



Indoor Air Quality Solutions – S&W





Air Pollution is the second leading cause of death in India



India is home to 10 of the 20 most polluted cities in the world



Studies show that Indoor Air Pollution is 2 – 5 times worse than Outdoor Air Pollution



What is IAQ ???

- The physical, chemical, and biological properties of air within and around buildings that can affect the comfort or health of the occupants.
- Most people benchmark IAQ w.r.t. temperature, humidity & fresh air.
- Indoor Air can be contaminated by VOC's, Microbial organisms & Airborne Pathogens (TB, H1N1, SARS) that can adversely affect the health of people.
- Poor IAQ can cause “SBS” where individuals report symptoms such as headaches, fatigue, drowsiness, and eye, nose, and throat irritation resulting in a loss of productivity.

Fatigue



Chronic Fatigue

Respiratory Infection



Sick Staff

Absenteeism



Absenteeism



Are You Health Conscious ???



Solid Consumption = 1Kg/Day



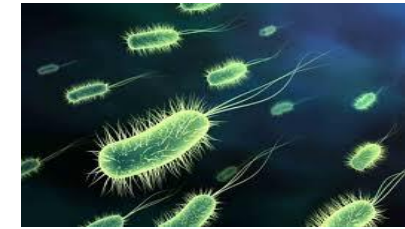
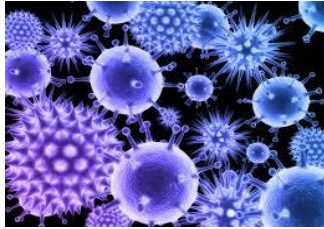
Liquid Consumption = 3Ltrs/Day



Air Consumption = 11000 Ltrs/Day
(7-8 ltr X 60min X 24hrs)

Do you know what you're breathing ?

VIRUS



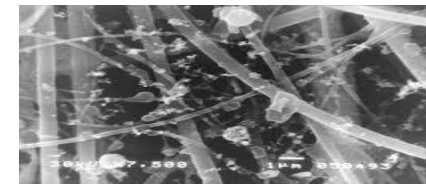
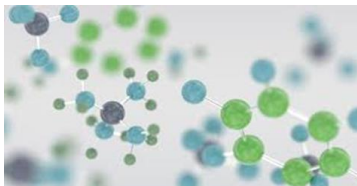
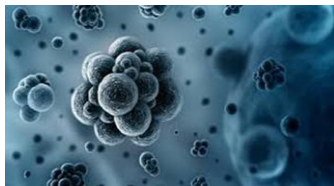
MOLD



BACTERIA



VOC's & PARTICULATES





IAQ in an Office Building.



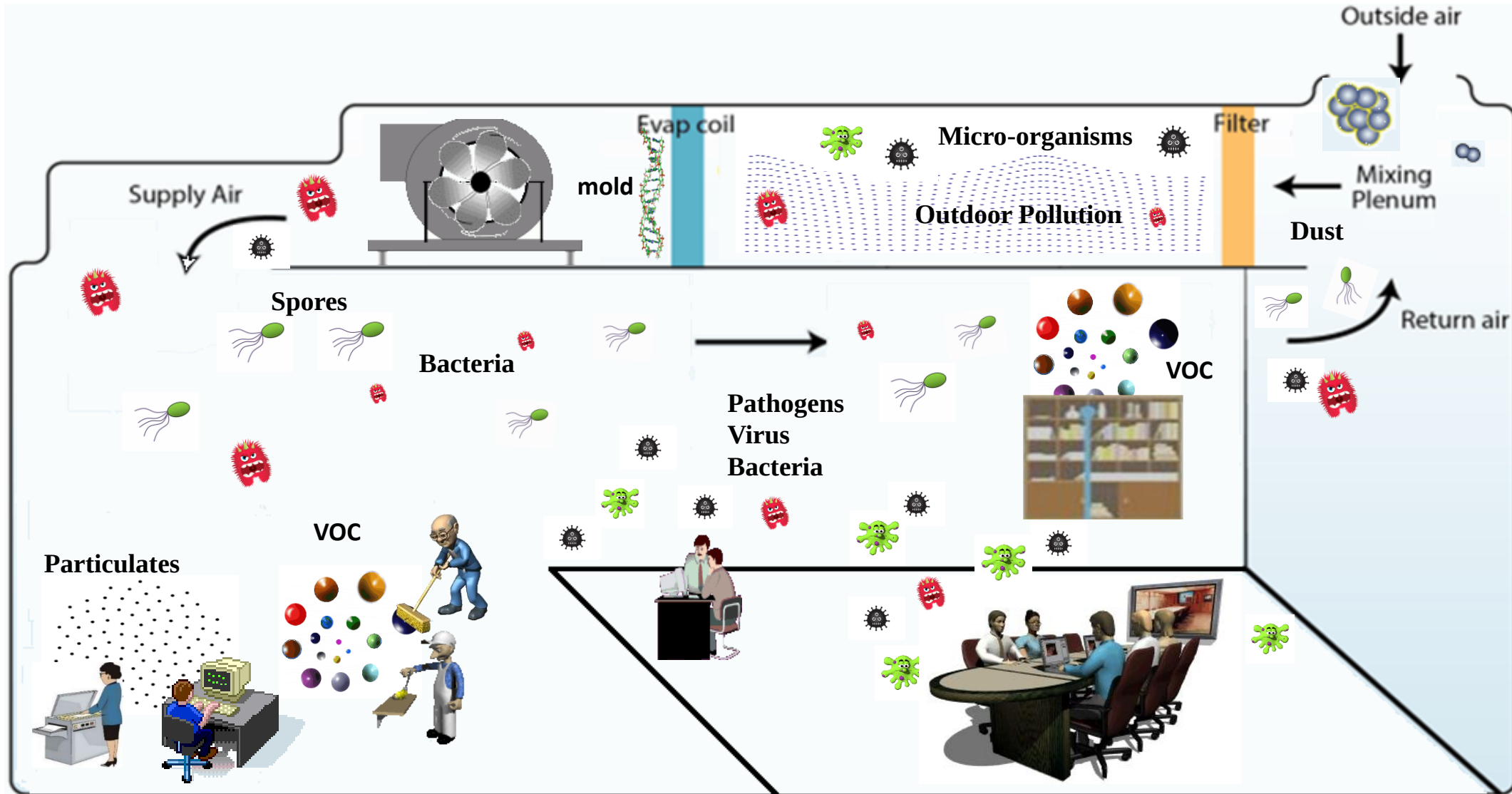
Outdoor
Pollution

Occupants

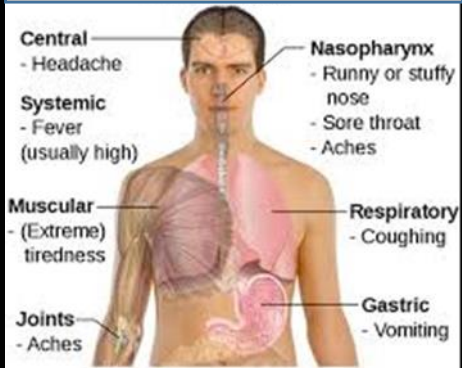
VOC's

Mold &
Bacteria

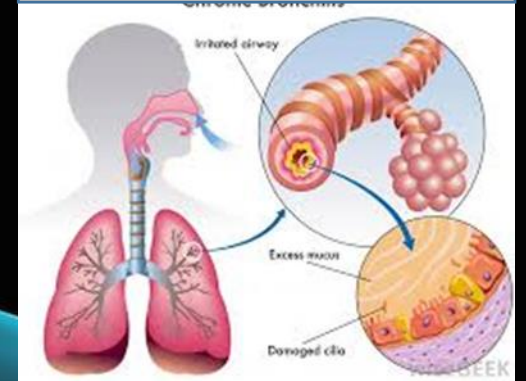
Dust &
Particulates



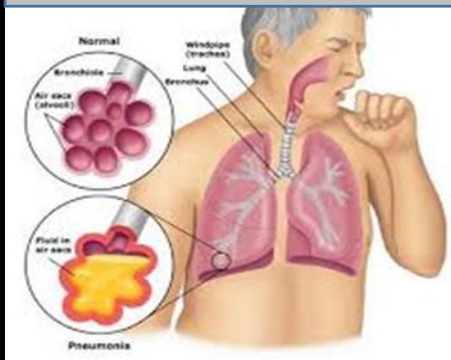
Influenza



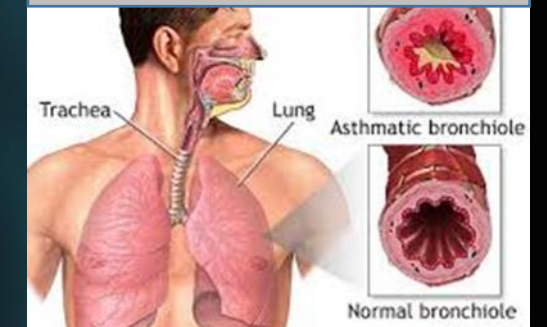
Bronchitis



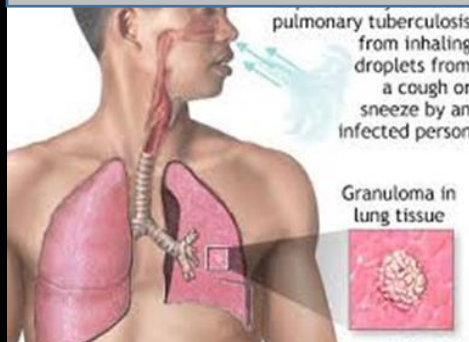
Pneumonia



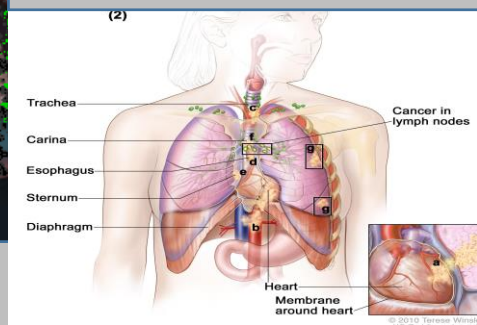
Asthma



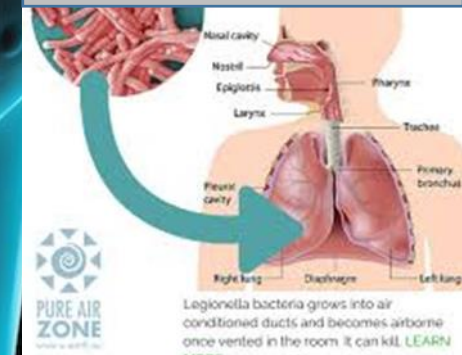
Tuberculosis



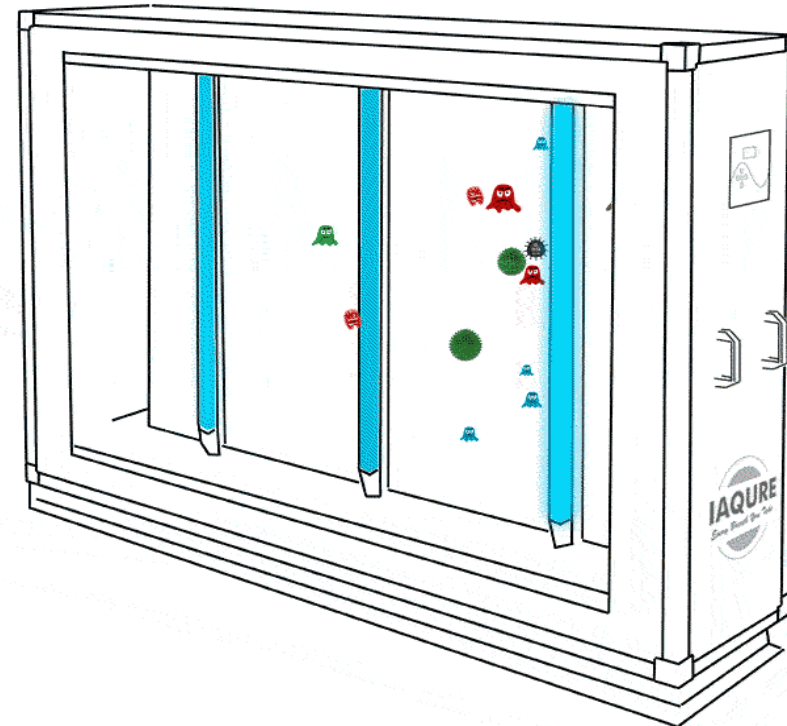
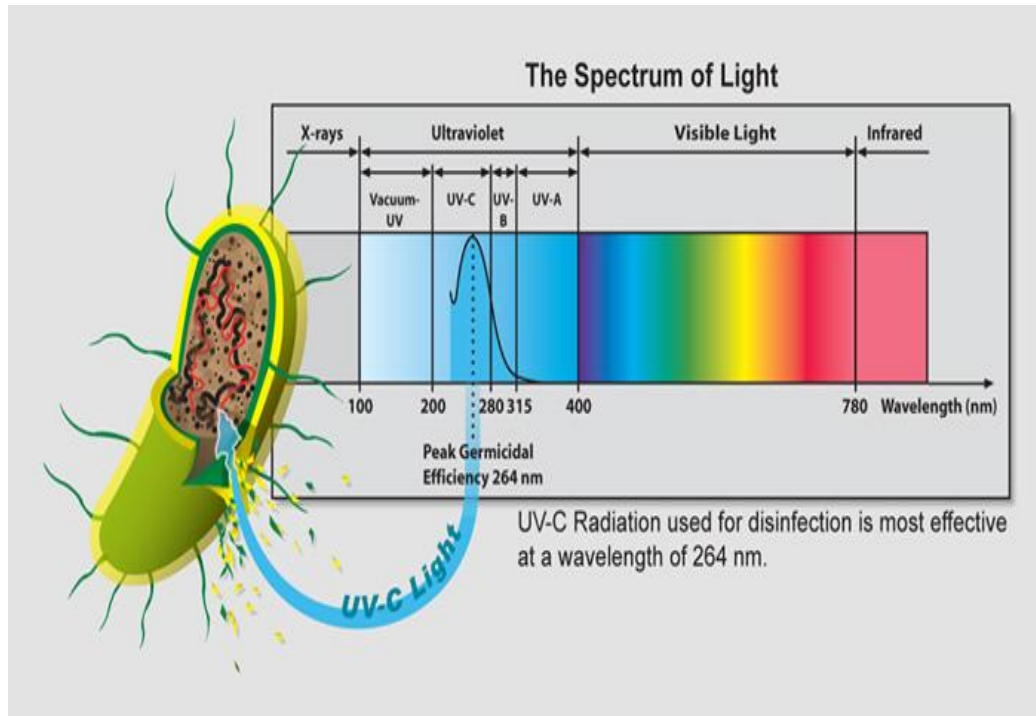
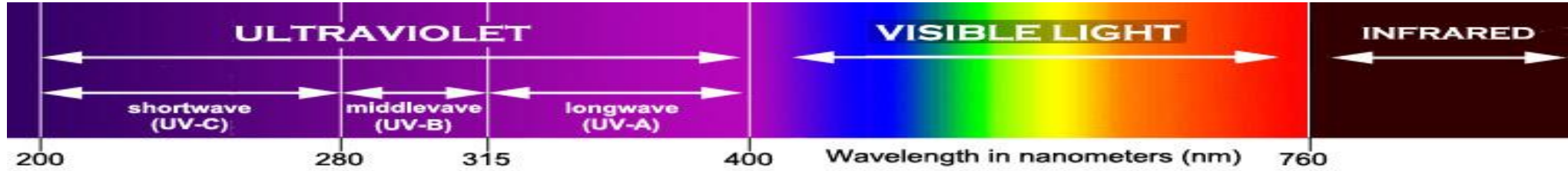
Cancer



Legionnaire's Disease

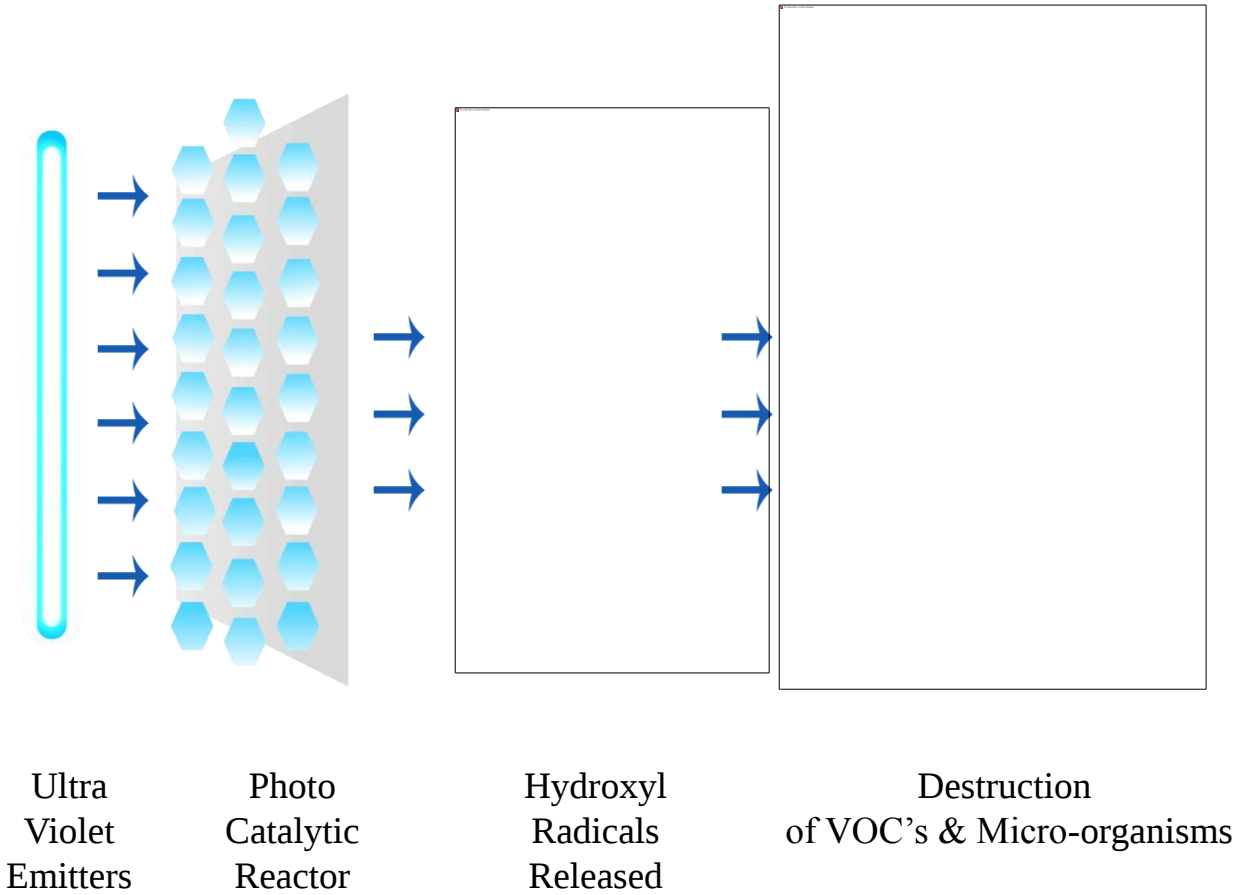


UVGI Technology



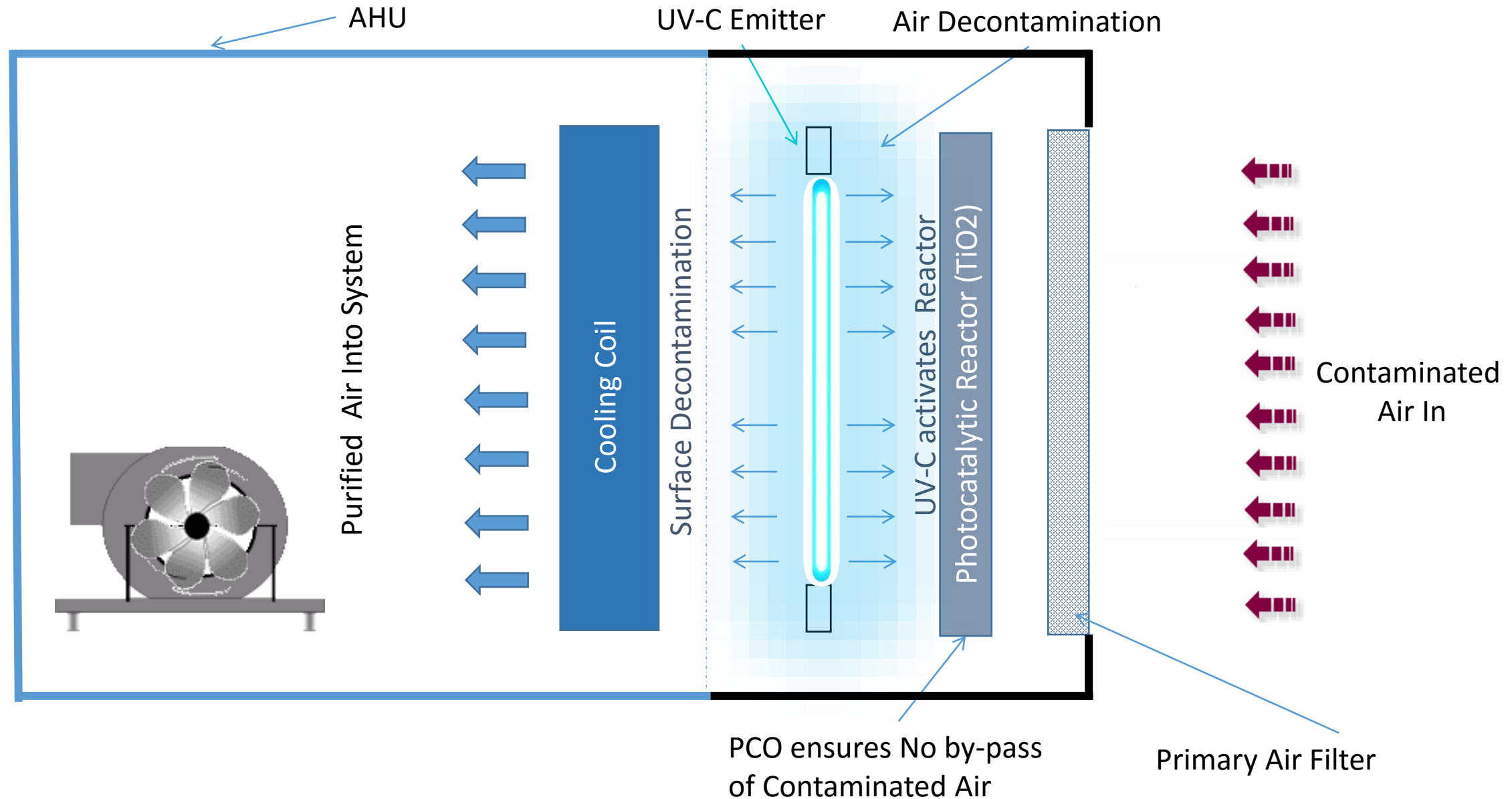


Photocatalytic Oxidation Process





IAQURE – System Schematic Diagram

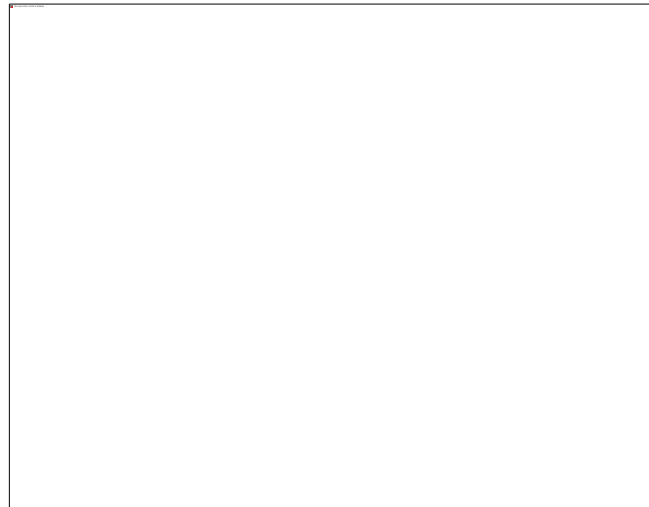
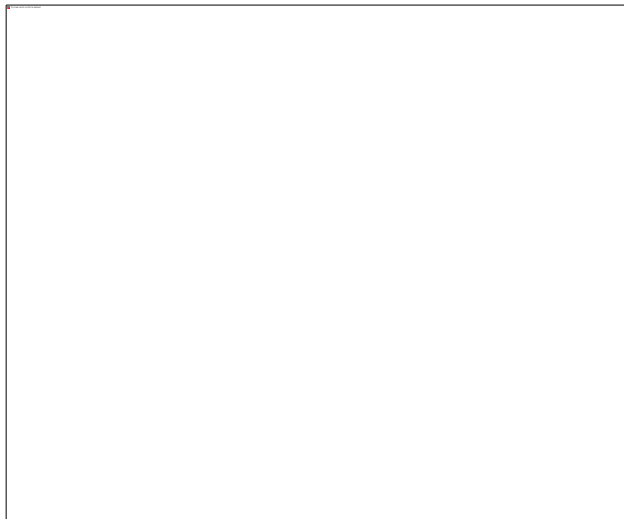




System Efficacy - Microbial De-Contamination

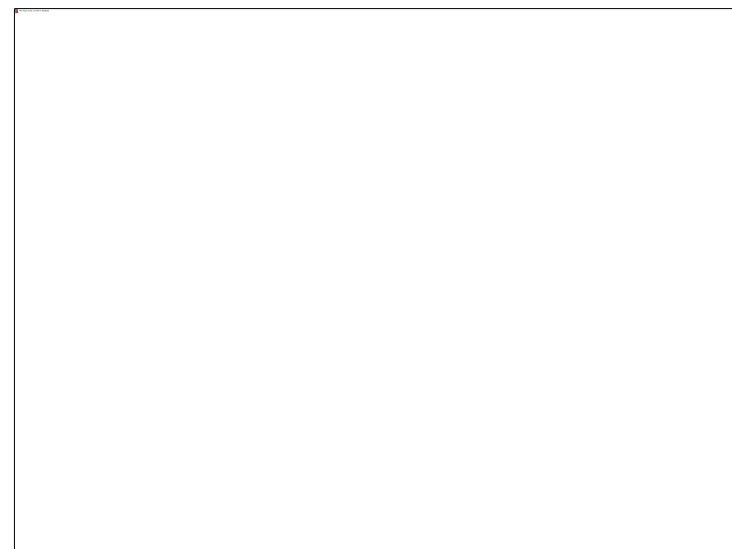


- NABL Certified Agency appointed to test and validate the efficacy of the system.
- Testing facility - 2000 Square Ft. Sterilized room with ducted supply and return air.
- Temperature was maintained @ 23 deg C and 50% Rh to simulate a commercial building environment.
- 2 Test plates, one coated with Nano TiO₂ and another without were infected with a consortium of micro-organisms and place inside the AHU.



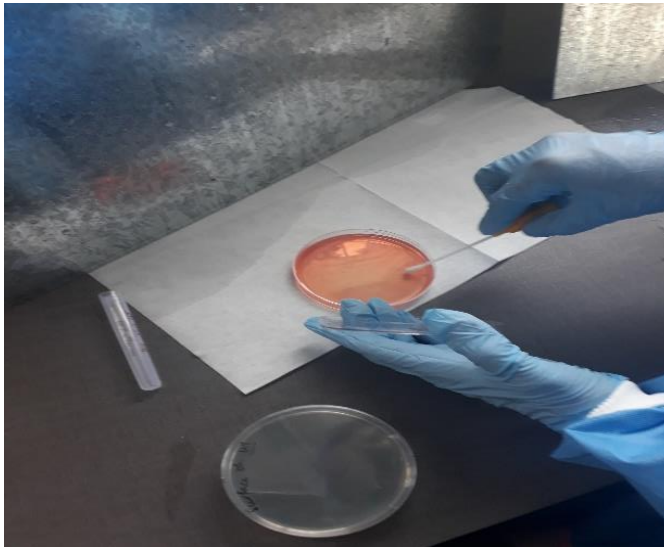
System Efficacy - Microbial De-Contamination

Sl. No	Micro-Organisms	Category	Culture Media
1	Staphylococcus aureus	Gram Positive Bacteria	Vojel Johnson (V J) agar
2	Escherichia coli	Gram Negative Bacteria	Eosin Methylene Blue (EMB) agar
3	Pseudomonas aeruginosa	Gram Negative Bacteria	Cetrimide agar
4	Candida albicans	Yeast	Sabourauds Dextrose agar with Antibiotic
5	Aspergillus niger	Mold	



Methodology - Microbial De-Contamination

- Swab samples from treated and untreated plates are collected and spread over different Culture media (agar plates) to capture specific micro-organism count.
- To monitor the reduction in CFU in air, samples are collected with an Anderson sampler and Gravimetric method.
- The samples are collected at interval of 0 hour to get initial count and further samples are collected after 15 minutes and 180 minutes.



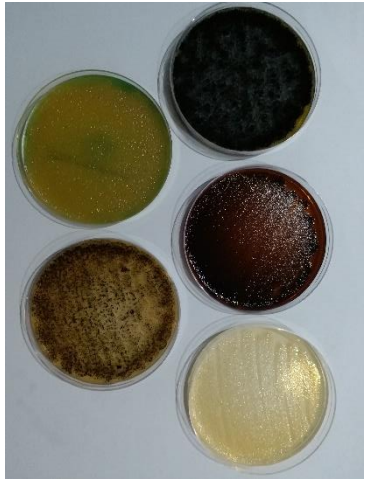
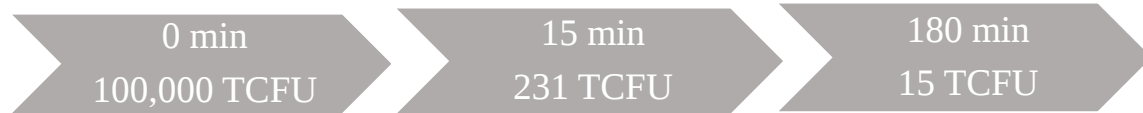


Microbial Surface and Air Sampling Analysis

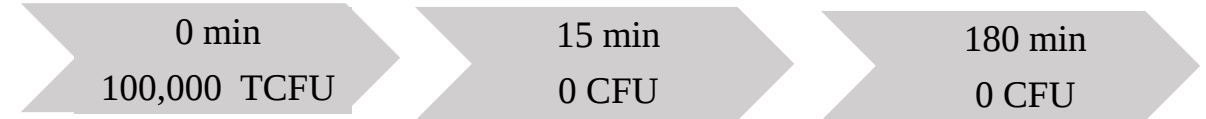


Sampling Type	Surface Sampling					Air Sampling			
	Test Plate Exposure Time					Gravimetric (Manual)		Anderson Machine	
Micro-organism	0 Mins	15 Mins		180 Mins		15 Mins	180 Mins	15 Mins	180 Mins
	Microbial Count in CFU	Only UVGI	UVGI + PCO	Only UVGI	UVGI + PCO	At Supply Grill		At Centre of Room	
Staphylococcus aureus	>100000	21	0	0	0	0	0	NA	
E. coli	>100000	9	0	0	0	12	0	NA	
Pseudomonas aeruginosa	>100000	180	0	0	0	8	0	NA	
Candida Albicans	>100000	20	0	12	0	22	0	34	0
Aspergillus Niger	>100000	8	0	3	0	3	0	14	0

Only UVGI



UVGI + PCO



Microbial Analysis – Air Sampling.

By Gravimetric Method

15 min
45 TCFU



180 min
0 TCFU



By Anderson Air Sampler

15 min
45 TCFU



180 min
0 CFU

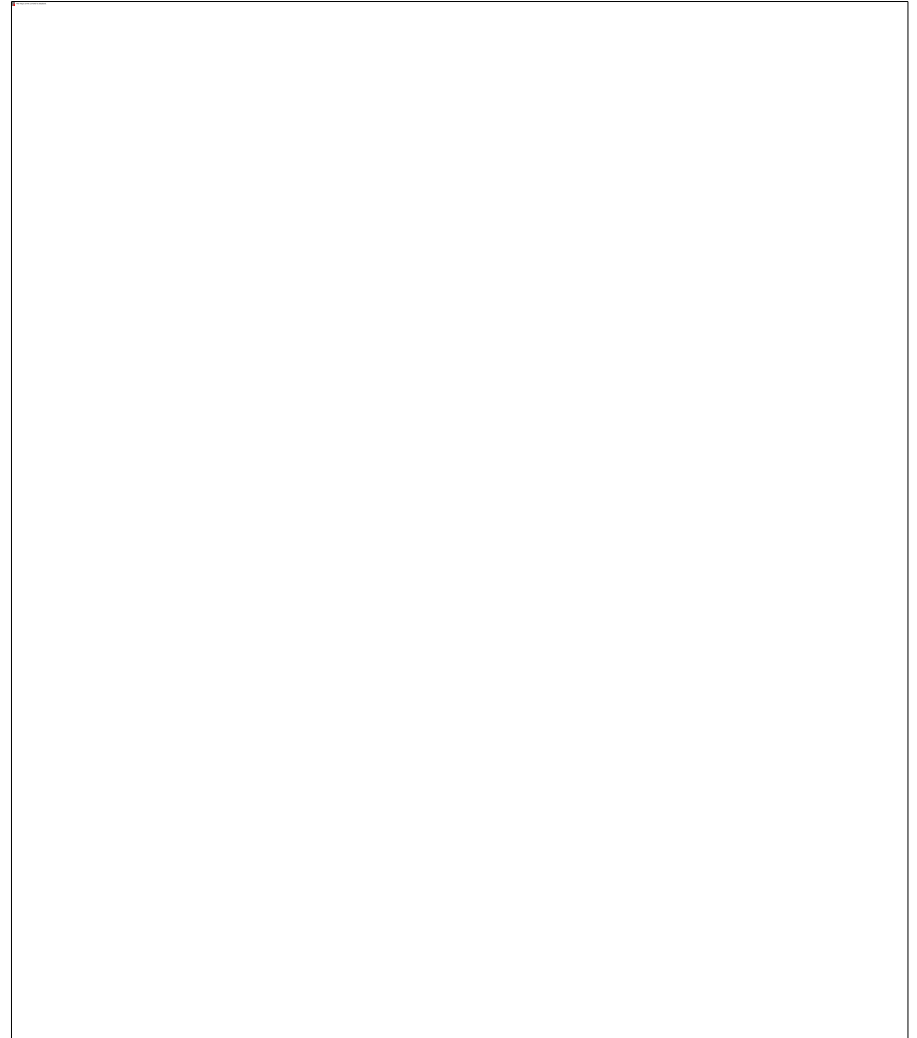


IGBC parameter for Indoor Emission & Microbial Count	Threshold value Class A	Threshold value Class B
Total Microbial Count	50 CFU/m ³	150 CFU/m ³



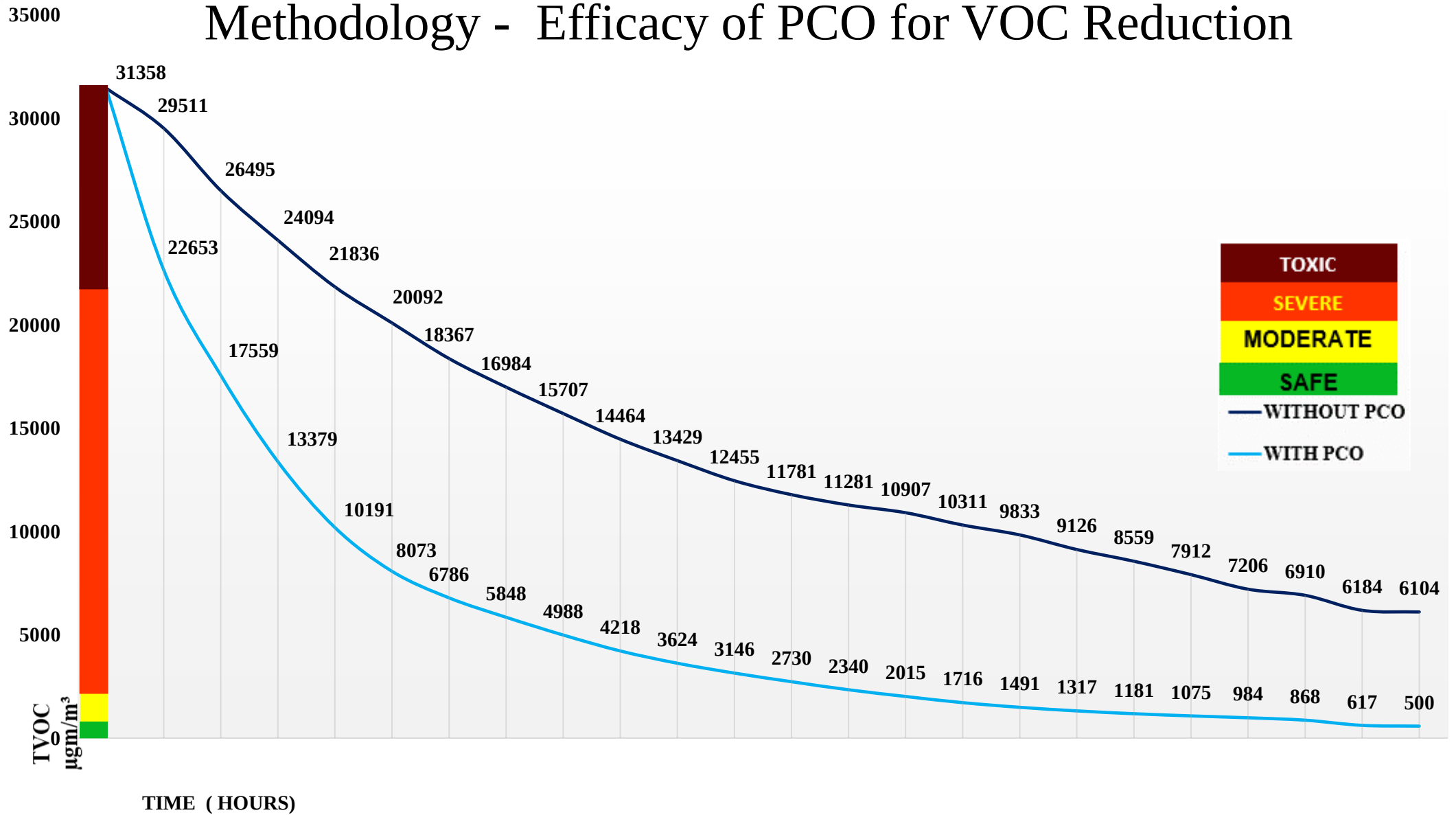
Methodology - Efficacy of PCO for VOC Reduction

- A mixture of Paint thinner, Cleaning Chemicals, Sanitary Deodorizer & Aerosols (Room freshener) were introduced into the air conditioned space, simulating TVOC counts above Toxic Limits.
- The Graywolf Sensors were setup for monitoring.
- Upon stabilization of TVOC reading, the data logger is started to record the TVOC count and monitor TVOC reduction with the IAQURE system in real time.
- Logging was stopped when the VOC count reached the permissible count of 500 $\mu\text{gm}/\text{m}^3$
- The process was repeated for the same timeframe without the PCO to determine the TVOC reduction and determine the efficacy of the system.





Methodology - Efficacy of PCO for VOC Reduction





IAQURE Installation Base (SP Info City)





Proof of Concept – Live Testing





Proof of Concept – Live Testing



Benchmark with IGBC – Healthy Building Standards for Micro-organism and TVOC control.

Customer	Microbial Count (CFU) Sample Surface Area 25 Sq. cm ²			Microbial Count (CFU/m ³) Air Sampling		TVOC (µg/m ³)		
	Pre Installation Oct 2017	Post Installation Dec 2017	Post Installation Mar 2018	Post Installation Mar 2018	IGBC Class	Post Installation Dec 2017	Post Installation Mar 2018	IGBC Class
Customer 1	1000++	0	8	77	B	60	122	A
Customer 2	1000++	1	20	48	A	357	157	A
Customer 3	1000++	56	4	34	A	75	125	A
Customer 4	1000++	55	4	28	A	89	147	A
Customer 5	1000++	2	10	127	B	201	140	A

IGBC Threshold values for Microbial Count & VOC : 50 CFU/m³ & 500 µg/m³ for “ Class A “ 150 CFU/m³ & 650 µg/m³ for “ Class B ” respectively , as per IGBC standard .



The IAQURE Advantage



Certified by CII – Green Products & Services Council



UL Certified UVGI System



Increased Productivity & Lower Absenteeism



Improved Heat Transfer – Power Savings



Enhanced Coil Life – Lower Maintenance Costs

World Class Indoor Air Quality



Thank You

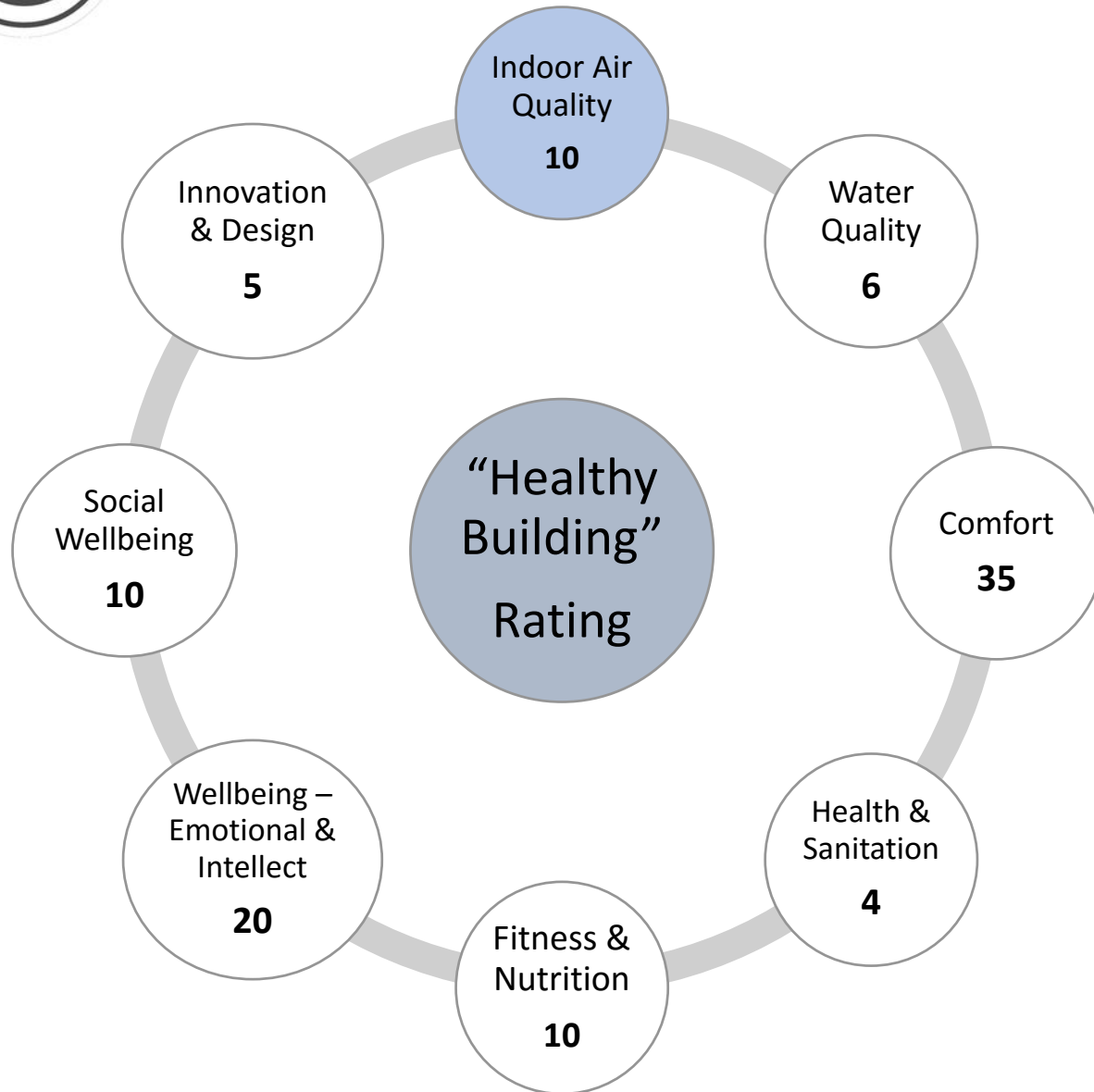


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IGBC Healthy Building Rating



Certified Level	Credits	Recognition
Certified	50 – 59	Best Practices
Silver	60 – 69	Outstanding Performance
Gold	70 – 79	National Excellence
Platinum	80 – 100	Global Leadership

Credit	Parameter	Points
IAQ Credit -1	Monitor Indoor Air Quality	7
IAQ Credit -2	Reduce Indoor Emissions	3
ID Credit	Innovation & Design	1
TOTAL		11



IGBC Healthy Building Standards



Parameter for Monitoring	Threshold values			Frequency of Monitoring
	Class A	Class B	Class C	
CO ₂	Max 350 ppm above ambient	Max 440 ppm above ambient	Max 530 ppm above ambient	Daily Monitoring
PM 2.5	< 15 µg/m ³	< 20 µg/m ³	< 25 µg/m ³	
PM 10	< 50 µg/m ³	< 75 µg/m ³	< 100 µg/m ³	
CO	< 2 ppm	< 6 ppm	< 9 ppm	
O ₃	< 50 µg/m ³	< 75 µg/m ³	< 100 µg/m ³	
TVOC	< 500 µg/m ³	< 650 µg/m ³	< 800 µg/m ³	Quarterly Monitoring
SO ₂	< 40 µg/m ³	< 80 µg/m ³	-	
NO ₂	< 40 µg/m ³	< 80 µg/m ³	-	

Parameter for Indoor Emission & Microbial Count	Threshold value Class A	Threshold value Class B	Frequency of Monitoring
CH ₂ O	< 40 µg/m ³	< 100 µg/m ³	Quarterly Monitoring
Total Microbial Count	50 CFU/m ³	150 CFU/m ³	