

Mystery of Sustainable Heat Exchange Material Heat Recovery Ventilator(HRV)

Contents

- Why Heat Recovery Ventilator(HRV) is required
- Type of Heat Recovery Ventilator
- Feature of MITSUBISHI ELECTRIC Lossnay
- Lossnay Core history / development and future

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Why Heat Recovery Ventilator is required

IAQ has become one of the most important topics on a worldwide level.

* IAQ = Indoor Air Quality

Today many people spend most of the time indoor (Office / factory worker, shop retailer, etc.,).

- Bad IAQ reduces **comfort**.
- Bad IAQ affects **health and well-being**.
- Bad IAQ makes people feel **lethargic and tired**.
- Bad IAQ may result **sick building syndrome** / allergic reaction / substance sensitivity risks ...

Why Heat Recovery Ventilator is required

Sick building syndrome



4/Mar/2003 Asahi newspaper



24/Jan/2003 Asahi newspaper

Why Heat Recovery Ventilator is required

Sick building syndrome

公共圖書館烏煙瘴氣，其實問題早已存在，只是負責管理的康文署一直懶理，直到年前審計署批評港府空談改善空氣質素，部門卻未有以身作則，積極參加當局推出的室內空氣質素檢定計劃，淪為眾矢之的的康文署才安排轄下六十多間圖書館分批檢測室內空氣質素，結果不查不知道，一查嚇一跳，可見康文署自暴其短完全是被迫的，並非官僚良心發現，主動向市民示警。

經機電工程署聘請顧問測試檢定，康文署轄下最少有七間公共圖書館空氣質素嚴重超標，其中使用多年的深水埗元州街圖書館是重災區，二氧化碳超標逾六成，空氣中細菌含量超標四成，總揮發性有機化合物亦超標兩成。本報記者邀請專家在平日人流較少期間實地測試，依然錄得二氧化碳及懸浮粒子超標，相信人流高峰期超標情況將會更嚴重。即使啟用僅七年的天水圍北公共圖書館，二氧化碳及細菌含量同樣不合格，其餘在旺角、紅磡、大角咀、九龍城及深水埗保安道等公共圖書館及自修室，亦錄得不同程度室內空氣質素超標，反映公共圖書館通風不良，冷氣系統缺乏清洗，藏污納垢。公共圖書館室內空氣污染問題長期未獲正視，令人擔心一旦進入流感高峰期，隨時出現交叉感染，成為播毒源頭。

事實上，公共圖書館及自修室一向是莘莘學子吸取知識及日常溫習功課的場所，近日踏入考試季節，學生人流更加密集，室內空氣質素只會更差。正如專家指出，市民逗留在二氧化碳及細菌含量過高的公共圖書館，會感到疲倦及昏昏欲睡，更會引發咳嗽影響肺功能。學生使用公共圖書館及自修室，原意是在寧靜環境更能集中精神溫習，爭取好成績，怎會料到室內空氣污染令人疲倦，溫習效果適得其反。公共圖書館空氣質素差劣，不止損害市民健康，而且間接影響萬千學子學業成績，康文署官僚敷衍塞責，名副其實誤人子弟，害人淺。

上樑不正下樑歪，港府推動環保不力，過去一直對改善空氣質素虛應故事，除了在年前被審計署踢爆室內空氣質素指標八年不改，室外空氣質素指標更是長期落後世界衛生組織指引，被環保團體譏為「氣候逃犯」，就算早前推出的空氣清新藍圖新指標，其實七年後也只是達到世衛的中期標準，並非最高的空氣質素指標水平，市民要吸上一口清新空氣的願望，仍是遙不可及。

港府改善空氣質素有姿勢無實際，部門自然有樣學樣，公共圖書館空氣質素不合格，不過是環保政策失敗的冰山一角。

29/May/2013
The Sun

政府創新科技署轄下的香港認可處，根據香港實驗所認可計劃，向合資格提供樓宇診斷測試服務的實驗所發出認可資格，有關計劃是自願性質的。認可處透過嚴格的評估工作，密切監察認可實驗所表現，以確保實驗所的測試質素。

現時，香港的認可實驗所約有200間，當中四分之一專門從事建築物測試。由於香港認可處已與亞太區實驗所認可合作組織（APLAC）及國際實驗所認可合作組織（ILAC）簽訂互認安排，獲香港認可處認可的實驗所發出的測試證書，為全球60多個經濟體系所承認，其認受性毋庸置疑。

香港認可證書認受性廣泛

從事建築業48年，同時亦是香港檢測和認證局推動建築材料行業檢測和認證服務小組召集人的專業工程師李承仕說，建築及結構物安全與否，除了視乎技術之外，最重要的就是原材料。所以，建築材料的檢測及認證十分重要。通過檢測及認證，可確保建築材料符合安全規格。而建築材料的檢測服務，一定要由認可實驗所提供，並於測試後提供及格報告，這樣才可令人放心購買和使用。李承仕表示，建築材料的品質控制，最理想的是從源頭做起，即是從生產商開始，監控產品的製造過程，並抽樣測試，若產品品質符合相關標準要求，才給予認證資格。他說：「其實，這些源頭檢測服務，過去數十年都在做，我們希望透過小組向社會各界多加推廣，在未來的日子，使建築材料的檢測服務可以做得更多。」另外，樓宇的保養維修亦同樣重要，因為採用品質良好的建築材料及保養得宜的樓宇，起碼可用上50年，甚至100年都沒有問題。

室內空氣質素測試助企業提升生產力

據估算，一般人一天約有七成時間留在室內，室內空氣質素因而與身體健康有莫大的關係。空氣受污染的室內環境容易令人感到身體不適、疲勞，尤其是患有呼吸系統或心臟病的人，間接影響生產力。

香港室內空氣質素協會主席林俊康表示：「室內空氣質素檢定證書簽發機構會根據環境保護署訂定的『辦公室及公眾場所室內空氣質素檢定計劃』提供室內空氣質素測試服務，內容包括實地視察；即場進行12項室內空氣質素量度及樣本採集，即室內溫度、相對濕度、空氣流動速度、二氧化碳、一氧化碳、可吸入懸浮粒子、二氧化氮、臭氧、甲醛、總揮發性有機化合物、氬氣及空氣中的細菌。檢定計劃是採用自願性及自我規管形式按年進行檢定工作，如檢定結果符合室內空氣質素指標，便可獲發檢定證書。」寫字樓及商場的業主及管理人員一般都樂意按檢定計劃，申請檢定證書，作為環保管理的一個指標。

提升設備 加強培訓配合驗樓計劃

樓宇健康與市民息息相關，數年前發生的土瓜灣樓塌事件，足以反映樓宇的維修及安全何等重要。

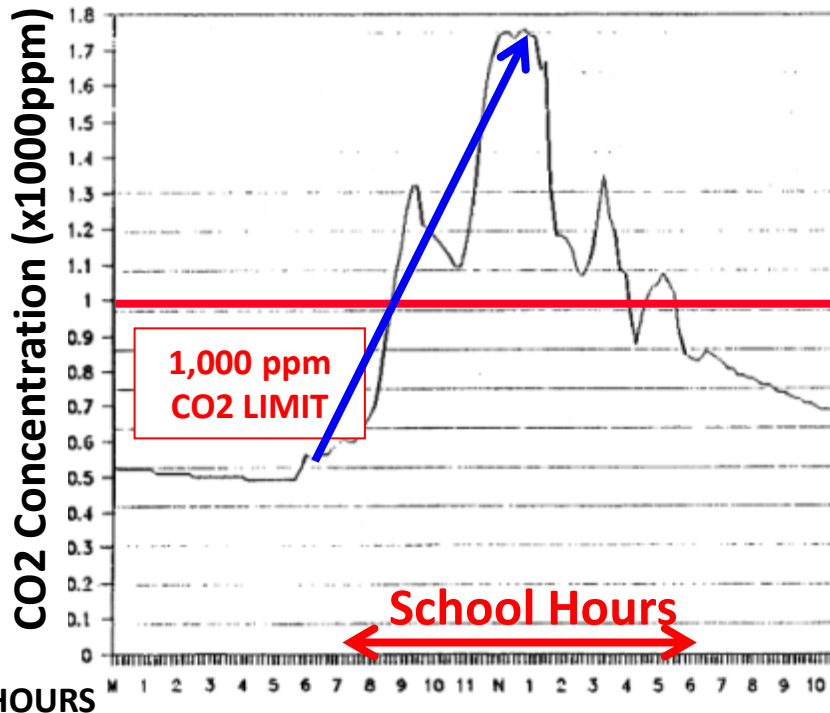
19/Mar/2013
Oriental Daily

Why Heat Recovery Ventilator is required

Example: Madison Public School in the U.S.

Without Ventilator

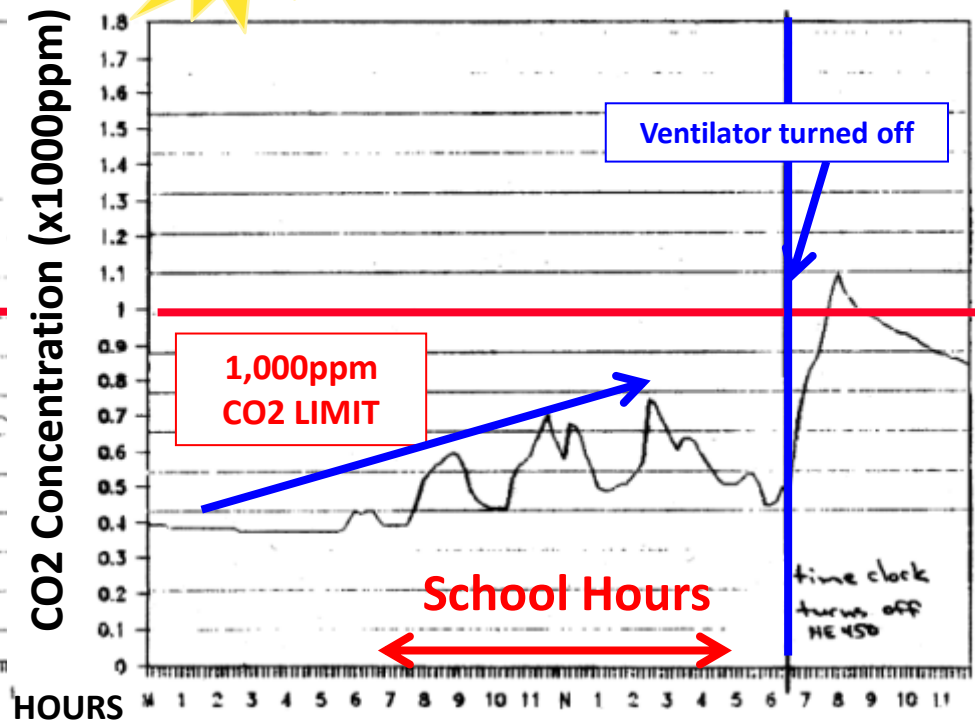
CLASSROOM



Better!

With Ventilator

CLASSROOM

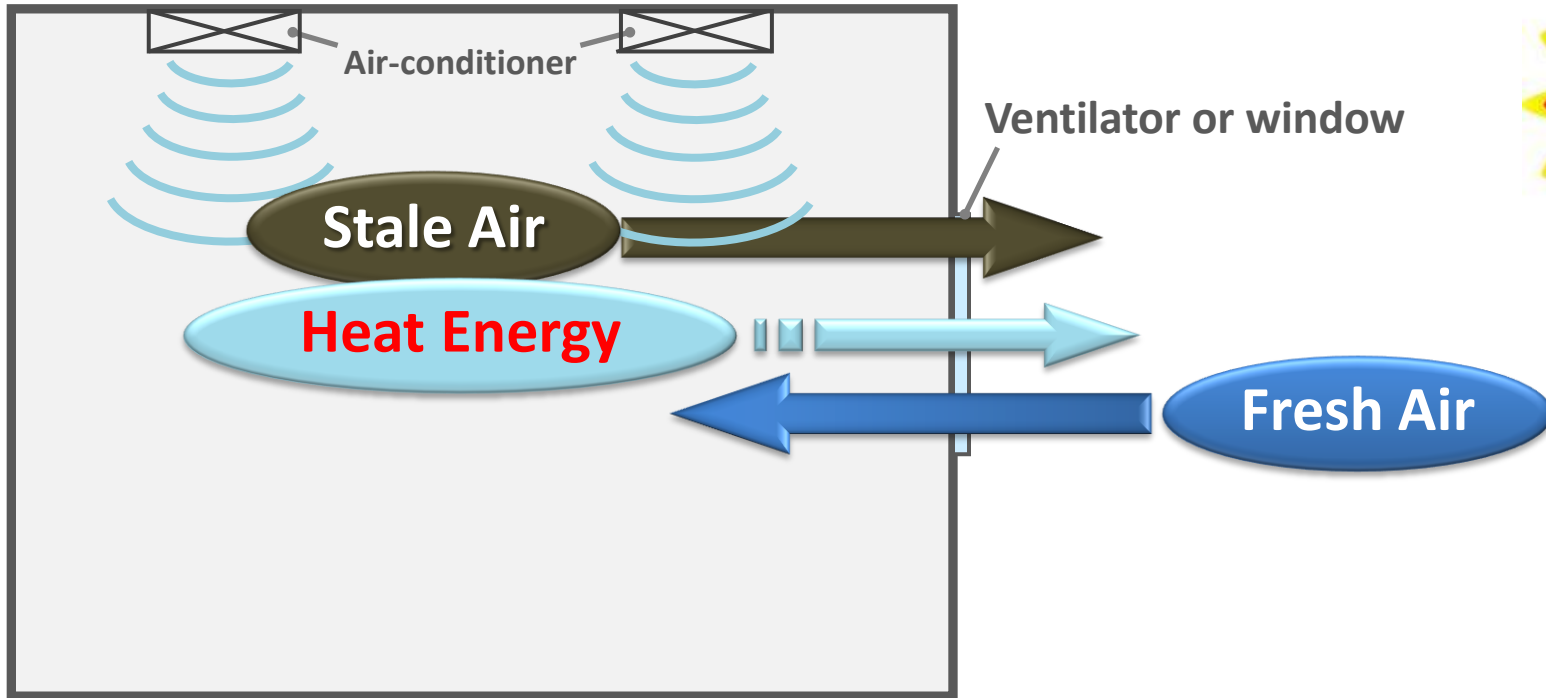


-The ventilator manages to keep the CO2 level under 1,000ppm

High CO2 concentration may cause fatigue and affect your ability to concentrate.

Why Heat Recovery Ventilator is required

Example: Office Building



Mechanical ventilation is important, however, it is waste of energy because it exhausts air-conditioned air...

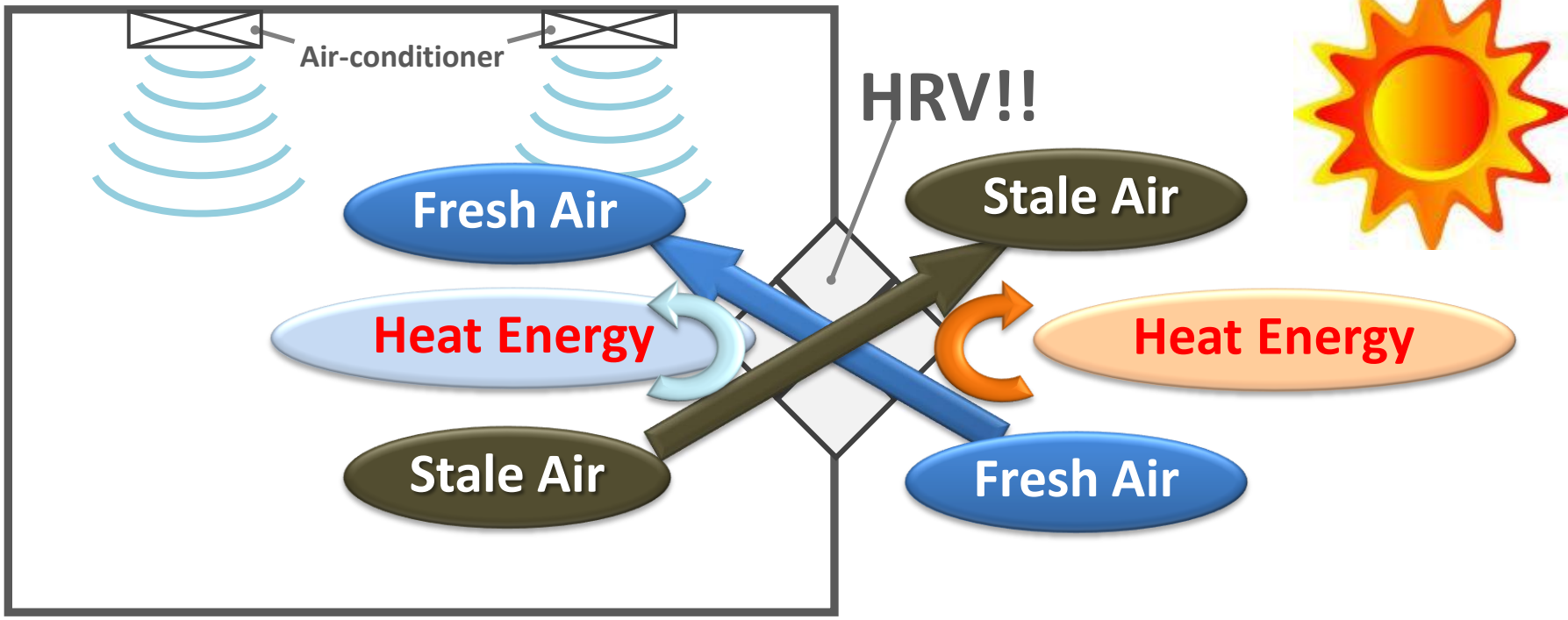
What is the solution....?



Aha! HRV is!

Why Heat Recovery Ventilator is required

Example: Office Building

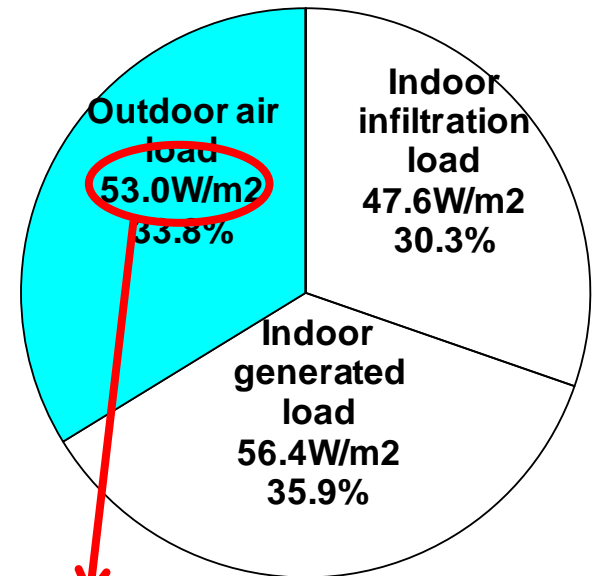


**HRV Recovers Energy!
(Temp. and Humidity)!**

Why Heat Recovery Ventilator is required

Cooling load example in summer

Type of Load		Estimated Load [W/m ²]
Indoor infiltration load	Heat from walls	47.6
	Heat from glass	
	-from direct sunlight	
	-from conduction & convection	
Accumulated heat load in walls		
Indoor generated load	Generated heat from people	26.4
	-Sensible heat -Latent heat	
Generated heat from electrical equipment (lighting etc.)		30.0
-Sensible heat		
Outdoor air load	Sensible heat	53.0
	Latent heat	
Total	-----	157.0

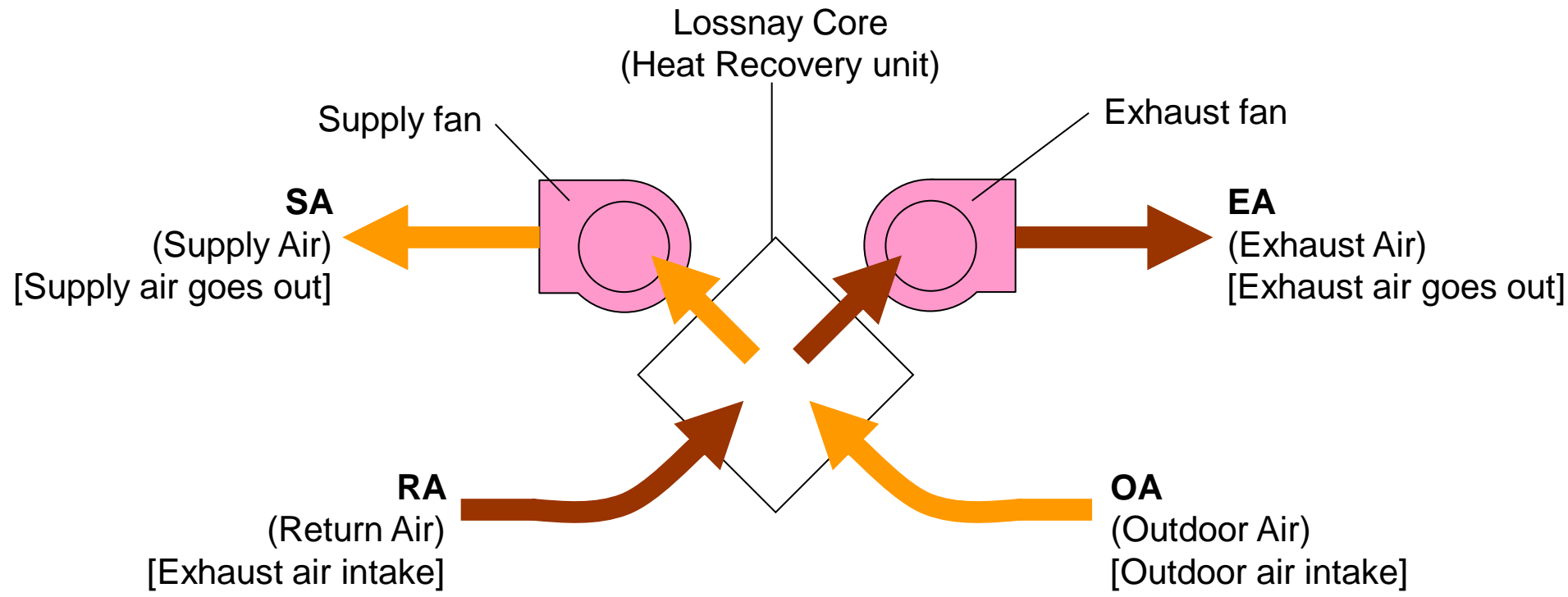


Energy loss caused by ventilation

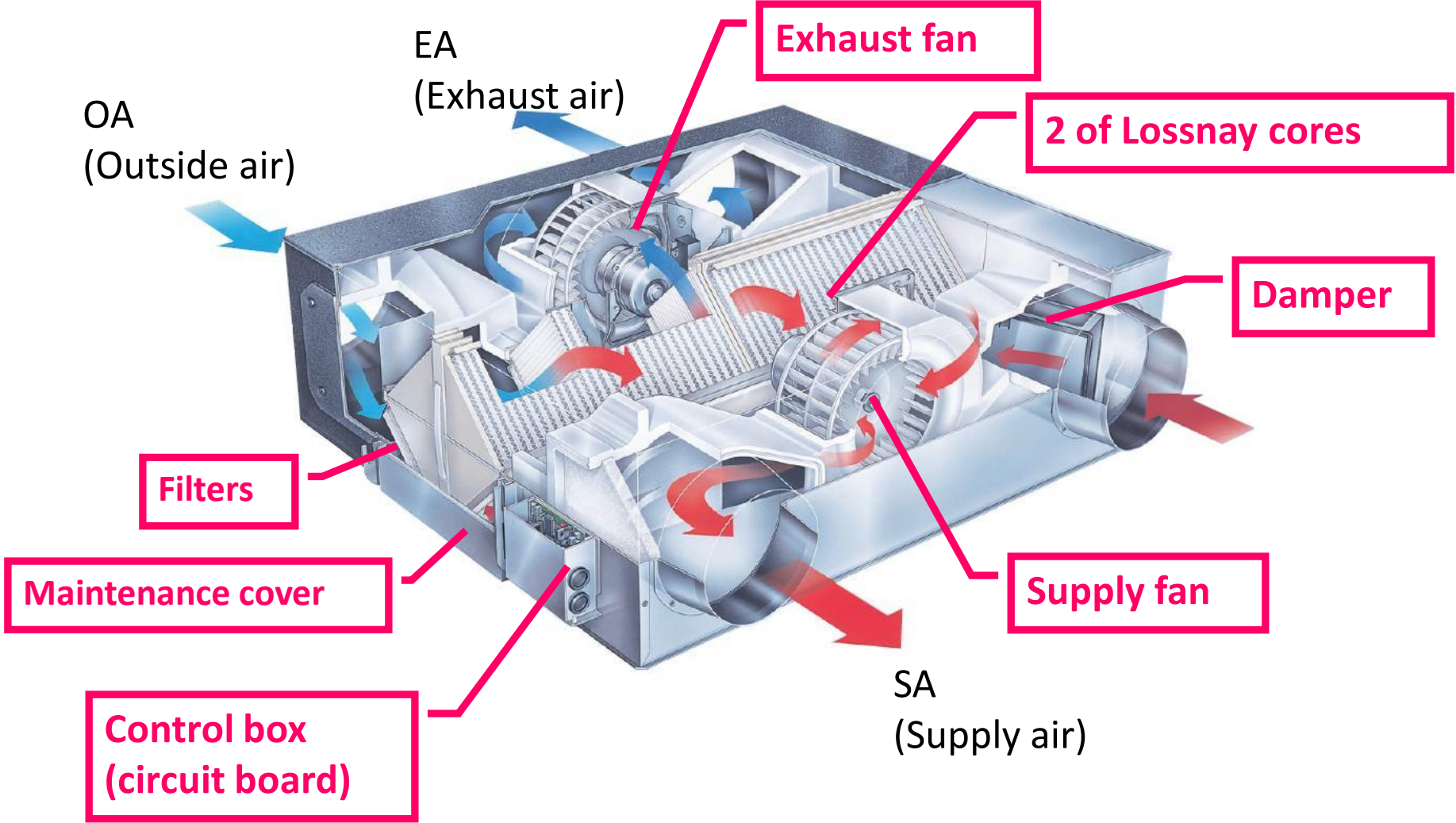
Conditions Outdoor air: DB 33°C, RH 63%
 Indoor air: DB 26°C, RH 50%
 Ventilation volume: 25m³ /Hr/person
 Middle floor of a general office building facing south

Why Heat Recovery Ventilator is required

Lossnay principle



Why Heat Recovery Ventilator is required

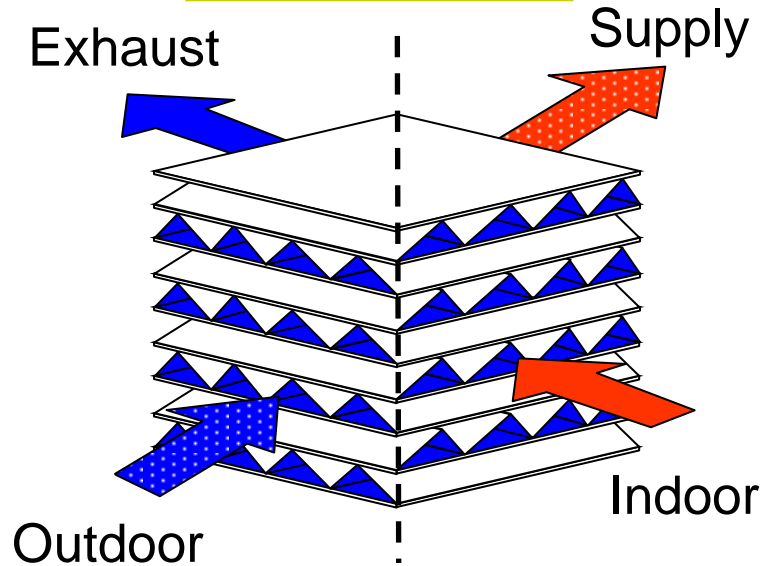


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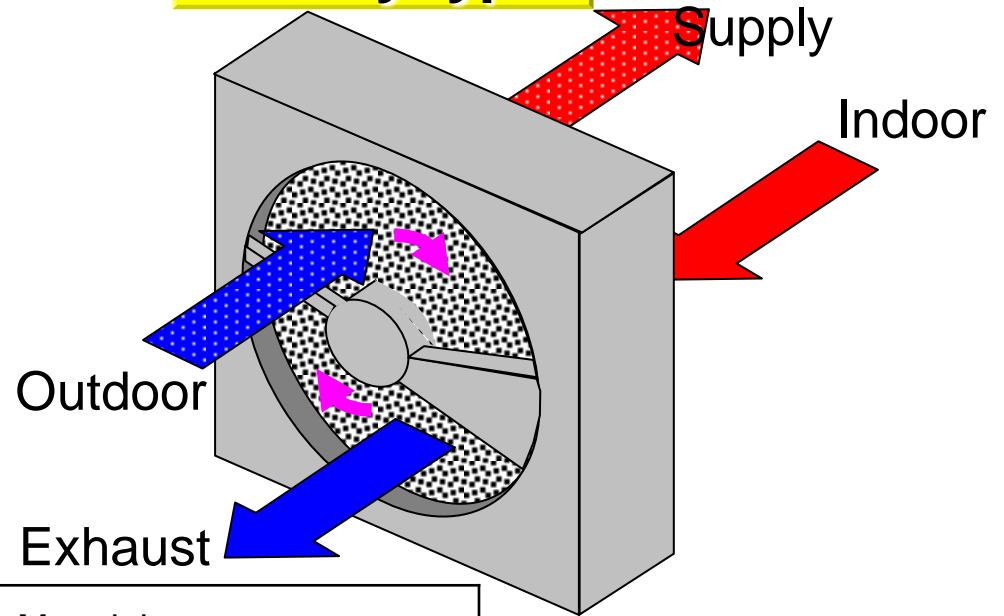
- Why Heat Recovery Ventilator(HRV) is required
- **Type of Heat Recovery Ventilator**
- Feature of MITSUBISHI ELECTRIC Lossnay
- Lossnay Core history / development and future

Type of HRV

Static type



Rotary type



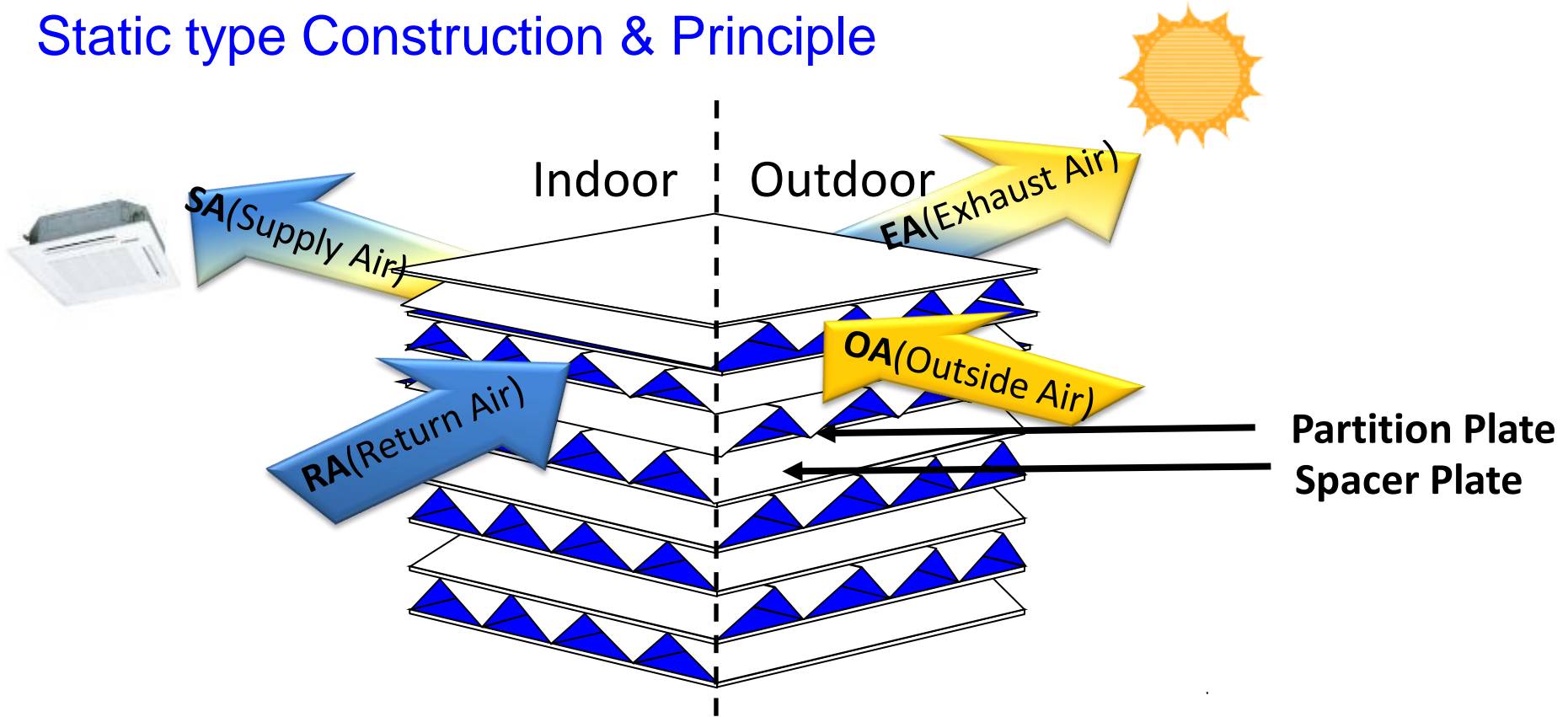
Type	Method	Material
Static	Conductive transmission	Metal/ plastic/ Paper
Rotary	Heat / Humidity accumulation	Metal/ plastic/ Paper
Heat pipe	Heat / Humidity accumulation	-

Rotary and Static type is majority in HRV

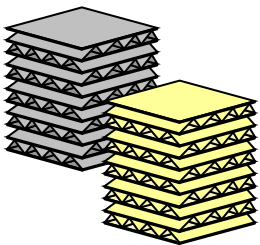
MITSUBISHI ELECTRIC is the origin of the static type enthalpy recovery core

Type of HRV

Static type Construction & Principle



General materials for core



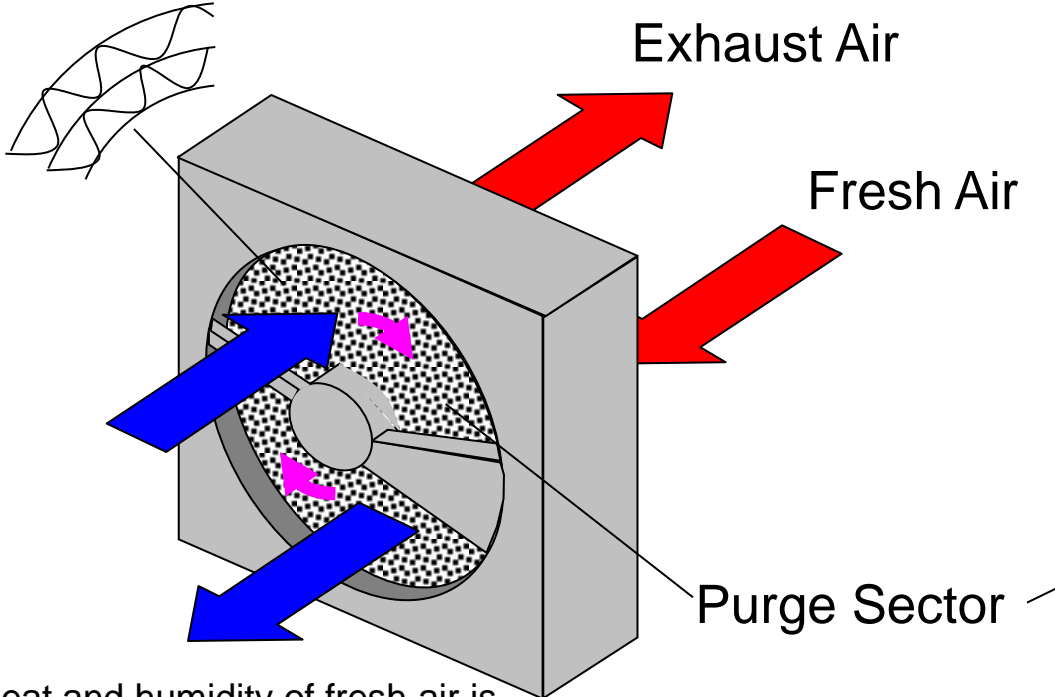
- Aluminum
- Copper
- Plastic/ polymer
- Paper

 **MITSUBISHI ELECTRIC**

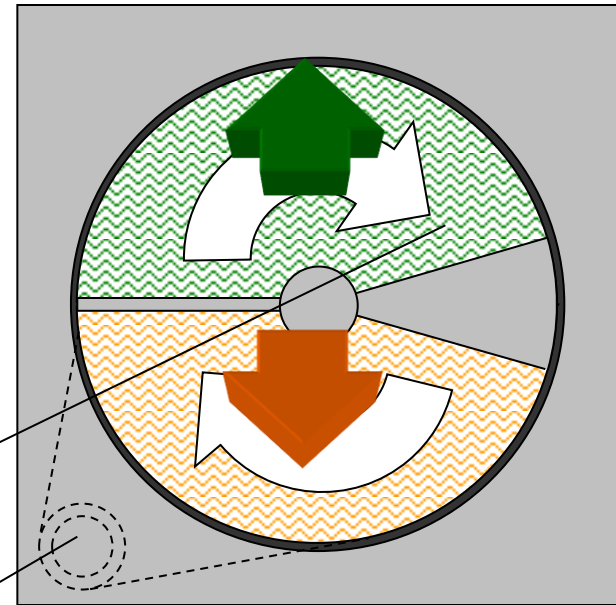
Type of HRV

Rotary type Construction & Principle

Rotor - A layered honeycomb structure made of paper applied moisture absorbent material.



Fresh air is purged at a purge sector to prevent air leakage from exhaust air to fresh air.



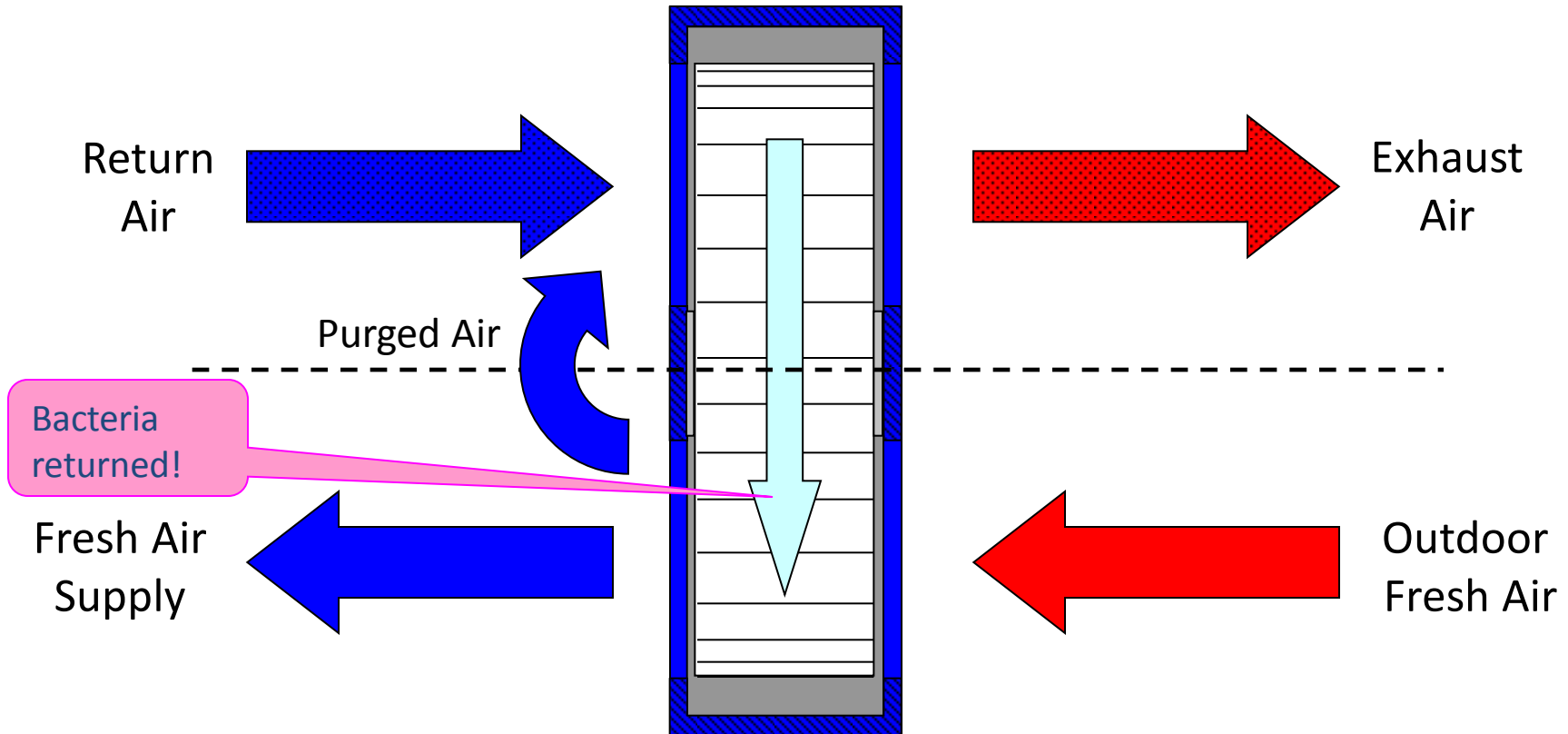
Rotor rotates by a drive motor. (8rpm)

Heat and humidity of fresh air is absorbed by the rotor and as the rotor is rotating, it moves into the exhaust air and discharged to outdoor. (In summer case)

Exhaust air and fresh air go through the same passage.

Type of HRV

Air leakage and Bacteria return is a problem of Rotary



Lower ventilation rate than actual performance of blowers.

Strong possibility of bacteria return!

Type of HRV

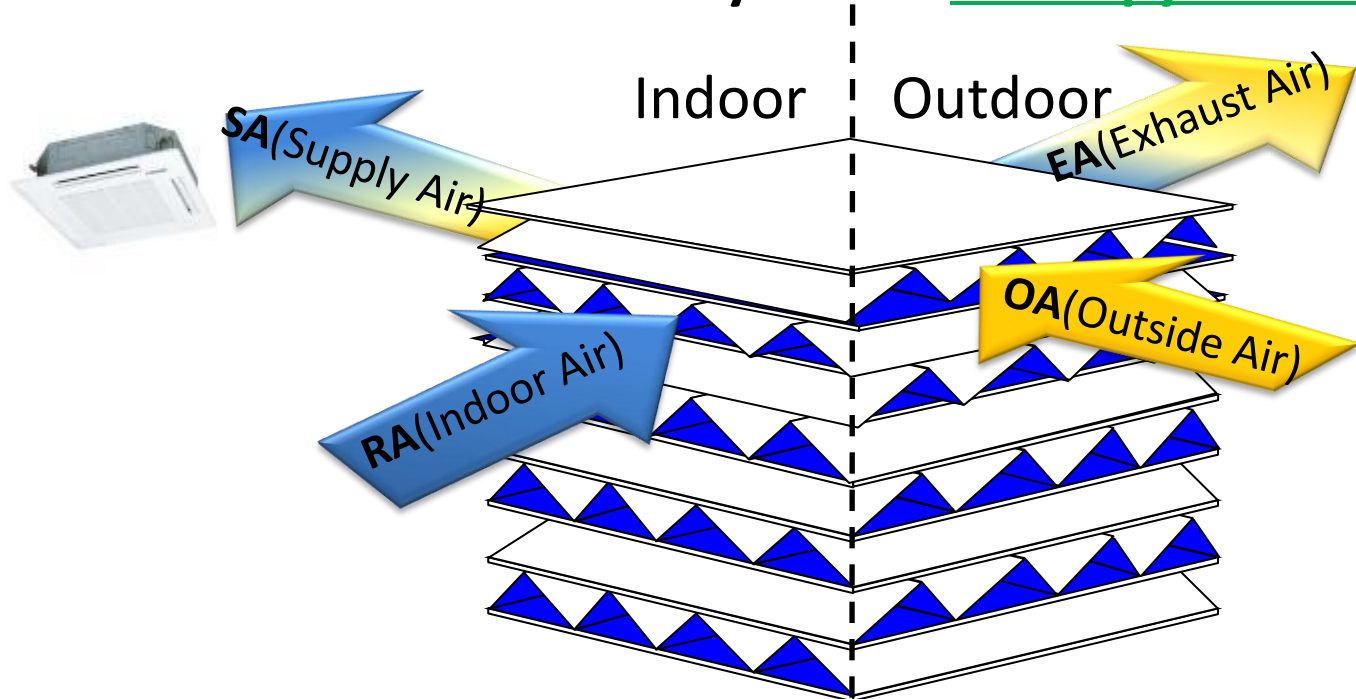
Item	Static-type Lossnay	Wheel type
Construction	Static transmission type. As the supply air and exhaust air pass through different passage, the air passages are completely separated.	Heat and humidity accumulation type. Supply air and exhaust air flow into the same air passage because of its rotary-type construction.
Moving parts	None: Fixed core	Used (rotor driven with belt by gear motor) Rotor core(8RPM).
Air leakage Gas transmission	Gas transmission (Ammonia 2.8%)	Gas transmission (Ammonia: 45-57%)
Bacteria	Low (As air intake/exhaust are separate, transmission is low.	High (As air intake/exhaust are the same, transmission is high)
Space, size	Core size and pressure drop become very big for large air volume unit.	Difficult to arrange rotary core inside small size HRV.

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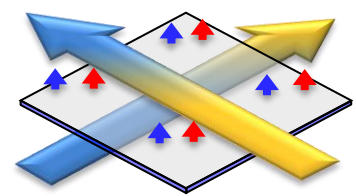
Feature of MITSUBISHI ELECTRIC Lossnay

Mitsubishi Electric Lossnay Core = Enthalpy Recovery



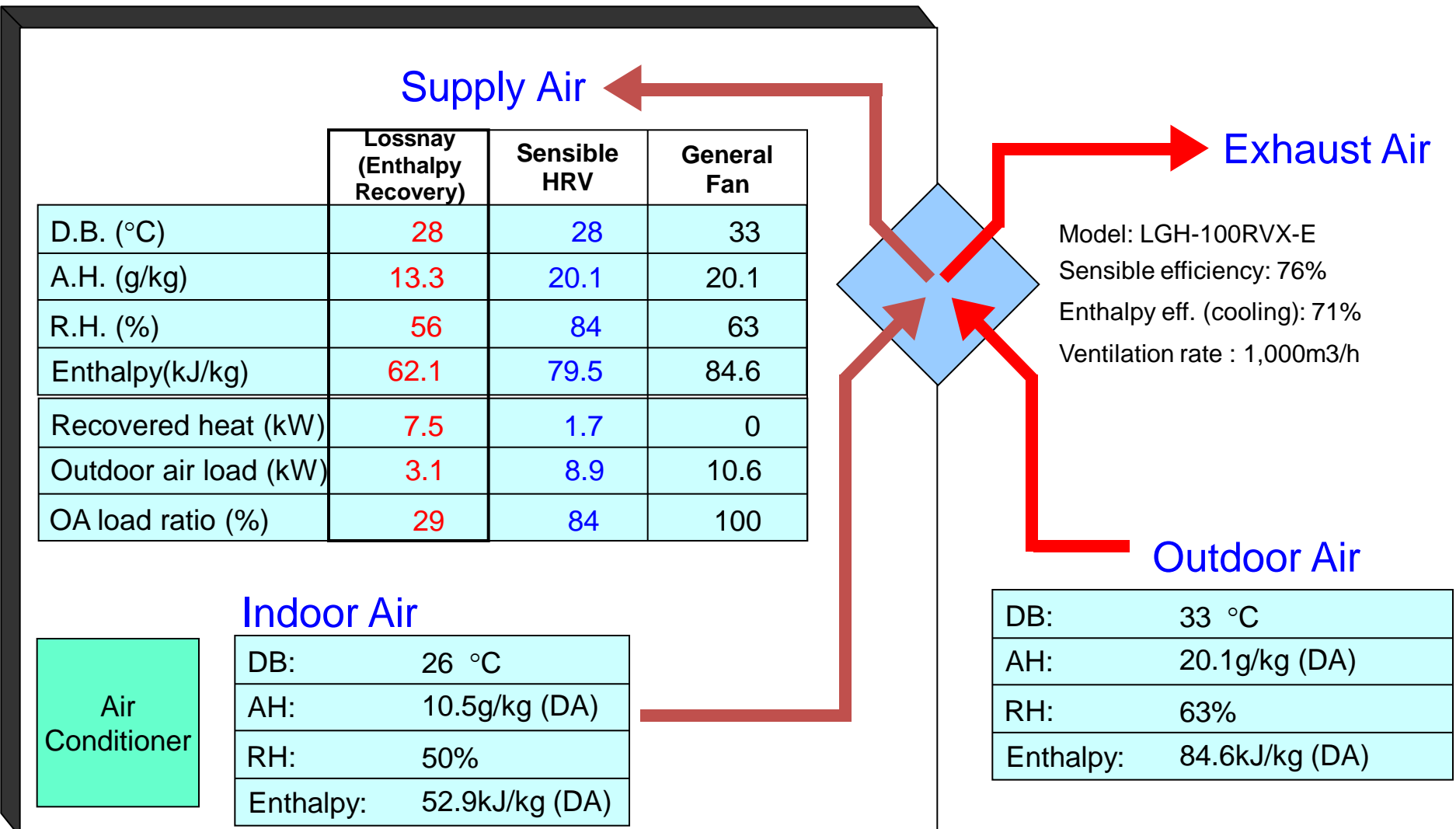
Enthalpy = Sensible Heat (Temp.) + Latent Heat (Humidity)

- Sensible Heat => Heat conduction by temp. difference
- Latent Heat => Vapor transition by vapor pressure difference



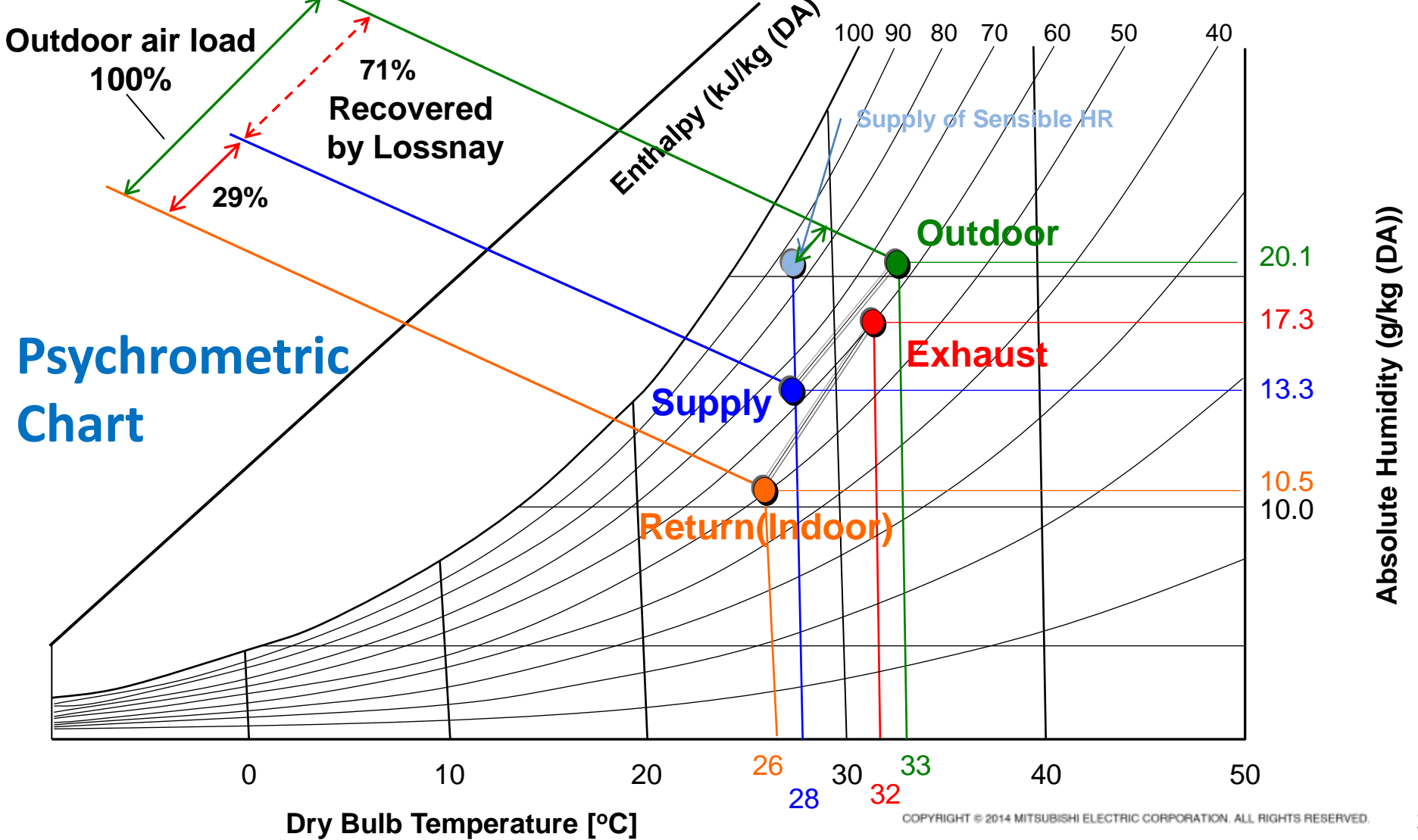
Feature of MITSUBISHI ELECTRIC Lossnay

Heat Recovery Calculation [Summer example]



Feature of MITSUBISHI ELECTRIC Lossnay

Heat Recovery Calculation [Summer example]



Feature of MITSUBISHI ELECTRIC Lossnay

Type of MITSUBISHI ELECTRIC HRV



Ceiling suspended

- Air volume is 150 – 2000 m³/h
- Ducting for 4 paths
- Can be concealed behind the ceiling



Cassette

- Air volume is 150 – 500 m³/h
- Ducting for 2 paths
- Panel is exposed under the ceiling
(Sold only in Japan)

Feature of MITSUBISHI ELECTRIC Lossnay

Type of MITSUBISHI ELECTRIC HRV



Wall mounted

- Mainly residential use
- 100m³/h
- Install on the wall like air conditioner's indoor unit
- Supply and exhaust air through 2 hole on the wall



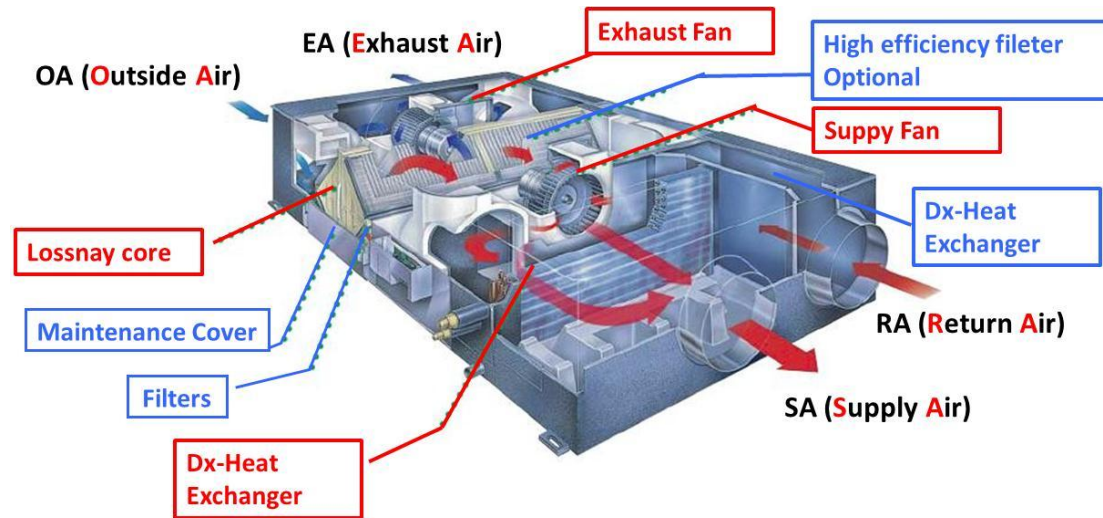
Feature of MITSUBISHI ELECTRIC Lossnay

Type of MITSUBISHI ELECTRIC HRV



Ceiling suspended with humidifier and DX coil

- Air volume is 500 and 1000m³/h
- Supplemental heating / cooling by using with MITSUBISHI ELECTRIC air conditioning system
- Connecting to water pipe for humidifying



Feature of MITSUBISHI ELECTRIC Lossnay

Type of MITSUBISHI ELECTRIC HRV



Floor standing

- Outdoor installation possible (Applied models only)
- Air volume 500 - 10000m³/h
- Humidifier model, heating / cooling model existing

Feature of MITSUBISHI ELECTRIC Lossnay

Type of MITSUBISHI ELECTRIC HRV



Hong Kong school model

- Strong fire proof construction
- Ceiling suspended (Not concealed)

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Lossnay Core history / development and future

1943 Nakatsugawa Works is Established



1945 Began manufacturing electric fans



1968 Began manufacturing duct fans



First in Japan!

World's First!

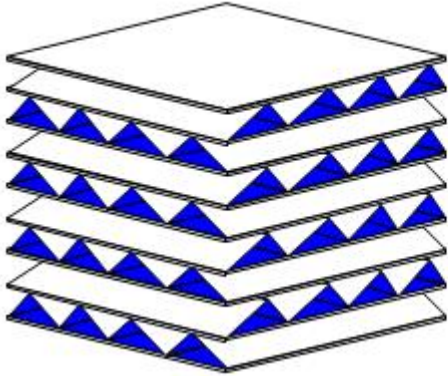
1970 Began marketing the Static enthalpy HRV

Major innovation in dramatically decreasing the amount of energy wasted from conventional building ventilation!



Original Lossnay Unit

Lossnay Core history / development and future



In 1969, Mr. Masataka Yoshino invented the principle of Lossnay.

Lossnay Core history / development and future

The trigger of invention



Simple and Effective

Excellent air quality
and unbeatable
Heat Exchange Efficiency

Try blowing into a rolled up piece of paper.
The warmth of your breath travels through
the paper to your hands.

Some 38 years ago, that simple principle led to the development
of our most advanced air-conditioning technology.

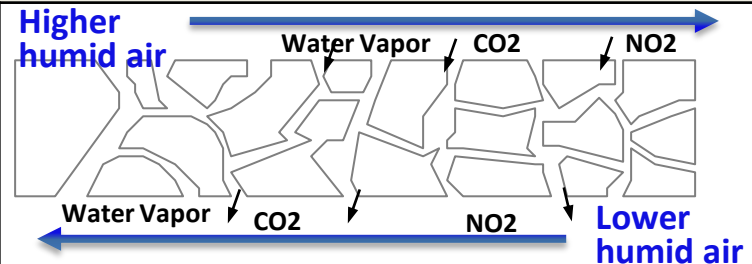
Lossnay Core history / development and future

Ordinary Paper

Humidity transfers, and also gasses that are easily dissolved in water such as CO₂, NO₂ transfers.



The contaminants passes through the plates during ventilation and returns to the room.

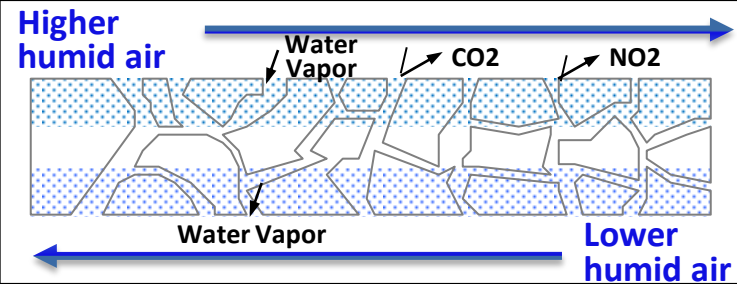


Specially Treated Paper (Made of Cellulose Fibers) *for the former series

Humidity transfers, but gasses such as CO₂, NO₂ do not transfer.



Most of the contaminants do not return to the room during ventilation.

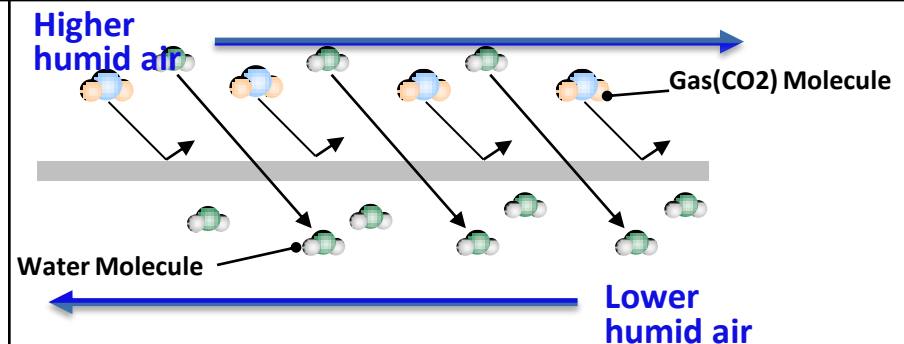


Hyper Eco Core (Made of Specially Treated Cellulose Membrane) *For the Current Series

More humidity transfers while the amount of gasses go through the plate decrease.

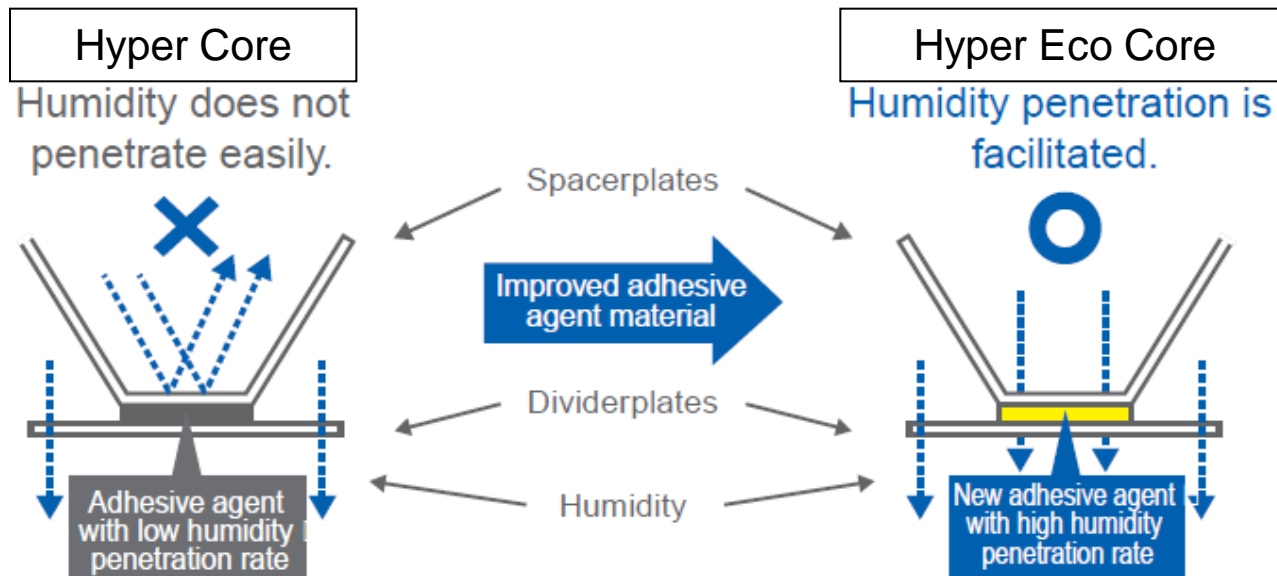
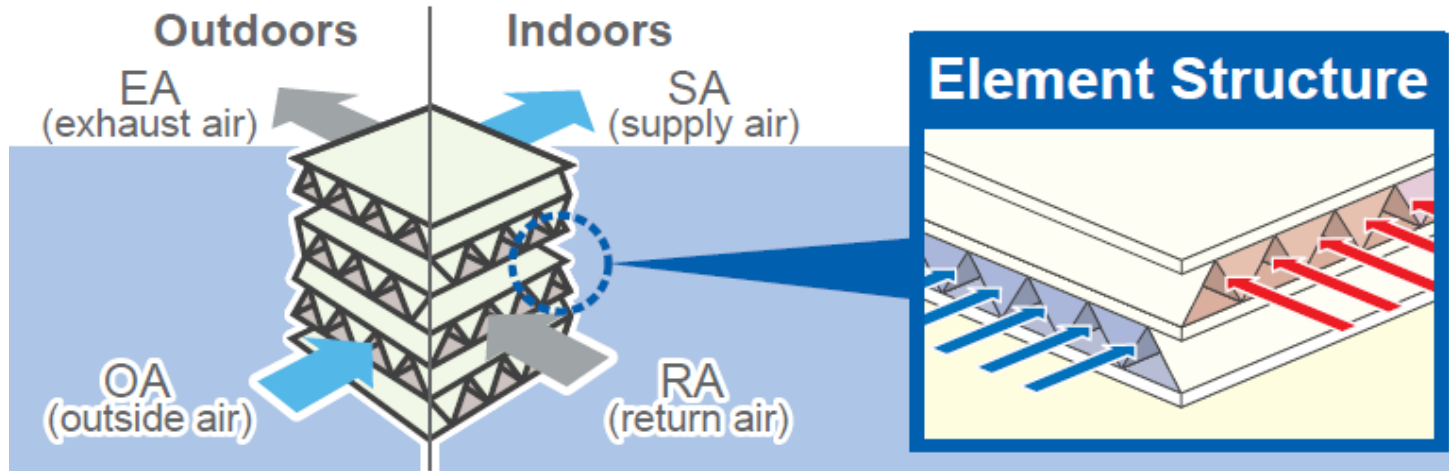


The amount of air returning to the room decreases to less than 1%*, and **the total heat exchange performance has been improved by the change of material.** (*Tested by Mitsubishi Electric)



Lossnay Core history / development and future

Hyper Eco Core <New adhesive> Our Patent



Lossnay Core history / development and future

Core future development for better energy recovery

For better humidity efficiency

- + Absorbent material (Volume, selection)
- + Spacer Plate (Thinner plate)

For better Temperature efficiency

- + Try to new construction of Air stream
(Changing partition plate shape and material.)

Lossnay for **school** in Hong Kong



Total over 20,000 units are installed.

Lossnay units are supporting to Hong Kong Children's Education.

