CONAIRE™

KNOWLEDGE SERIES # 18

MAKING RIGHT CHOICES

# IMPORTANCE OF VENTILATION WITH ENERGY RECOVERY

*Typical outdoor $CO_2$ concentration is about 400 ppm, whereas in urban areas it is found to be as high as 500 ppm, but $CO_2$ concentration inside buildings can go upto several thousand ppm.*

*Research has documented direct health effects of $CO_2$ on human health, but only at concentrations much higher than those found in normal indoor settings. $CO_2$ may act as an oxygen displacer in confined spaces and cause a number of reactions. These reactions include, but are not limited to, dizziness, disorientation, suffocation, and under certain circumstances, death. Before these reactions manifest, there is documented evidence that higher levels of $CO_2$ indoors, do lead to impaired performance and efficiency of the occupants.*

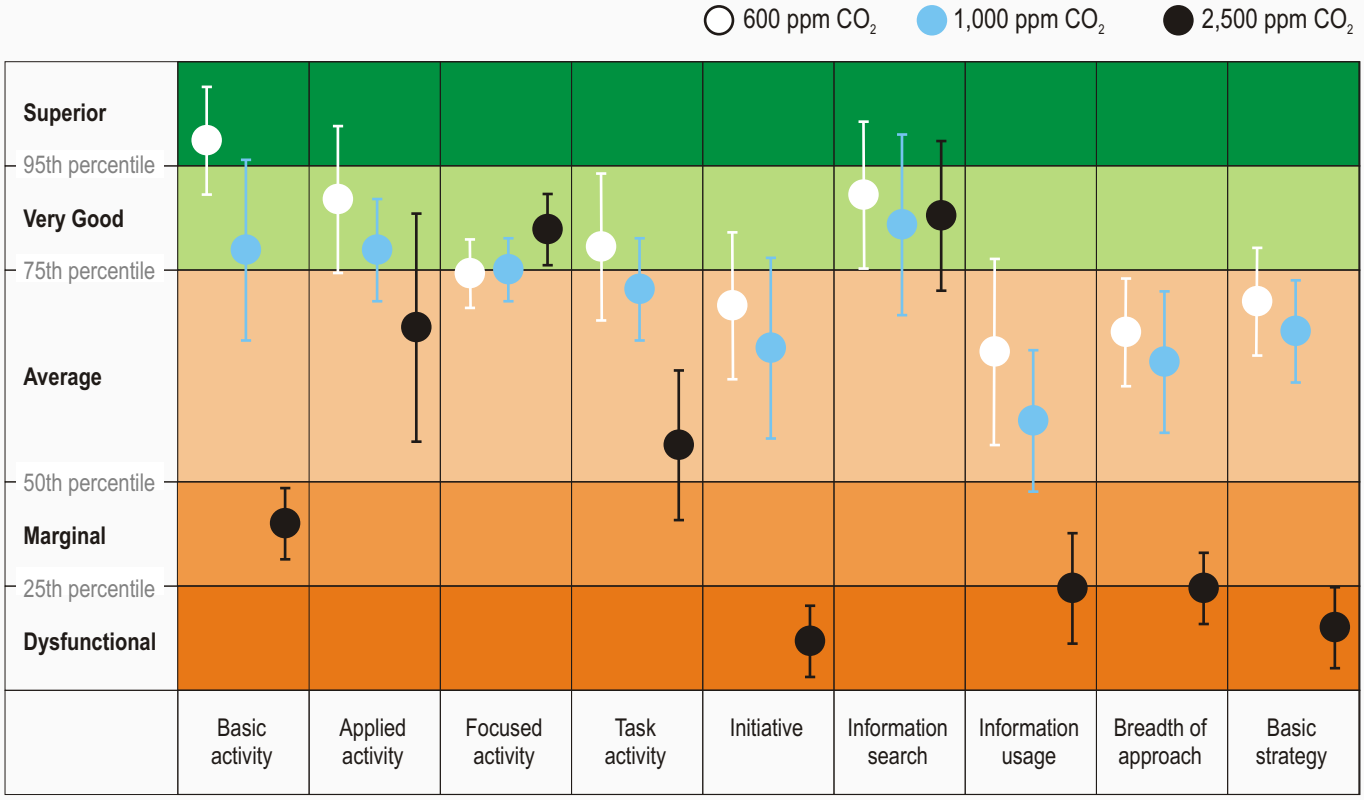
*Most of the buildings have $CO_2$ concentration exceeding 1000 ppm. Occupant performance and productivity in any building either residential, commercial, or educational hold the key. We need to rethink on setting the limit of indoor $CO_2$ concentration and monitor indoor air quality especially carbon dioxide concentration and fresh air intake to strategies demand control ventilation in our buildings.*

## A.
## HOW HIGHER INDOOR $CO_2$ CONCENTRATION AFFECTS HUMAN PERFORMANCE

Intervention research has shown that higher levels of $CO_2$ within the range found in normal indoor settings are associated with perceptions of poor air quality, increased prevalence of acute health symptoms (e.g., headache, mucosal irritation), slower work performance, and increased absenteeism.

Maximum recommended occupational exposure limits for an 8-hr workday are 5,000 ppm as a time-weighted average, as per the Occupational Safety and Health Administration (OSHA 2012) and the American Conference of Government Industrial Hygienists (ACGIH 2011).

The following figure showing the impact of $CO_2$ on human decision making performance.




*Direct Effects of Low-to-Moderate CO2 Concentrations on Human Decision-Making Performance Usha Satish, Mark J. Mendell, Krishnamurthy Shekhar, Toshifumi Hotchi, Douglas Sullivan, Siegfried Streufert, and William J. Fisk)*

# B.

## THE NEED TO STRATEGISE DEMAND CONTROLLED VENTILATION WITH REAL TIME MONITORING OF $CO_2$ CONCENTRATION

You can see a marginal drift in performance with increase $CO_2$ concentration for almost all type of activity. Hence we need to maintain $CO_2$ concentration within 600 ppm to increase the productivity levels of the occupant. Whereas in reality our most of the buildings have $CO_2$ concentration more than 1000 ppm.

Occupant performance and productivity in any building either residential, commercial, or educational hold the key for growth. We should rethink on setting the limit of indoor $CO_2$ concentration and monitor indoor air quality especially carbon dioxide concentration and fresh air intake to strategise demand control ventilation in our buildings. Carbon dioxide is also a good indicator of presence of toss gases such as carbon monoxide, NOx, SOx, etc. It is good to have such indicators in living spaces.

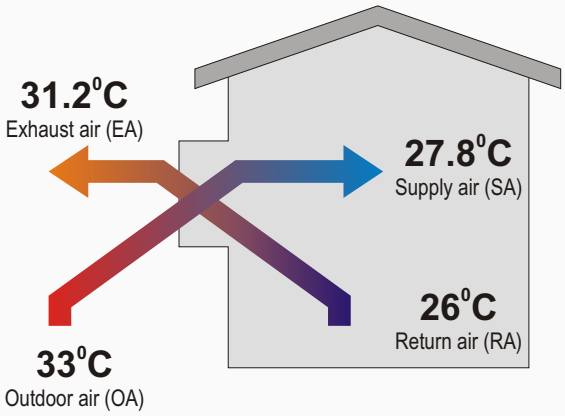
# C.
# ENERGY RECOVERY. HOW DOES IT WORK & WHY IS IT IMPORTANT?

More fresh air means more energy required to treat the fresh air, hence it is advisable to precondition the incoming outdoor air by exchanging the energy contained in normally exhausted buildings or space air. The suitable energy recovery ventilator is required in combination with indoor air quality monitor consisting of carbon dioxide sensor so as to save the energy required to power the blower of ventilator during periods when fresh air is not required.

**Heat Recovery (Summer)**

SA temp.
→ OA temp.- (OA temp.-RA temp.)xtemp recovery efficiency

Example
→ 33-(33-26)x74% = 27.8$^0$C

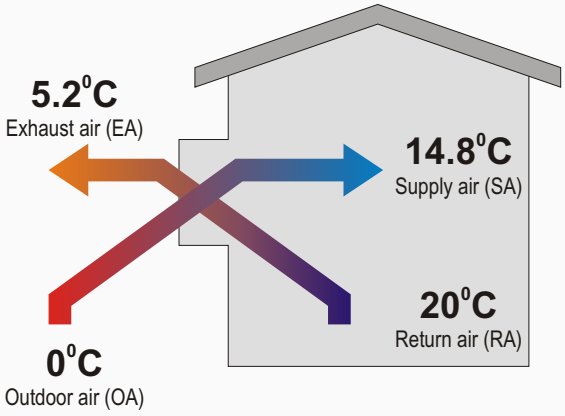



During Summers, it pre cools and dehumidify incoming fresh air

**Heat Recovery (Winter)**

SA temp.
→ OA temp.+ (RA temp.-OA temp.)xtemp recovery efficiency

Example
→ 0+(20-0)x74% = 14.8$^0$C




While in Winters, it pre heats and humidify incoming fresh air.

Thus by the means of energy recovery our energy loads will be minimised and at the same time suitable amount of fresh air intake will increase productivity levels in our building.

# D.

## RECOMMENDED PRODUCTS FOR MONITORING INDOOR AIR QUALITY AND VENTILATION WITH ENERGY RECOVERY

a) Indoor air quality monitor with a carbon dioxide sensor and controller.

b) Energy recovery ventilator to be used with centralised air-conditioning system ranging in airflow for upto 600 cfm. Available in ceiling suspended option and wall mounting.

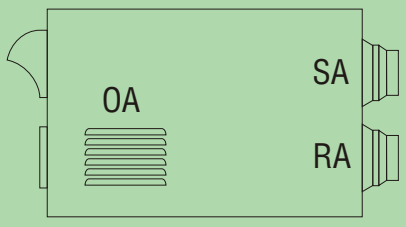
c) Single room energy recovery unit to be used with single room air-conditioning system with easy installation.

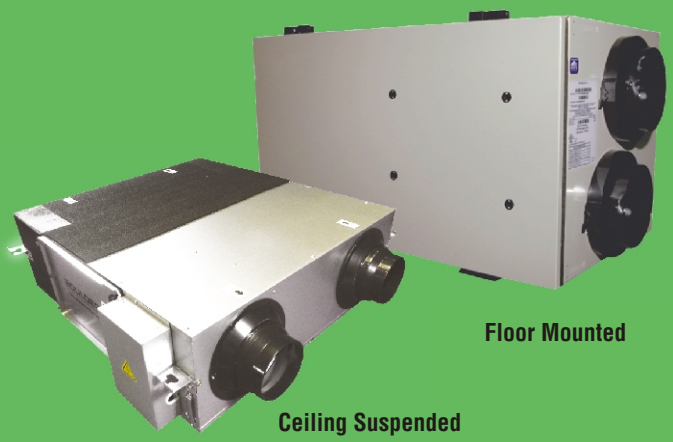
### Indoor Air Quality Monitor

Conaire's Indoor Air Quality Monitor provides real time measurement of indoor air quality across various parameters like CO2, PM, Humidity etc.
It is a compact unit, requires no installation and can communicate with your DCV system over....


### Energy Recovery Ventilator for Centralised HVAC System

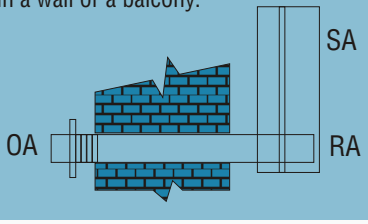
Conaire's Floor mounted or ceiling suspended energy recovery ventilator is suited for centrally air conditioned spaces. It has a highly efficient cross-flow heat exchanger and a heavy duty blower in a compact assembly.

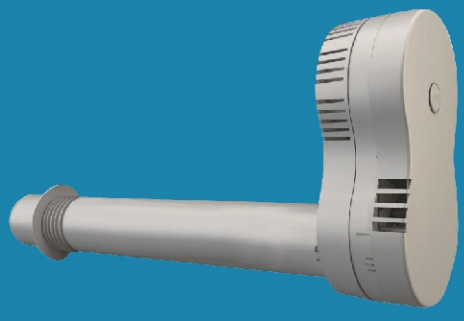



### Single Room Energy Recovery Ventilator

Conaire's wall type energy recovery ventilator incorporates cross-flow heat exchanger and a highly efficient blower with single phase motor in a compact assembly that can be installed easily in a wall or a balcony.



## NEED MORE INFORMATION?

If you have found this information useful and wish to implement Ventilation with Energy Recovery in your facility, please get in touch to set up a meeting or a presentation.

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