MVHR – Where next?

AECB conference 2016

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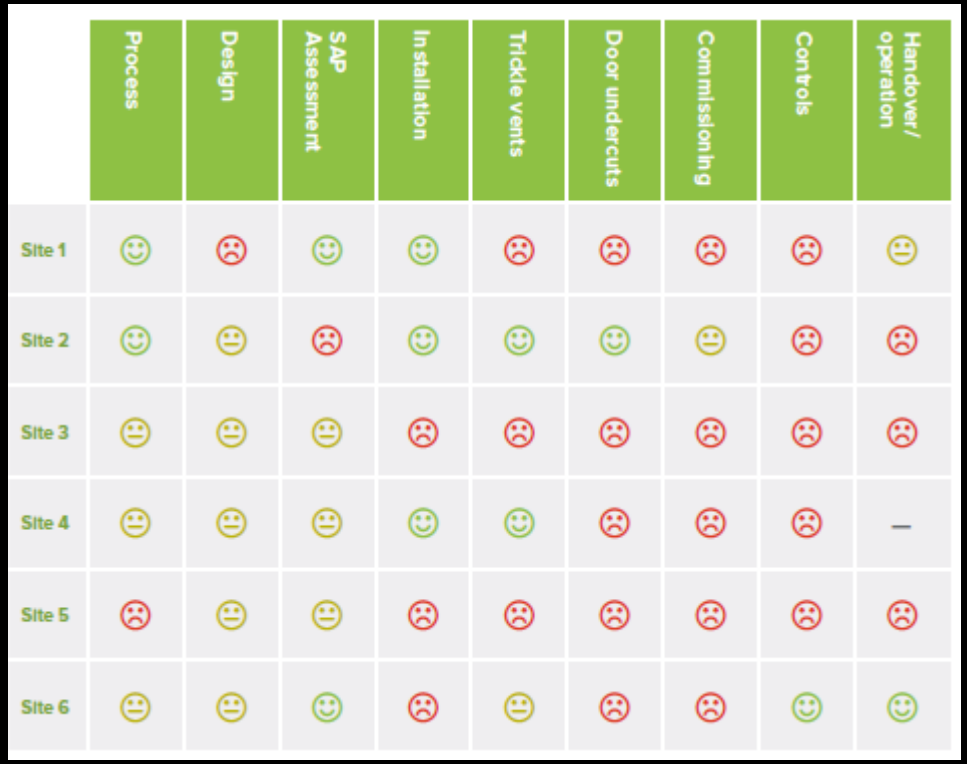
Prediction is very difficult

How are things now?

Zero Carbon Hub ventilation study (Ian Mawditt)



	Process	Design	SAP Assessment	Installation	Trickle vents	Door undercuts	Commissioning	Controls	Handover/ operation
Site 1	☺	☹	☺	☺	☹	☹	☹	☹	😐
Site 2	☺	😐	☹	☺	☺	☺	😐	☹	☹
Site 3	😐	😐	😐	☹	☹	☹	☹	☹	☹
Site 4	😐	😐	😐	☺	☺	☹	☹	☹	–
Site 5	☹	😐	😐	☹	☹	☹	☹	☹	☹
Site 6	😐	😐	☺	☹	😐	☹	☹	☺	☺

Issues identified?

- Inadequate design
- Poor installation & commissioning

Outcomes

- Flowrates often only half design
- Systems turned off because of noise
- Poor air quality

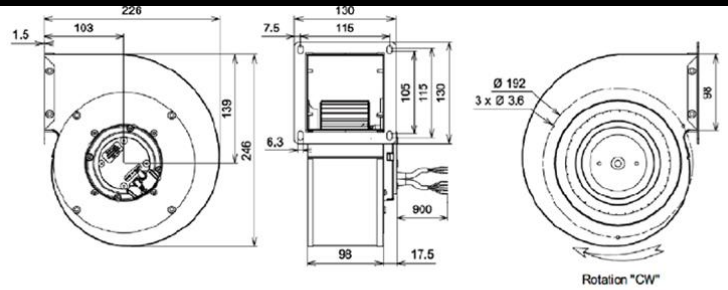
Noise

- Mainly caused by fans
- Silencers work – but bulky and cost

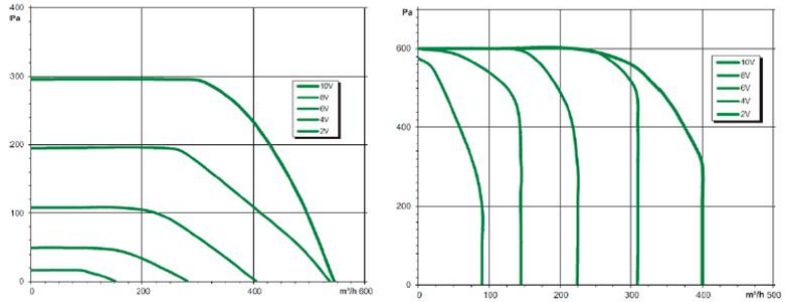
Future direction #1

- Low noise fans
- Noise is lost energy, low noise=efficient

Forward curved constant volume fans

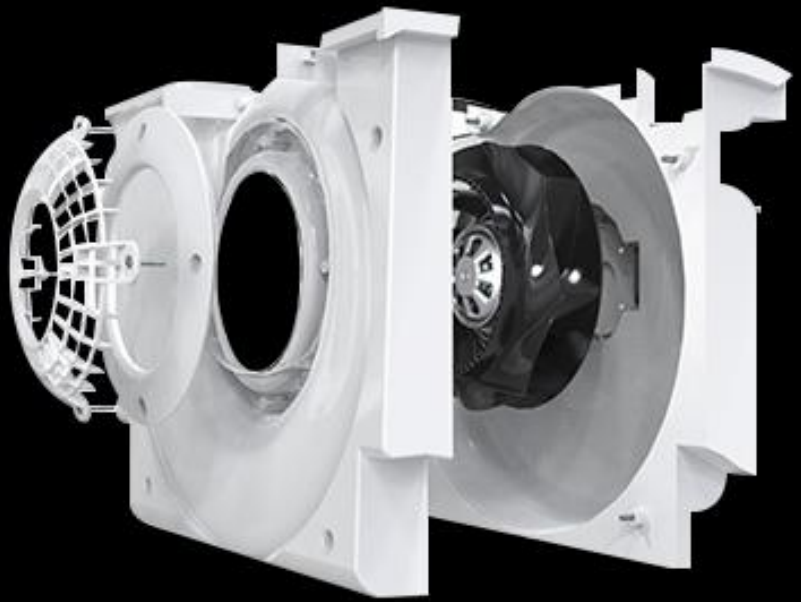


The graphs below show typical curves with either a constant pressure or a constant volume program. The size and main characteristics of the fan remain the same, except for the software which is tailored to the customer's request. This kind of program is ideal for all HVAC applications, such as Central Exhaust Systems or Heat Recovery Units



Airflow measurement

…can use more efficient fans



Integral silencers:

Flow rate problems

- Ducts too small / long
- Poor installation
- No commissioning
- Filters blocked

Design and installation

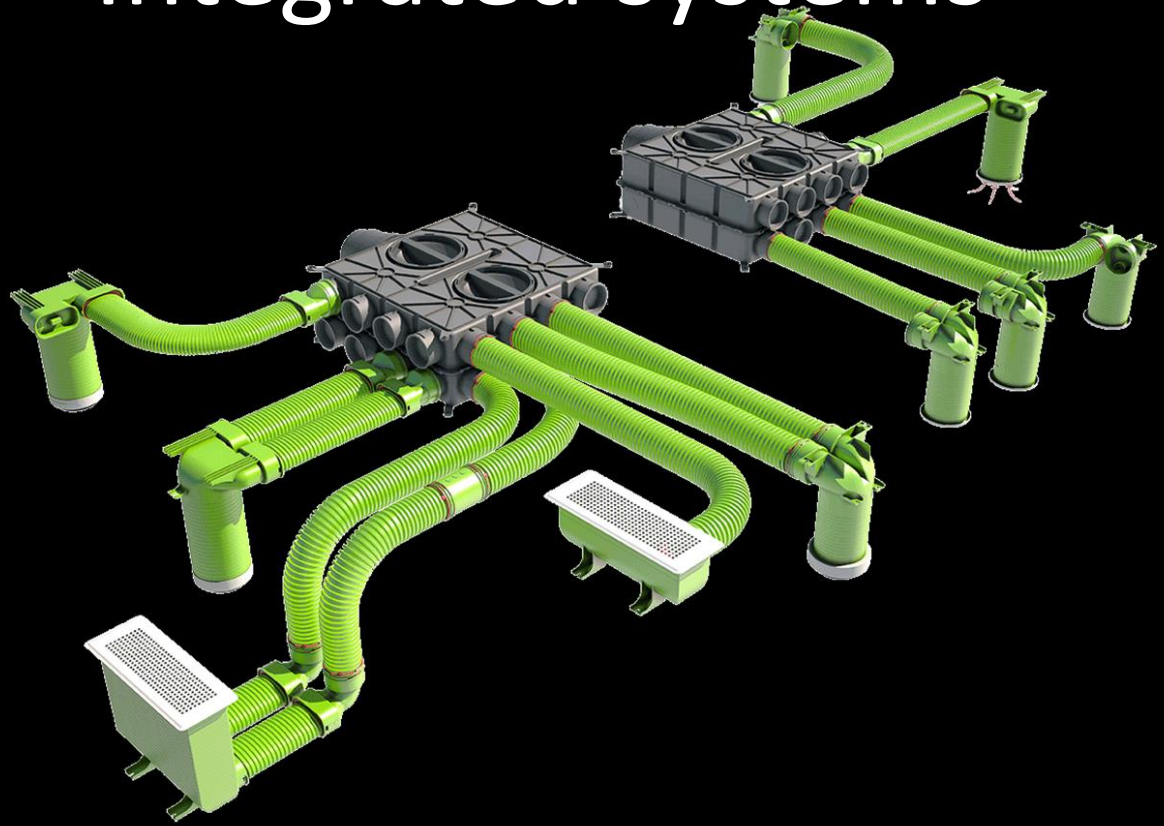
MVHR is a system, not a “box”

- Ductwork needs design
- There is always a cheaper installer who can do a worse job!

Future direction #2

MVHR manufactures take responsibility for system

Integrated systems



Or like this

Easier commissioning

Future direction #3

- Flow measured and set at MVHR
- Manufacturer designed ductwork systems
- Pre-set branch air flow

Filters

Currently replaced on time basis

Expensive

Future direction #4

- Filter condition measured on pressure
- Larger filters
- Auto ordering?

MVHR is expensive

And will be for a while…

Next steps:

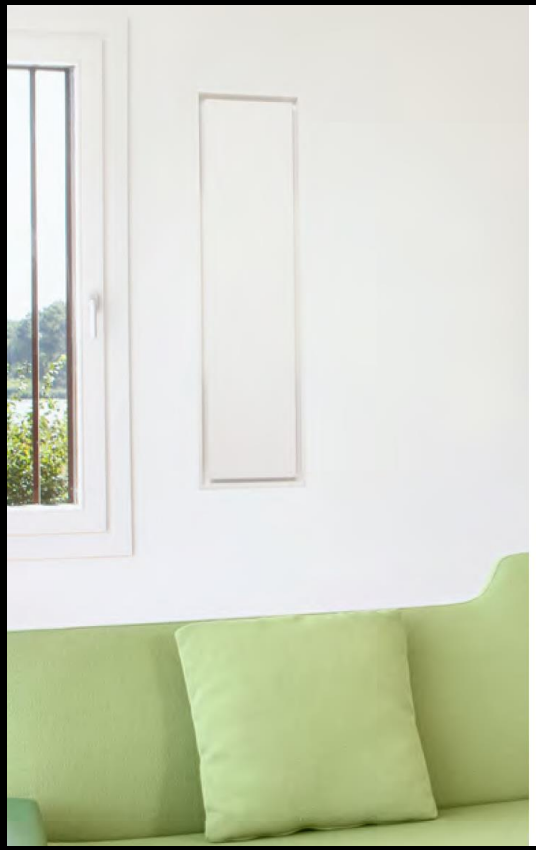
- More functions built into MVHR unit
- Quicker/cheaper install & commission
- Longer filter life

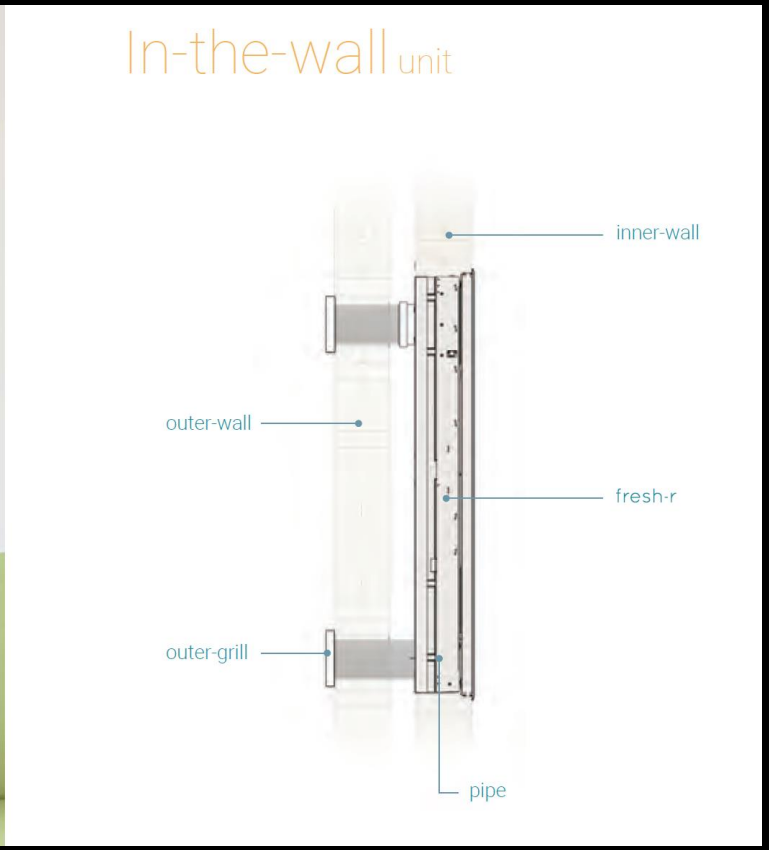
More novel approaches

Do we need ductwork?

- FreshR unit – extract ducts only
- Blumartin – separate room transfer fans
- Lunos – fully ductless

Vaventis Fresh-r





Fine wire heat exchanger

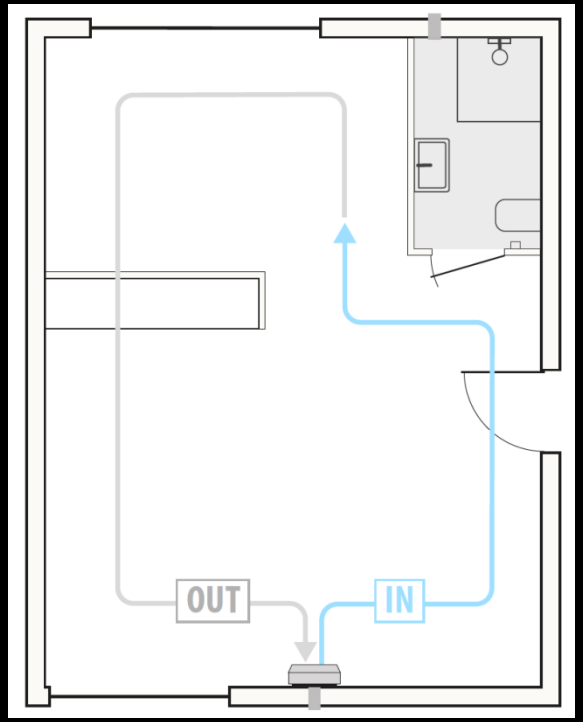
Very slim unit

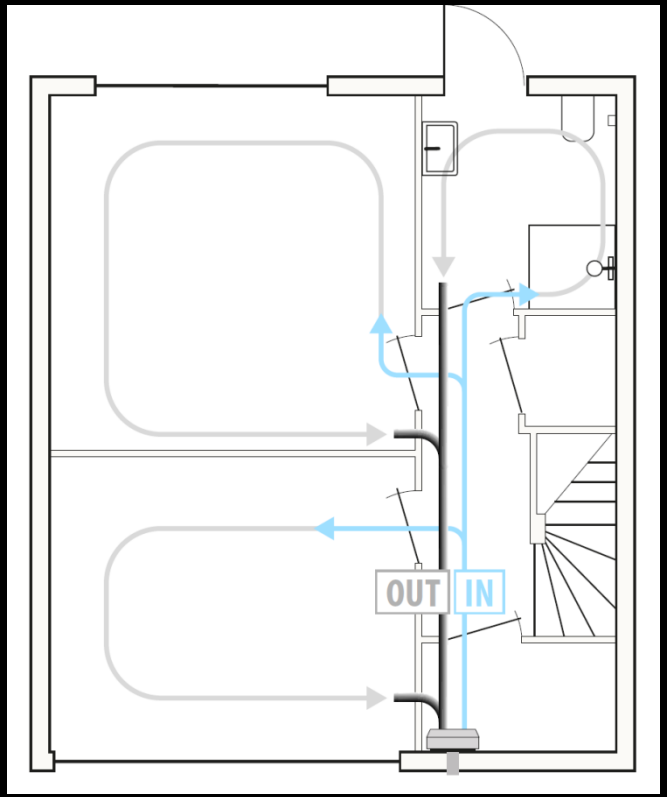
No filters

But have to wash the heat exchanger

No frost heater or condensate drain

More than one room?



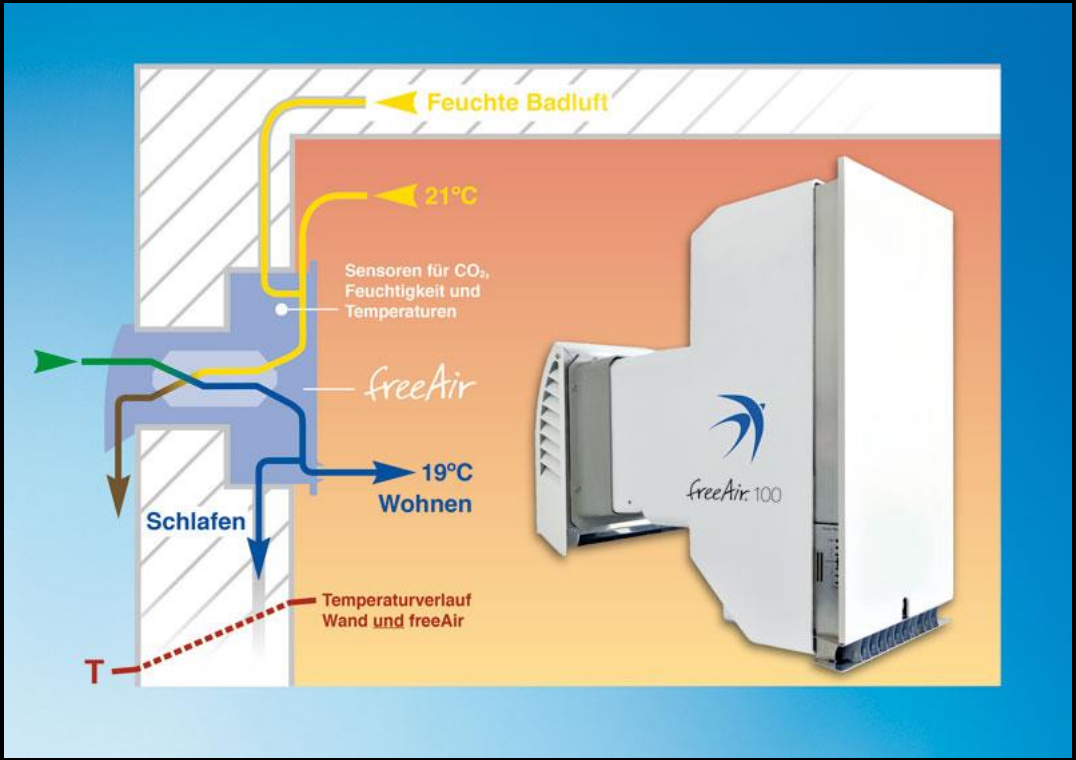


Pros/cons

+ Low space take
+ No filters
+ Internet monitoring

- No summer bypass
- Vulnerable heat-ex?
- 78% efficient

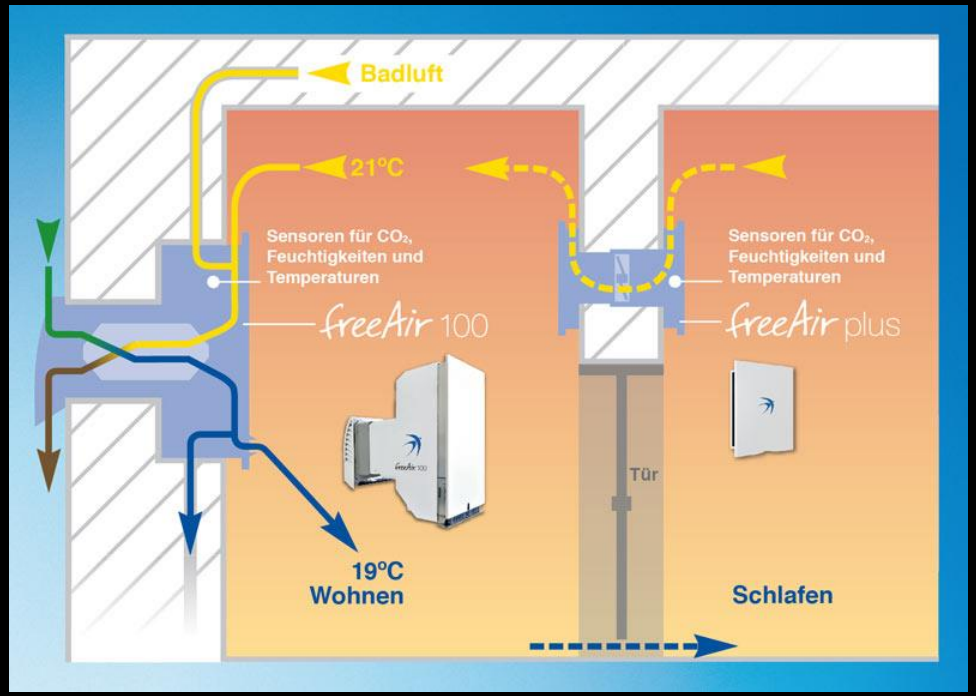
BluMartin freeAir



Conventional MVHR – built in wall

- Fits in wall
- IAQ control
- RH control through vent rate
- External condensate drain

Other rooms…

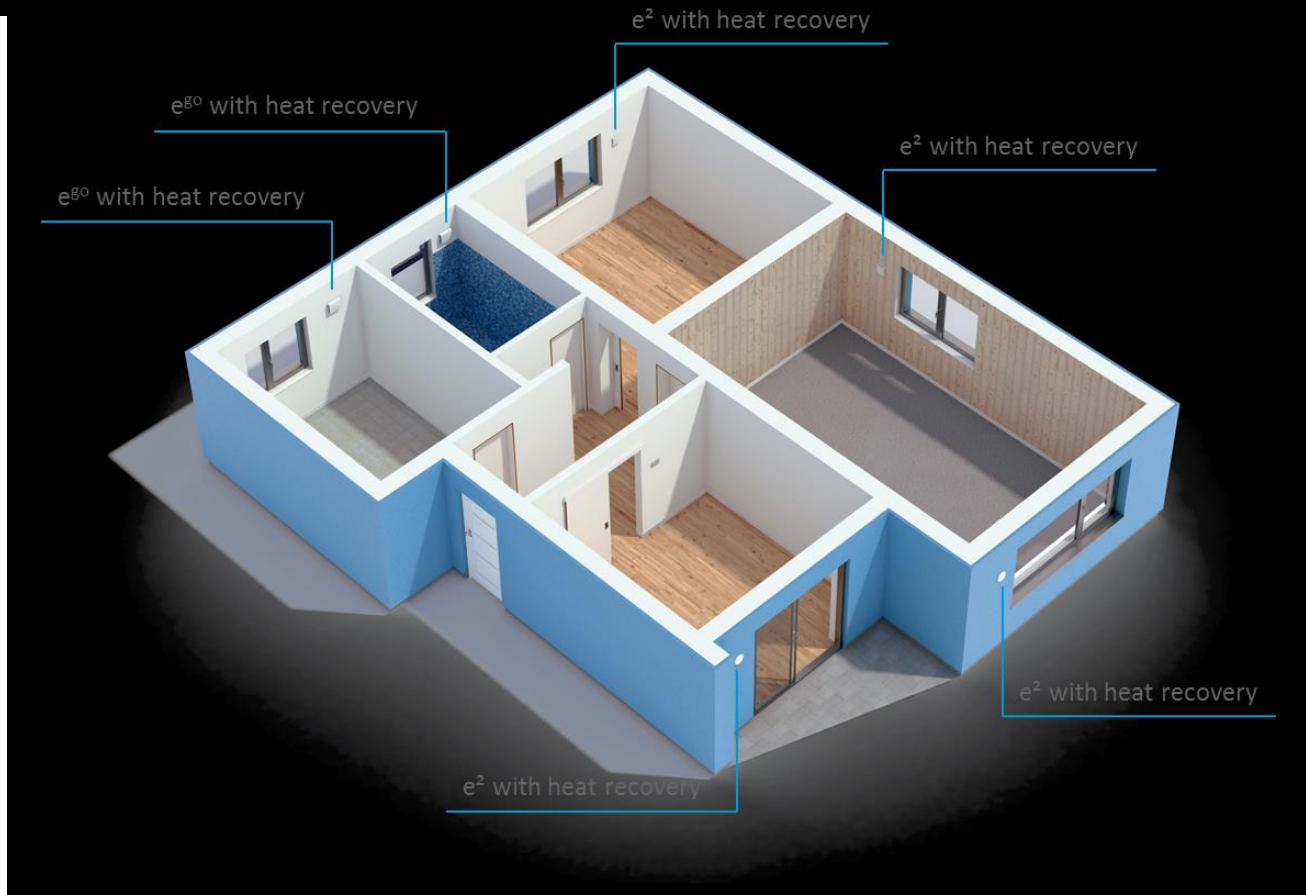

Badluft
21°C
Sensoren für CO_2, Feuchtigkeiten und Temperaturen
freeAir 100
Sensoren für CO_2, Feuchtigkeiten und Temperaturen
freeAir plus
Tür
19°C
Wohnen
Schlafen

Pros/cons

+ Low space take
+ Minimal ductwork
+ Smart control
+ Long filter life

- No summer bypass
- Hard to change filter
- Expensive with multi room system
- Extra fans could be noisy?

Lunos


e² with heat recovery
eᵍᵒ with heat recovery
eᵍᵒ with heat recovery
e² with heat recovery
e² with heat recovery
e² with heat recovery

Pros/cons

+ Just 160mm holes
+ Really no ductwork
+ Can do summer vent

- No PHI certificate
- Basic filtration
- Not cheap

Demand control ventilation

Theory:

Ventilation dilutes pollutants, so vary ventilation rate according to pollutant level.

Over-ventilation is inefficient – reduce fan power and heat loss with demand control

Humidity control

The usual pollutant in UK is water – but it's outside as well

20 C / 50% RH = 8 g/kg

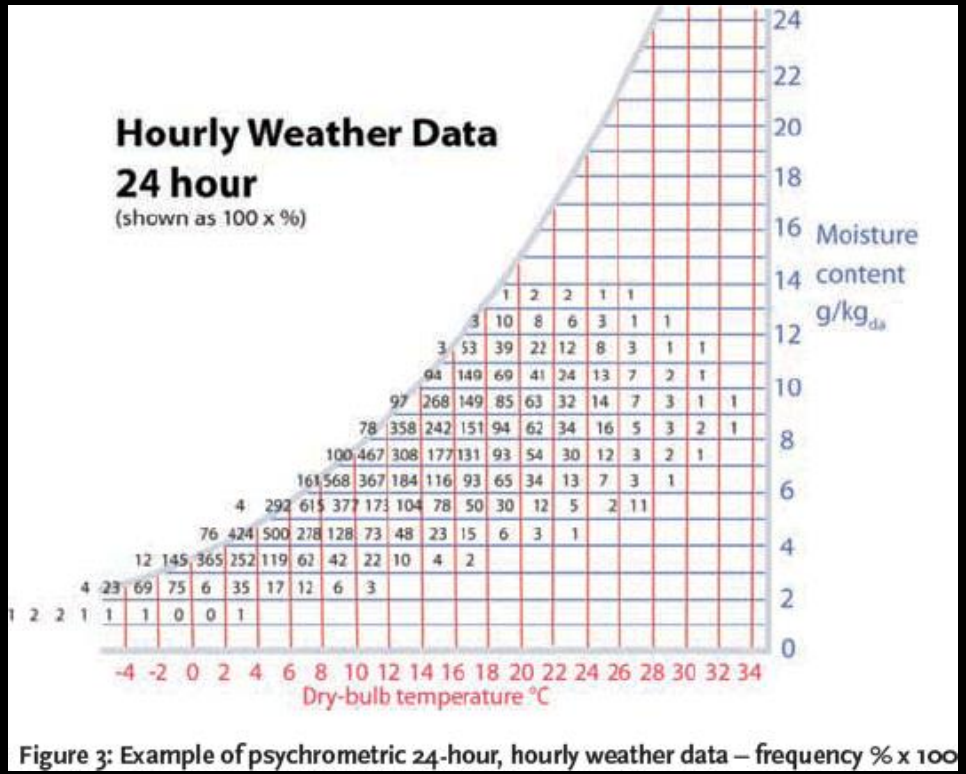


Figure 3: Example of psychrometric 24-hour, hourly weather data – frequency % x 100

Ventilating with humid air

In this example vent would *add* moisture for 25% of year compared with 20 C, 50 %RH

Weather data for example site – collected over 20 years. Hourly averages 0:00 to 24:00 – shown as %

	Moisture content kg/kg															
Dry Bulb °C	0.00 to 0.99	1.00 to 1.99	2.00 to 2.99	3.00 to 3.99	4.00 to 4.99	5.00 to 5.99	6.00 to 6.99	7.00 to 7.99	8.00 to 8.99	9.00 to 9.99	10.00 to 10.99	11.00 to 11.99	12.00 to 12.99	13.00 to 13.99	14.00 to 14.99	TOTAL
-16.0 to -14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
-14.0 to -12.1	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
-12.0 to -10.1	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
-10.0 to -8.1	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
-8.0 to -6.1	0.0	0.02	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06
-6.0 to -4.1	0.0	0.01	0.23	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.24
-4.0 to -2.1	0.0	0.01	0.69	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.82
-2.0 to -0.1	0.0	0.01	0.75	1.45	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.21
0.0 to 1.9	0.0	0.00	0.56	3.65	0.76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.97
2.0 to 3.9	0.0	0.00	0.35	2.52	4.24	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.15
4.0 to 5.9	0.0	0.01	0.17	1.19	5.00	2.92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.29
6.0 to 7.9	0.0	0.00	0.12	0.62	2.78	6.15	1.61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.28
8.0 to 9.9	0.00	0.00	0.06	0.42	1.28	3.77	5.68	1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.21
10.0 to 11.9	0.0	0.0	0.03	0.22	0.73	1.73	3.67	4.67	0.78	0.0	0.0	0.0	0.0	0.0	0.0	11.83
12.0 to 13.9	0.0	0.0	0.00	0.10	0.48	1.04	1.84	3.08	3.58	0.97	0.00	0.0	0.0	0.0	0.0	11.09
14.0 to 15.9	0.0	0.0	0.00	0.04	0.23	0.78	1.16	1.77	2.42	2.68	0.94	0.03	0.0	0.0	0.0	10.05
16.0 to 17.9	0.0	0.0	0.00	0.02	0.15	0.50	0.93	1.31	1.51	1.49	1.49	0.53	0.03	0.0	0.0	7.96
18.0 to 19.9	0.0	0.0	0.00	0.00	0.06	0.30	0.65	0.93	0.94	0.85	0.69	0.39	0.10	0.01	0.0	4.92
20.0 to 21.9	0.0	0.0	0.00	0.00	0.03	0.12	0.34	0.54	0.62	0.63	0.41	0.22	0.08	0.02	0.0	3.01
22.0 to 23.9	0.0	0.0	0.0	0.00	0.01	0.05	0.13	0.30	0.34	0.32	0.24	0.12	0.06	0.02	0.00	1.59
24.0 to 25.9	0.0	0.0	0.0	0.00	0.00	0.02	0.07	0.12	0.16	0.14	0.13	0.08	0.03	0.01	0.00	0.76
26.0 to 27.9	0.0	0.0	0.0	0.00	0.0	0.01	0.03	0.03	0.05	0.07	0.07	0.03	0.01	0.01	0.00	0.31
28.0 to 29.9	0.0	0.0	0.0	0.00	0.0	0.01	0.01	0.02	0.03	0.03	0.02	0.01	0.01	0.00	0.0	0.14
30.0 to 31.9	0.0	0.0	0.0	0.00	0.0	0.0	0.00	0.01	0.02	0.01	0.01	0.01	0.00	0.0	0.0	0.06
32.0 to 33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.01	0.01	0.00	0.00	0.0	0.0	0.0	0.02
34.0 to 35.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.00
36.0 to 37.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
TOTAL	0.0	0.1	3.0	10.4	15.8	17.4	16.1	13.8	10.5	7.2	4.0	1.4	0.3	0.1	0.0	100.00

Data is rounded – '0.00' indicates an occurrence less than 0.01%

Figure 2: 24-hour weather data for example UK site

Blumartin demand control

German climate has dry winters – here the aim is to *retain* moisture.

Monitor CO_2 and VOC to minimise vent rate where possible.

UK experience is that this is not necessary and single speed fans work well.

Conclusions “conventional MVHR”

- Flow measurement
- Quieter fans
- Integrated silencer and duct systems
- Easier commissioning
- Filter condition monitored
- Internet connectivity

“ductless MVHR”

- Some challenges still
- Ducting needed for internal bathrooms
- Still expensive
- Summer bypass not always possible

Thank you