal capture range, which would not be seen if the devices had been calibrate for the altitude of use.

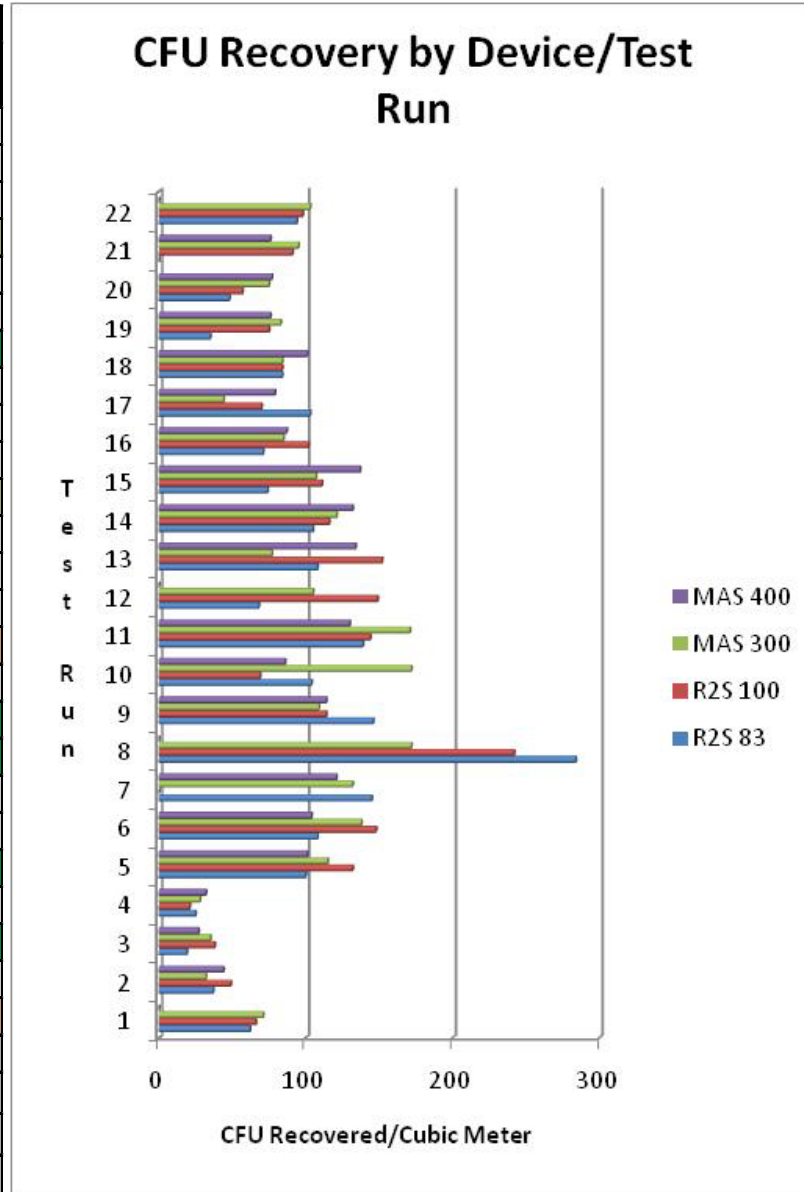
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Testing and Test Location Set up Example Images



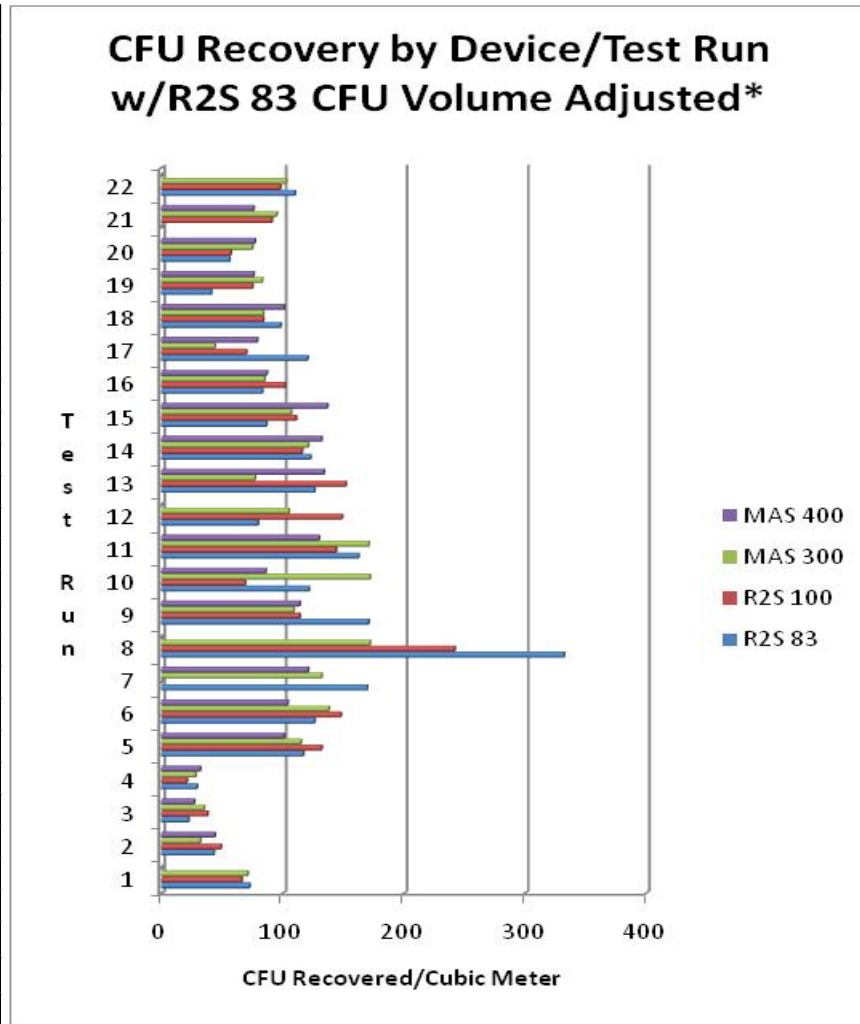
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CFU Recovery by Device/Test Run					
Test Date	Event	Device			
		CFU/m ³			
		R2S 83	R2S 100	MAS 300	MAS 400
6/5/2010	1	62	66	71	0
6/5/2010	2	37	49	32	44
6/5/2010	3	19	38	35	27
6/5/2010	4	25	21	28	32
6/5/2010	5	100	132	115	101
6/5/2010	6	108	148	138	104
6/5/2010	7	145	0	132	121
6/5/2010	8	284	242	172	0
6/13/2010	9	146	114	109	114
6/13/2010	10	104	69	172	86
6/13/2010	11	139	144	171	130
6/13/2010	12	68	149	105	0
6/13/2010	13	108	152	77	134
6/13/2010	14	105	116	121	132
6/13/2010	15	74	111	107	137
6/13/2010	16	71	102	85	87
6/13/2010	17	103	70	44	79
6/13/2010	18	84	84	84	101
6/13/2010	19	35	75	83	76
6/13/2010	20	48	57	75	77
6/13/2010	21	0	91	95	76
6/13/2010	22	94	98	103	0
Total CFU		1959	2128	2154	1658
Total m³		21	21	22	18
Mean CFU/m³		93	101	98	92
Mean CFU/m³ R2S v MAS			97		95








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CFU Recovery by Device/Test Run with R2S 83 CFU Volume Adjusted*					
Test Date	Event	Device			
		CFU/m ³			
		R2S 83	R2S 100	MAS 300	MAS 400
6/5/2010	1	73	66	71	0
6/5/2010	2	43	49	32	44
6/5/2010	3	22	38	35	27
6/5/2010	4	29	21	28	32
6/5/2010	5	117	132	115	101
6/5/2010	6	126	148	138	104
6/5/2010	7	170	0	132	121
6/5/2010	8	332	242	172	0
6/13/2010	9	171	114	109	114
6/13/2010	10	122	69	172	86
6/13/2010	11	163	144	171	130
6/13/2010	12	80	149	105	0
6/13/2010	13	126	152	77	134
6/13/2010	14	123	116	121	132
6/13/2010	15	87	111	107	137
6/13/2010	16	83	102	85	87
6/13/2010	17	121	70	44	79
6/13/2010	18	98	84	84	101
6/13/2010	19	41	75	83	76
6/13/2010	20	56	57	75	77
6/13/2010	21	0	91	95	76
6/13/2010	22	110	98	103	0
Total CFU		2292	2128	2154	1658
Total m³		21	21	22	18
Mean CFU/m³		109	101	98	92
Mean CFU/m³ R2S v MAS			105		95



*As sampling was performed at 5000 feet in Longmont, CO, the actual volumetric flow rate at a mass flow reading of 83 LPM is approximately 100 SLPM volumetric. While the other devices were operated at a mass flow rate of 100 LPM or 117 SLPM volumetric due to the expansion of gasses at the 5000 foot test altitude. As such, for comparison purposes, the CFU counts for the R2S operated at 83 LPM mass flow (its proper flow rate for its designed ideal organism capture speed), were adjusted by 17% to compare to the higher volumes being sampled by the other three devices.

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Legend	
	Highest Recovery for that Run
	Incomplete Run/Not Included in Totals (Battery Drained/Power Cable Fell Out/Started Late)
	Over Growth of Mold/Bacteria (Not Included in totals)
	Highest Mean CFU/m ³ per device or device type.
	CFU counts for R2S 83 adjusted by 17% to match volume of other device flow rates
CFU	Colony Forming Units
m³	Cubic Meters
LPM	Liters per Minute (Volumetric Flow)
SLPM	Standard Liters per Minute (Mass Flow)
MAS 300	MAS 100 w/300 hole inlet cover, sampling rate of 100 LPM mass flow, or 117 LPM volumetric
MAS 400	MAS 100 w/400 hole inlet cover, sampling rate of 100 LPM mass flow, or 117 LPM volumetric
R2S 83	R2S w/V100 Controller, sampling rate of 83 LPM mass flow rate, or 100 LPM Volumetric
R2S 100	R2S w/V100 Controller, sampling rate of 100 LPM Mass flow, or 117 LPM volumetric

Results Summary

As seen in the tabular and graphical results summary from page 2 the R2S 100 showed a mean CFU recovery approximately 3% higher than the MAS 300 and 9% higher than the MAS 400, while the R2S 83 (operating at a 17% lower sample rate), only recovered 1% more CFU than the MAS 400 and 5% less CFU than the MAS 300. But, when adjusting the CFU counts to account for the volume difference on the R2S 83, there was a 10-15% increase in mean CFU recovery seen by the R2S 83 over the MAS 300 (10%) and MAS 400 (15%) (and 7% over the R2S 100). Overall, the MAS 100 and V100/R2S assembly proved to be fairly similar in recovery with the mean results achieved for the devices falling within the range of ±30%, which is acceptable for microbial testing comparison purposes in the industry.

It is to be noted that neither MAS 100 units would operate without the power cords attached. The batteries appeared to not hold a charge. This became an issue with the MAS 400, as the power cord was very loose and fell out during operation several times.