



Pure Air. Real Science.™

**An Energy Saving, Indoor Air Quality
&
Sustainability Initiative**

For



Preliminary Report

**Building 1. AC 5-1 & AC 5-2
34 days**



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AC 5-1 and AC 5-2 Preliminary results

Product Technology Overview

Steril-Aires world leading UVC technology provides multiple benefits with a very short return on investment.

Energy Saving:

The biofilms that build up on the cooling and heating exchange plates (or fins) inhibit the heat transfer process and reduce the airflow.

Steril-Aires Emitters™ destroy these biofilms restoring and maintaining coils to their 'as new' performance and efficiency. Typical savings are 15-20% but 30-40% savings have been achieved.

Maintenance Savings:

By destroying the biofilm and organic build up on the cooling coils Steril-Aires Emitters™ eliminate the need for manual cleaning and chemical usage. Coils, drain pans and plenums stay free of mould and bacteria.

Duct cleaning can also be eliminated (depending on the severity of contamination) as the cooling coils and drain pans are the food source for the mould that grows downstream in the duct work. The high output UVC Emitters™ destroy the food source so the mould in the duct work starves and dies.

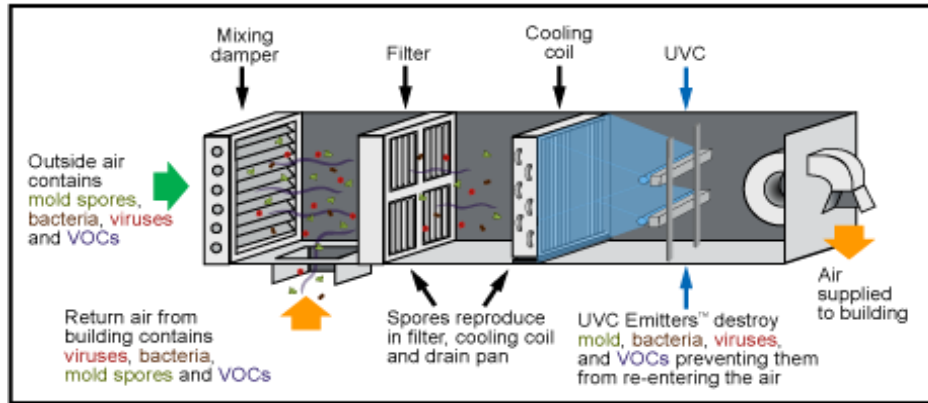
Other maintenance benefits include free flowing drain pans and drain lines (no slim/algae build up) and removal of odours caused by the mould growing in the ducts and also odours created within the building.

Health:

Steril-Aire's Emitters™ will eliminate up to 99% of airborne viruses and bacteria and other microbes, significantly improving indoor air quality (IAQ).

Provide staff and student protection against future pandemics. Steril-Aires high output UVC is very effective against viruses such as flu strains, SARS, pneumonia, TB (incl new super strains recorded around Australia) and the common cold.

Reduced allergy and asthma symptoms triggered by biofilm and mould. Independent studies have shown up to 60% reductions in Hospital Acquired Infections, 50% reduction in school staff absenteeism and improved productivity when using Steril-Aire UVC Emitters.



Sustainability:

This can be achieved in many ways with the use of Steril-Aires Emitters™:

- Sterilises the condensate water from the drain pans allowing it to be recycled at a high quality level.
An example is to use as make-up water in cooling towers, resulting in a reduction in water and chemical consumption.
- Reducing chemicals used within the building
- Reduce Ozone created within the building from photo copiers, furniture etc
- Extending the life of the air conditioning equipment but restoring and keeping components and interior surfaces clean and free of mould and organics containing moisture causing corrosion and degradation.

A simple effective way of reducing carbon footprint with so many other benefits.

Trial Objective

To show significant performance improvements:

- Visual difference in cleanliness of cooling coil and drain pan after 30 and 60 days
- Efficiency improvement from better coil heat transfer resulting in a 10-20% energy reduction
- Improved Indoor Air Quality
- Reduction in mould growth within system
- Produce clean condensate water suitable for recycling
- Return on Investment in under 2-Years

Tests to be conducted before and after UVC installation:

- Wet and Dry Bulb temperatures before and after cooling coil
- Chiller water entering and leaving delta T.
- Cooling coil pressure drop
- Airflow/velocity readings
- Coil and drain pan surface contact plates
- Classroom/space air sampling
- Photos (before and at 60 days)

Using the above data, AHU manufacturers design performance and basic HVAC guidelines from ASHRAE/AIRAH we can calculate efficiency improvements.

AHU AC 5-1

Manufacturer: F.Muller

Model No: FSO50VFN1

UVC Installation Date: 18/12/09

30 Day Testing Date: 21/01/10 (actual 34 days)

Testing for AHU AC 5-1 included:

- Data loggers measure entering and leaving temperature (dry and wet bulb), humidity and coil chilled water entering and leaving temperatures.
- Airflow and selected supply registers using a digital vane anemometer recording highest velocities.
- Airflow at AHU return air filter box opening (filters removed) using a digital vane anemometer. Readings taken in a grid pattern across the transom.
- Pressure drop across the cooling coil using a dual port differential manometer
- Rodac contact plates used for checking before and after microbial counts on cooling coils and drain pans.

Each testing period is carried out with the system at 100%. Chilled water valve and VAV's at 100% open. Outside air dampers closed and return air 100% open. Duration 1-2 hours.

Airflow:

	Supply Registers		AHU Return Air opening		
	18/12/09	21/01/10		18/12/09	21/01/10
Lobby	245	307	1	917	968
Adjacent Room 538	282	343	2	898	932
Copy Room	368	458	3	898	1040
Room 528	98	161	4	868	1110
Room 526-1	501	630	5	687	991
Room 526-2	300	347	6	776	936
Room 526-3	228	293	7	716	996
			8	762	912
Total	2022	2539	9	775	968
Improvement		26%	10	868	943
			11	906	1052
			12	239	347
			13	794	942
			14	835	994
			15	896	1005
			16	255	246
			Total	11222	14382
			Improvement		28%

Notes:

Airflow readings are taken in feet per minute and show an estimated average improvement
AHU Return Air opening is 1160mm X 1160mm
Surface swabs and space air quality sampling will be completed at the 60 day completion of the trial.

Cooling Coil Pressure drop:

18/12/09	21/01/10
240 Pa (pascal)	170 Pa
Coil Pressure Drop Reduction	29%

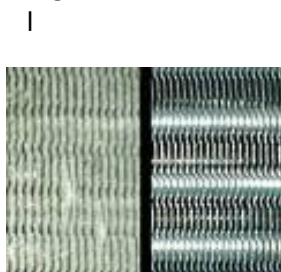
The reduction in static pressure shows that the UVC is destroying the build-up of biofilm between the cooling fins. Less restriction means more airflow and better heat transfer.

Chilled Water Coil – Entering/Leaving Delta T

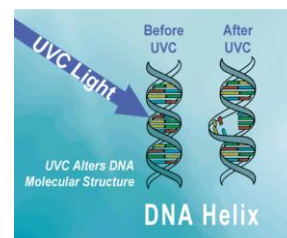
18/12/09		21/01/10	
CHW Entering Temp	7.8 deg C	CHW Entering Temp	8.1 deg C
CHW Leaving Temp	11.8 deg C	CHW Leaving Temp	13.2 deg C
CHW Delta T	4 deg C	CHW Delta T	5.1 deg C
Efficiency Improvement:	27%		

Graphs from data logger showing entering/leaving temperatures attached.

An increase in the chilled water entering and leaving temperature difference (Delta T) is a very clear indication that the coil is operating more efficiently. The chilled water pumped through the coil is absorbing more heat from the air as it passes through the clean cooling fins.



Before After
Example cooling coil



AHU AC 5-2

Manufacturer: F.Muller

Model No: FSO35VFN1

UVC Installation Date: 18/12/09

30 Day Testing Date: 21/01/10 (actual 34 days)

Testing for AHU AC 5-2 included:

- AHU entering and leaving Temperature (wet and dry bulb) using a digital sling Psychrometer
- Airflow at AHU return air filter box opening (filters removed) using a digital vane anemometer. Readings taken in a grid pattern across the transom.
- Pressure drop across the cooling coil using a dual port differential manometer
- Rodac contact plates used for checking before and after microbial counts on cooling coils and drain pans.

Each testing period is carried out with the system at 100%. Chilled water valve and VAV's at 100% open. Outside air dampers closed and return air 100% open. Duration 1-2 hours.

AHU Return Air opening		
	18/12/09	21/01/10
1	643	646
2	620	648
3	580	757
4	617	715
5	565	700
6	608	716
7	629	681
8	639	669
Total		
Improvement		13%

Cooling Coil Pressure drop:

18/12/09	21/01/10
224 Pa (pascal)	175 Pa
Coil Pressure Drop Reduction	22%

The reduction in static pressure shows that the UVC is destroying the build-up of biofilm between the cooling fins. Less restriction means more airflow and better heat transfer.

Life Cycle Estimate:

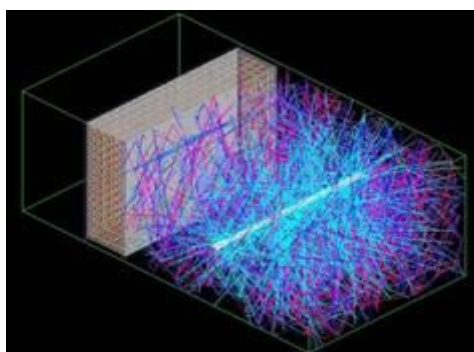
The Life Cycle Estimate program provides a way of showing savings that can be achieved by using Steril-Aires Emitters™. The attached document entitled 'Enthalpy' explains in detail how the program works.

In summary you enter all the data that we retrieve during testing and associated costs with installing the Emitters™ and the program provides a good indication of the savings achieved over a 4-Year period.

Note: AHU commissioning and design data not available at the time of this report. Manufacturer is no longer in operation.

Based on manufactures model numbers we have assumed the following:

- AC 5-1 Max cabinet size 5000 L/S
- AC 5-2 Max cabinet size 3500 L/S



Microbial Testing:

Surface and air sampling is being carried out before and after.

Air sampling and surface swabs will be completed at the 60 day mark.

Rodac contact plates were taken on the air off side of the coil and drain pans before and at 34 days. Further plates will be taken at the 60 days.

Results attached show that the Emitters have destroyed all microbial growth on the air off side of the coil and the drain pan.

Carbon Emissions:

Based on the data we have retrieved and the estimated cooling capacity of AHU 5-1 & 5-2.

AHU AC-5-1

At \$0.10 per kWh we estimate a reduction of 42,710 kWh per annum.

1231 kWh = 1 tonne of Co2-e

AC 5-1 = reduction of 34.7 tonnes of Co2-e per annum

AHU AC-5-2

At \$0.10 per kWh we estimate a reduction of 58,950 kWh per annum.

1231 kWh = 1 tonne of Co2-e

AC 5-2 = reduction of 47.8 tonnes of Co2-e per annum

Note: AHU AC 5-1 cooling coil has heavier contamination and the UVC Emitter will take longer to achieve results.

Attached:

- Life Cycles Estimate
- Enthalpy document
- Chilled water entering leaving graphs
- Installation drawing
- Rodac contact plate photos

Full report to be completed at 60 days

Sincerely

Malcolm Cain

