EVIA Position on Ecodesign requirements for ventilation units

10th April 2013

Brussels, 10 April 2013

Dear Mr. Biermann, Dear Mr Kemna,

EVIA, the European Ventilation Industry Association, would like to thank you for the further draft working documents on Ecodesign requirements for ventilation units and the possibility to be involved in the current discussions.

Overall, we support the general approach. However, we have some comments, which we would like to share with you.

You will find below the main points of concern to which we would like to bring your attention and we hope that these will be of constructive support for the further development of the consolidated working document.

The comments made in previous comments are still valid except where new proposals have been made.

Should you have any questions regarding EVIA or our comments, do not hesitate to contact us.

Best regards,

Stefan Wiesendanger
Chairman of EVIA

Claus Händel
EVIA Technical Secretary

Rick Bruins
Chair of the EVIA Residential ventilation working group

Dr. Christoph Kaup
Chair of the EVIA Non-residential ventilation working group

Geoff Lockwood
Chair of the EVIA Fans working group

EVIA Position on Ecodesign requirements for ventilation units

10th April 2013

1. Product Groups

EVIA still sees a lot of products, which are not considered properly with the chosen split between RVU and NRVU.

- Box and roof fans
- Ventilation units and fan systems under 125 W and under 1.000 m3/h air volume flow, serving non-residential applications

EVIA still request the Intended Use instead the fan power which will be the best solution to avoid misinterpretations

- Residential Ventilation Unit
- Non Residential Ventilation Unit
- Box and Roof Fan as a separate product group (see previous EVIA comments). This would avoid misunderstandings, if such a product is not used for ventilation in the sense of this regulation.

The risk of a loophole is very limited because:

- It is really not possible to sell products with the wrong performance data.
- There a many national requirements on Residential Ventilation products
- The requirements in fan efficiency and heat recovery are comparable
- A labelling of products in Non-Residential applications according the SEC does not make sense, because the air volume flows are totally different and the formula is not applicable.

As a compromise, EVIA can support the following split definition:

- Over ~1.000 m^3/h nominal outside air volume flow is Non-Residential Ventilation – Criteria Annex 2
- Under ~1.000 m^3/h nominal outside air volume flow the manufacturer shall declare:
    - Non-Residential Ventilation – Criteria Annex 2 or
    - Residential Ventilation – Criteria Annex 1 plus Labelling

2. Subject matter and scope

Due to the fact, that ventilation units might have many additional functions which might lead to conflicting requirements, the following ventilation units shall be excluded from the scope.
Using HEPA filters is no reason to exclude, because the add pressure drop can be considered:

2. This Regulation shall not apply to ventilation units which are:

~~(iii) in sterile or clean manufacturing environments where the use of HEPA or ULPA filters as defined in Annex II mandatory.~~

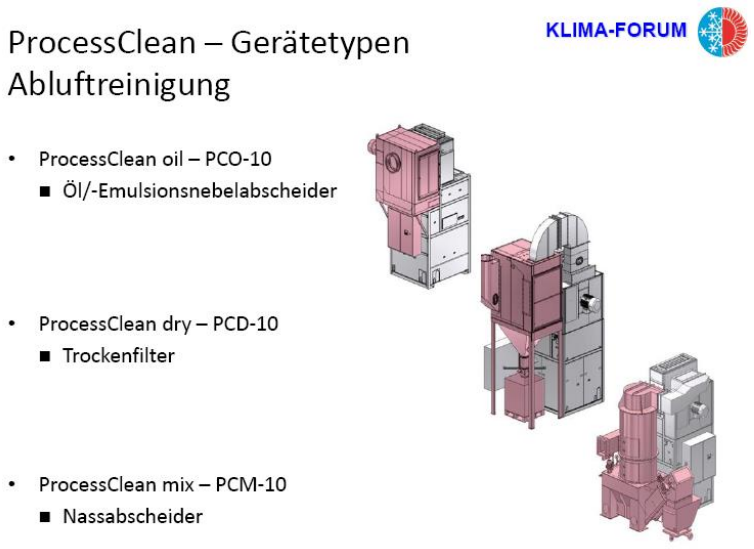
e) units including a heat exchanger and a heat pump for heat recovery

f) residential units using recirculation air for heating and/or cooling

g) defined by an industrial process and min. one airstream is defined by the process application.

h) Dual purpose ventilation units dealing with fire and smoke protection and safety aspects according to CPD.

i) where simultaneous operation of small fans for Residential Ventilation connected to an common exhaust duct is needed and therefore high pressure reserve is required; moreover this fans are equipped with integrated additional non reverse airtight flap and/or fire damper for safety reasons



Example for industrial process unit with heat recovery

The exhaust part is defined by the process and the air is used for heat recovery. This means the efficiency of heat recovery is depending on extract temperature which might be higher than typical room temperatures. One fan must transport any process parts and is not considered in EU 327/2011.

So the minimum definition on HR and fan efficiency in Lot 6 regulation does not make sense.

3. SEC calculation and classes of Residential Ventilation units

The case of defrosting:

EVIA still highlights, that the calculation of defrosting energy in the WD does not reflect the market and good or bad defrosting strategies. In detail see HLH 61/2010 attached. The current test method is a functional test and does not measure the energy impact.
EVIA´s proposal is to delete this parameter in the current version and include defrosting in the future revision, when further energy measurements will be available.

Due to the fact, that the influence is low, EVIA accepts the stated formula and parameters.

SEC classes for ventilation:

Bases on the equation given in the WD

$$SEC = \frac{8760}{1000} \times PRI_{el} \times 1{,}3 \times \mathrm{MISC} \times CTRL^{x} \times SPI - t_h \times \Delta T_h \times \frac{344}{10^6} \times PRI_h \times \left(2{,}2 - 1{,}3 \times CTRL \times MISC \times (1 - HR)\right) + \mathrm{Q_{defrost}}$$

EVIA is proposing the following SEC classes, considering a common label for all types of residential ventilation units.

SEC class	SEC in kWh/(a m^2) average climate	SEC in kWh/(a m^2) warm climate	SEC in kWh/(a m^2) cold climate
A+	SEC ≤ - 40	SEC ≤ - 15	SEC ≤ - 85
A	-40 < SEC ≤ -35	-15 < SEC ≤ -13	-85 < SEC ≤ -75
B	-35 < SEC ≤ -30	-13 < SEC ≤ -11	-75 < SEC ≤ -64
C	-30 < SEC ≤ -24	-11 < SEC ≤ -9	-64 < SEC ≤ -51
D	-24 < SEC ≤ -15	-9 < SEC ≤ -7	-51 < SEC ≤ -32
E	-15 < SEC ≤ -8	-7 < SEC ≤ -3	-32 < SEC ≤ -17
F	-8 < SEC ≤ 0	-3 < SEC ≤ 0	-17 < SEC ≤ 0

The basic for this proposal is the fact:

- A very good Exhaust Ventilation Unit (suitable for refurbishments) shall be able to reach a B classification in average climates with add controls options.
- A very good HR Ventilation Unit shall reach an A without any add. controls options. This reflects that a good heat recovery and an energy efficient fan have a reasonable position in applications. Tests of controls factors are not available (except passive air transfer devices).

- In warm climate zones a very good demand controlled exhaust ventilation system is comparable to a good HR-unit (no controls option) and in class A (Figure 2).
- In cold climates the exhaust ventilation systems are lower (Figure 3).
- The proposal reflects also the size of the units. In refurbishments and multifamily dwellings, space for the ventilation unit is limited.

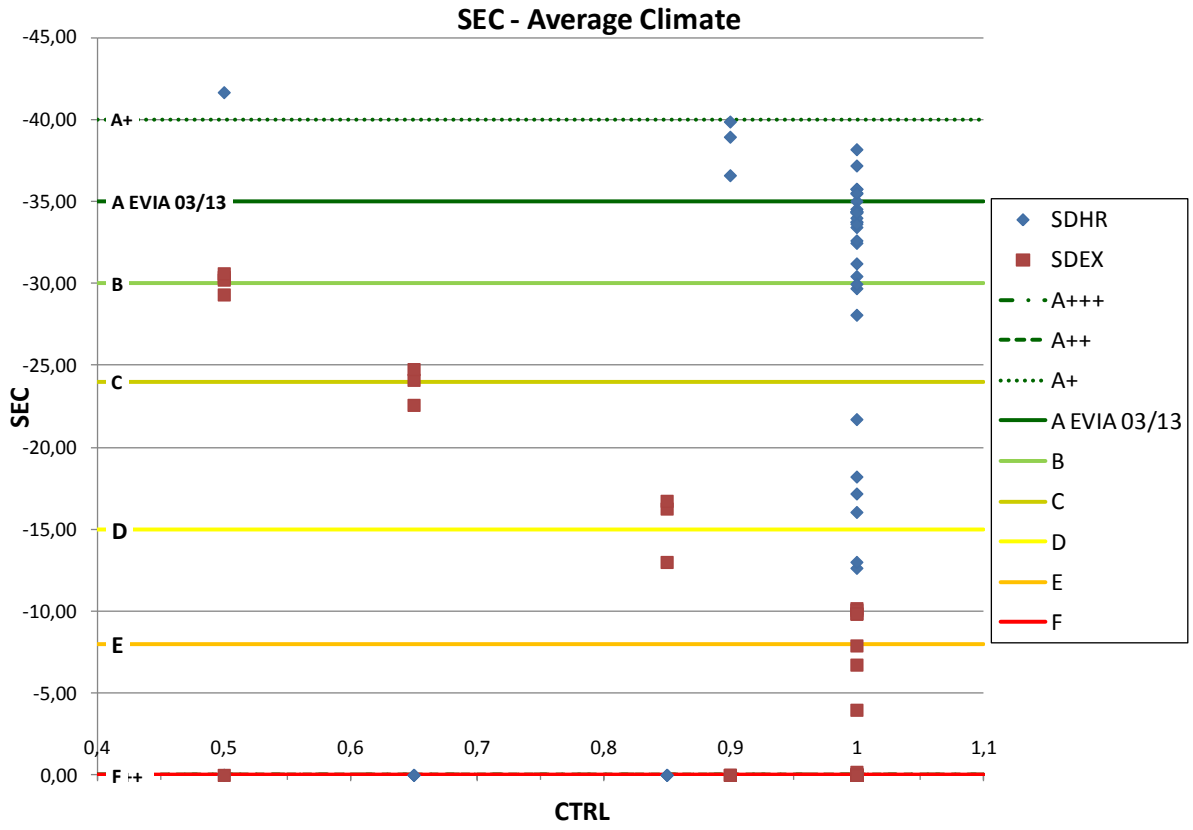


Figure 1: Typical products and classification according EVIA proposal average climate

Climate zones for classification:

EVIA stresses the importance to show an efficiency class for climate zones (warm and cold) instead the energy savings @100 m^2.

The reason is, that these given values do not reflect the aspects of the combination with the buildings and possibly the end user has a wrong expectation.

In warmer regions, DCV exhaust systems will lead to the same energy savings like HR Systems when considering heating energy demands.
Cold energy demand in air conditioned buildings is not considered in the current approach.

The label must show these aspects.

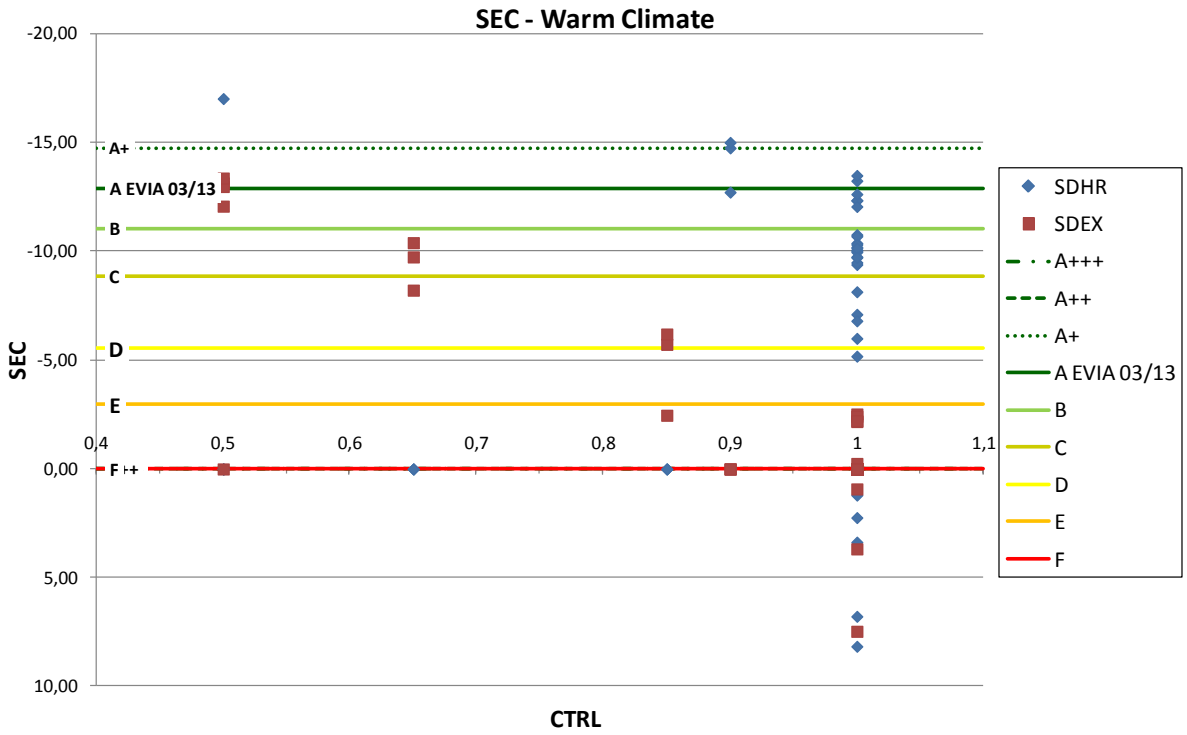


Figure 2: Typical products and classification according EVIA proposal warm climate

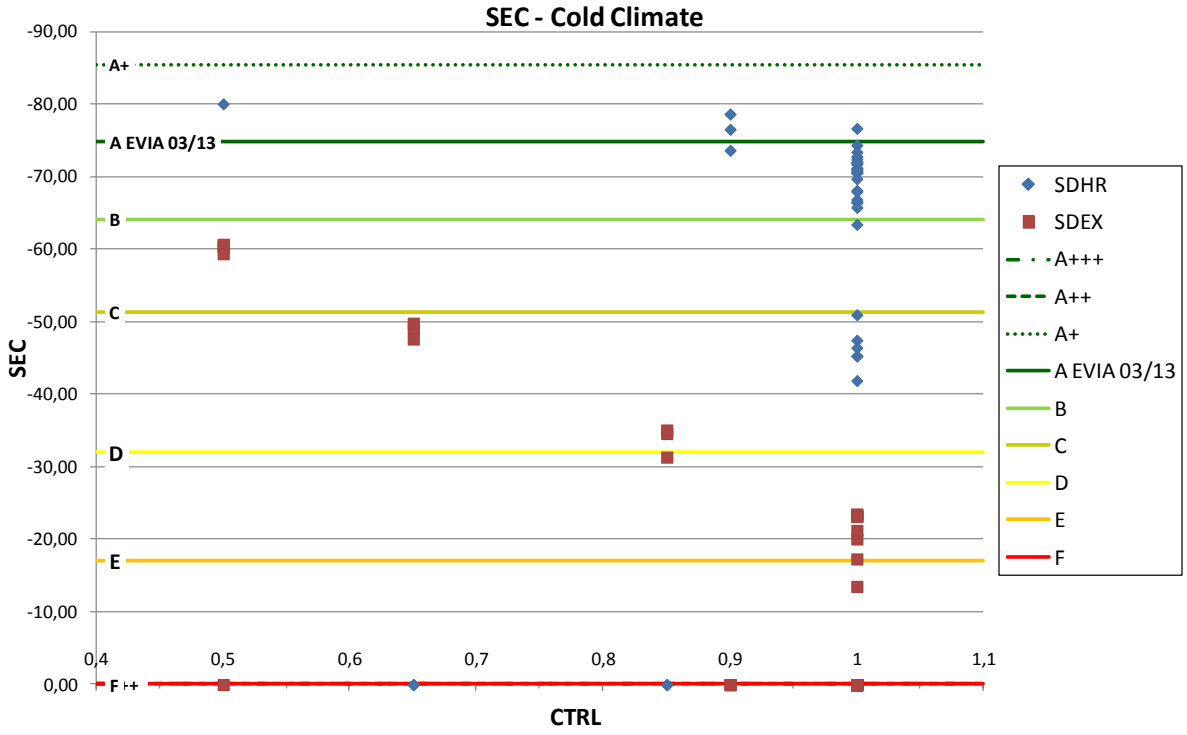


Figure 3: Typical products and classification according EVIA proposal cold climate

4. Minimum Requirements for Residential Ventilation units

Based on the calculation and the proposal for minimum requirements in EVIA comments document December 2012, EVIA proposes to fix the minimum requirements for bidirectional and unidirectional residential units based on average climate as follows.

	Tier 1		Tier 2		BAT	
	bidir	unidir	bidir	unidir	bidir	unidir
MISC	1,10	1,21	1,10	1,21	1,1	1,21
CTRL	1,00	1,00	1,00	0,90	0,65	0,50
X	2,00	2,00	2,00	2,00	2,00	2,00
SPI	0,45	0,23	0,35	0,18	0,30	0,10
ηt	0,75	0	0,80	0	0,85	0
SEC min (rounded)	**-24**	**-8**	**-30**	**-15**	**-42**	**-30**

The reasons are:

- Units shall be optimised in fan and HR aspects, which are currently tested. Controls aspects are not tested but EVIA agrees that this is an important aspect.
- The values of SPI and HR shall consider the available space in the building. This means optimised values will lead to big units. The size of the unit is an important

aspect especially in refurbishments. The given values reflect a compromise in these aspects.

Acoustics:

The minimum criteria for sound power radiated from the casing shall be for both Tier 1 and 2 (see EVIA comments December 2012):

- For units in a single room LWA < 45 dB(A) @reference volume flow
- For single dwelling units LWA < 55 dB(A) @reference volume flow

Definitions of control factors etc.:

The definitions shall consider EVIA proposal from December 2012 page 7 and 8.

5. The case of enthalpy recovery (clarification of 14th Dec. Document):

Humidity recovery can play an important role in the energy efficiency of residential ventilation when considering thermal comfort in winter and enthalpy recovery in summer cooling. EVIA supports the idea not to include these aspects in the current SEC-calculation by adding an additional humidity balance, but EVIA supports using a correction factor for temperature ratios.

Justification: All available plate heat recovery systems with humidity recovery will not fulfil the minimum criteria of dry temperature ratio of 80%.
EVIA proposes to allow a correction of temperature ratio, if humidity ratio is significant and measured.
The minimum thermal efficiency of heat recovery units with humidity recovery ratio (not condensing units) shall be calculated using the following table.

Class EN 13142	Humidity ratio %	Add %, in climate zone Cold	average	warm
I	>= 90	15	13	8
II	80-89	15	13	8
III	70-79	12	10	5
IV	60-69	8	6	3
V	50-59	5	3	0

A simplified approach might be: $\eta_{t,corr} = \eta_t * 1{,}125$ if $\eta_h \geq 0{,}6$

This aspect can be dealt in further guidance documents.

6. The case of fan system efficiency incorporated in the ventilation unit

EVIA still stresses the importance to allow different fan designs depending on the application (see comments of December 2012).

To avoid misunderstandings with fan regulation EU 327/2011, which defines a fan, this regulation should speak about ventilation fan systems. This means that a fan is incorporated in an additional housing. Unidirectional ventilation unit, if this fan in a casing is used for ventilation.

As a compromise and considering the current discussion on SFP values EVIA proposes a modified formula for the fan system efficiency.

Proposed formula:

$$\eta e_{ref} >= 6{,}2 \times LN(Pm) - 14{,}3 + X$$

T1: X = 46

T2: X = 56

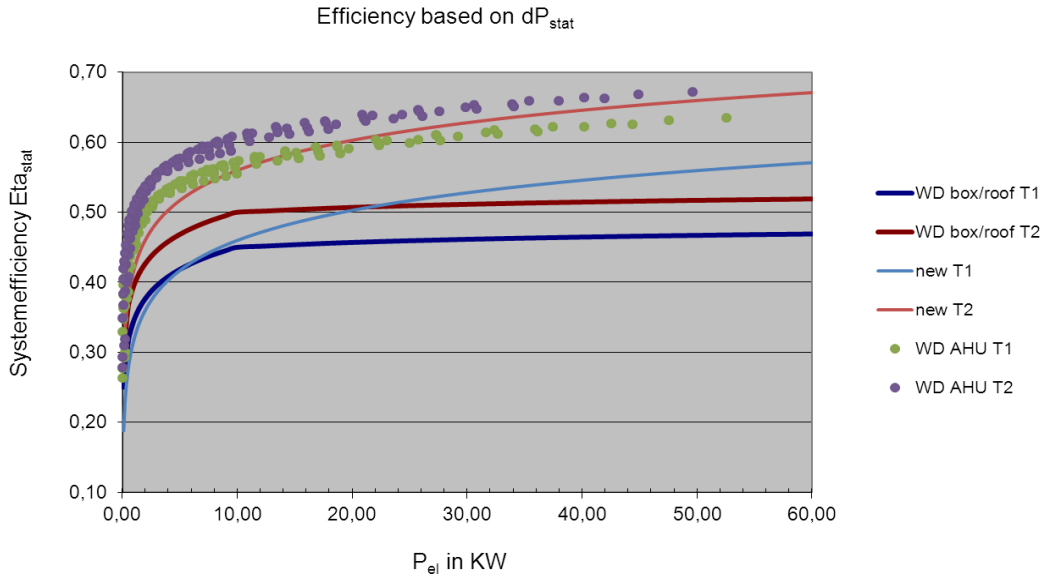


Figure 4: Proposal for a modified fan system efficiency

- Solves the inconsistency with EN 13053 pm classes.
- Gives add. 2 years for the industry needed to redevelop a great variety of products and applications between Tier 1 and 2.
- Comparable efficiency in Tier 1 at higher power, but solves the problems of smaller fans in smaller units to reach the target.
- Higher efficiency in Tier 2

- The fans inside shall comply with the fan regulation EU 327/2011. No further intermediate requirements for fans > 125W needed.

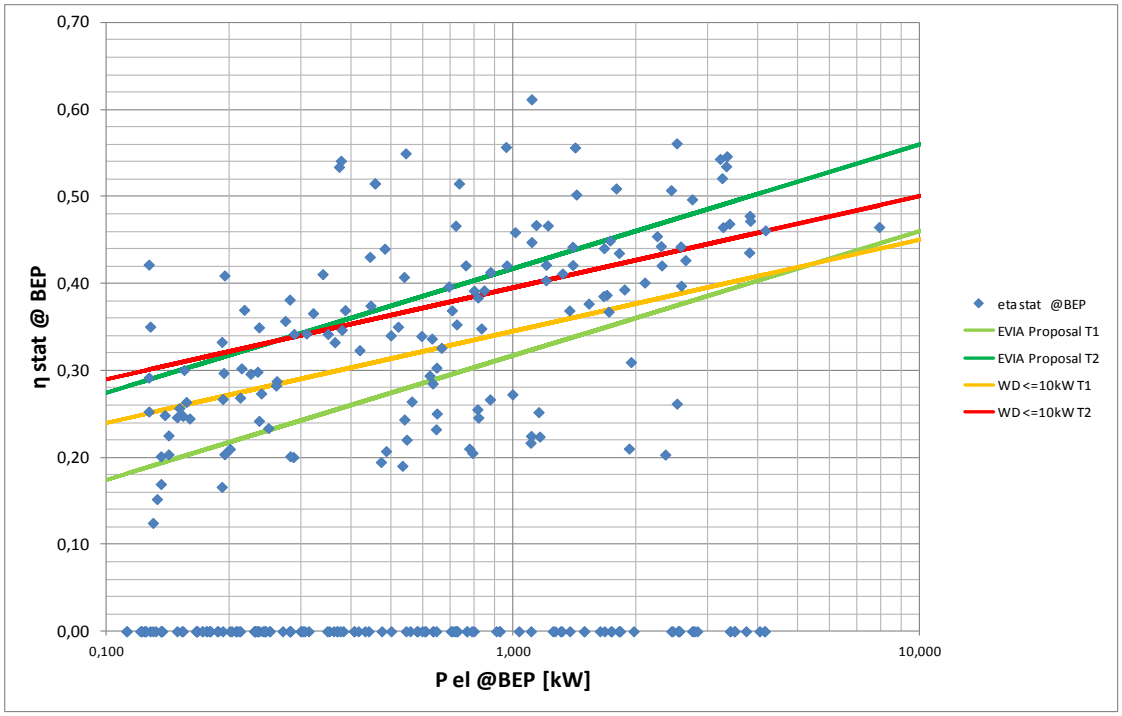


Figure 5: Typical box and roof fans and the EVIA proposal for min efficiency

7. Minimum Requirements of NRV-units

EVIA is observing the ongoing discussion on various approaches using SFP values to define minimum efficiency for air transportation. All of them do have positive aspects, but none of them is covering all the needs of the wide product range which is in the scope of the discussed regulation.

None of them has been approved in practice!

Any SFP approach has the problem, that a better heat recovery will lead to a higher pressure drop and therefore to a higher SFP value. The definition of a general correction factor is complex and not solved.

EVIA is still requesting to follow up the approach drafted in the working document October 2012 which is an approved practice based on valid EN Standards and is known by the manufacturer and customer (business to business).

The following aspects shall be considered.

The current definitions are not really sufficient. EVIA proposes to use the following to split between unidirectional Ventilation Units and Air Handling Units:

- **Unidirectional Air Handling Units** means fan system plus minimum one add treatment (for example filter, or other)
  Minimum requirements:
  - Fan system efficiency
  - Air velocity
- **Unidirectional Ventilation Unit** means fan in a casing (fan systems) without any other treatment (filter etc.)
  - Minimum requirements only fan system efficiency (see 6)
- **Bidirectional AHU** means supply and exhaust volume flow plus minimum one add air treatment (filter, thermal, etc).
  Minimum requirements based on
  - Fan system efficiency
  - Air velocity
  - Heat recovery

Energy efficiency of heat recovery according EN 13053 (considering pressure drop of HR section)

- Tier 1 heat recovery class H2
- Tier 2 heat recovery class H1

EVIA Position on Ecodesign requirements for ventilation units

10th April 2013

SFP approach for NR-Ventilation units:

EVIA would favourite to shift all SFP data to the mandatory product information.

This would have the following benefits:

- No need for new definitions.
- The SFP values as needed in EPBD calculation at operating point and selected design can be given based on EN 13779.
- Impossible to rate or compare SFP values in units with different HR performance
- Flexible in use

EVIA will help to convince the nordic countries, that such an approach will better fit to EPBD criteria and comparisons in complete systems which is the target of SFP.

EVIA would like to keep the following requirements for the units:

1. Bidirectional Air Handling Units (Balanced Units or combined units with supply and exhaust air flow)
    a. Heat recovery requirement H2 (tier 1) and H1 (tier 2)
    b. Min. fan system efficiency see chapter 6. The fan inside shall comply with fan regulation 327/2011
    c. Velocities inside of the unit (that will have a impact to additional components too)
        i. y = 0,1418Ln(x) + 0,7326 / (Tier 1) 1,8 to 2,2 m/s as a function of air flow rate
        ii. y = 0,1407Ln(x) + 0,5574 / (Tier 2) 1,6 to 2,0 m/s as a function of air flow rate

2. Unidirectional Air Handling Units (with air treatment in supply or exhaust air flow)
    a. Min. fan system efficiency see chapter 6. The fan inside shall comply with fan regulation 327/2011
    b. Velocities inside of the unit (that will have a impact to additional components too)
        i. y = 0,1418Ln(x) + 0,7326 / (Tier 1) 1,8 to 2,2 m/s as a function of air flow rate
        ii. y = 0,1407Ln(x) + 0,5574 / (Tier 2) 1,6 to 2,0 m/s as a function of air flow rate

3. Unidirectional Ventilation Units without any components or air treatment (supply or exhaust air flow)
    a. See chapter 6

Velocities inside the unit for refurbishments:

A suitable option should be allowed, if the space in refurbishments is not enough to reach the targets.

EVIA Position on Ecodesign requirements for ventilation units

10th April 2013

Alternative proposal for minimum requirements based on modified SFP approach:

If an approach based on SFP values cannot be avoided, EVIA would like to help developing a suitable and practicable approach. Based on lab tests, EVIA developed an approach for AHU´s.
But considering all the possible impact´s, EVIA requests the commission not to use such an approach.

Non Residential ventilation units shall comply with the following requirements:

- Bidirectional Air Handling Units:
  - Efficiency of heat recovery shall be t least
    - H2 for Tier 1
    - H1 for Tier 2
  - SFP (for heat recovery function) shall be at least
    - SFP = -170 * ln(qV) + X for Tier 1
      X = 2335 supply, X = 2232 exhaust
    - SFP = -147 * ln(qV) + X for Tier 2
      X = 2072 supply, X = 2000 exhaust
  - Maximum velocity for additional components shall be:
    - Cmax = 0,141 * ln(qV) + Y [m/s]
      - Y = 0,73 for Tier 1
      - Y = 0,55 for Tier 2
- Unidirectional Air Handling Units:
  - No heat recovery
  - SFP to be determined on same basis as Bidirectional AHU without HR or using minimum fan system efficiency according chapter 6
  - Maximum velocity for additional components shall be:
    - Cmax=0,141 * ln(qV) + Y [m/s]
      - Y = 0,73 for Tier 1
      - Y = 0,55 for Tier 2
- Unidirectional Ventilation Units:
  - No heat recovery
  - The minimum fan system efficiency shall be
    η e,ref = 6,2 * ln(Pm) - 14,3 + X
    - X = 46 for Tier 1
    - X = 56 for Tier 2
  - No velocity requirements

Pm: elec. Power input [kW]
qV: Air volume flow [m3/h]
SFP: SFP internal [W/(m3/s)]
Cmax: max velocity in net space [m/s]

If a filter is selected an energy efficient filter has to be possibly installed.

Justification for the approaches stated above:

The velocity inside of the unit can be defined as a function related to the air low rates in m³/h

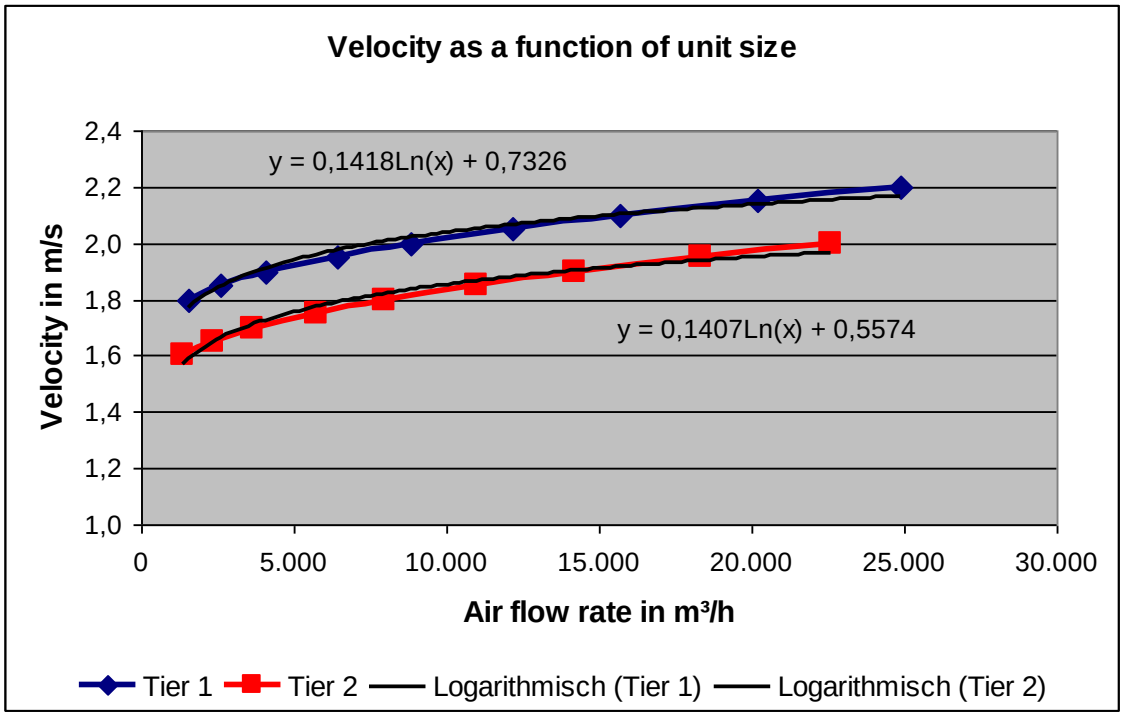


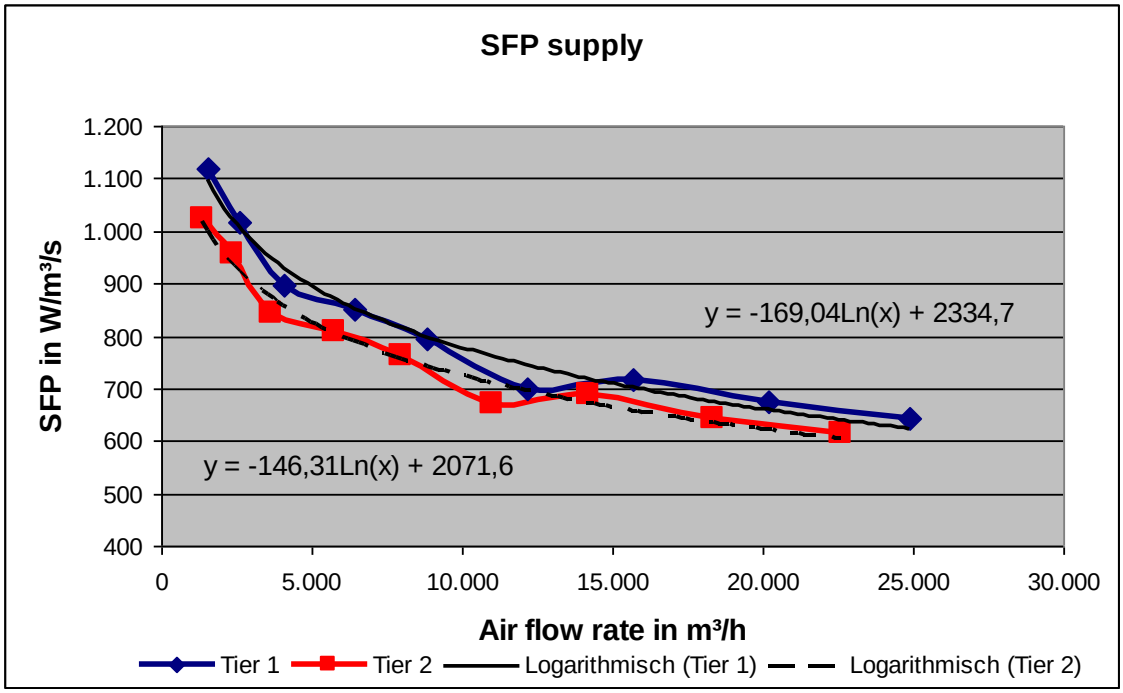
Figure 6: Air Velocity as a function of unit size

Despite of the statements above, EVIA will help to develop a compromising SFP approach based on the ongoing discussion for **air handling units.**

If SFP could not be avoided the SFP-values should be possible for all heat recovery systems.

And we have to deal with the fact, that the velocity inside of the components is different to the velocity inside of the unit.
Therefore we need a separation in SFP related to the different systems and to the size of the units (air flow rate):

Units with heat recovery:



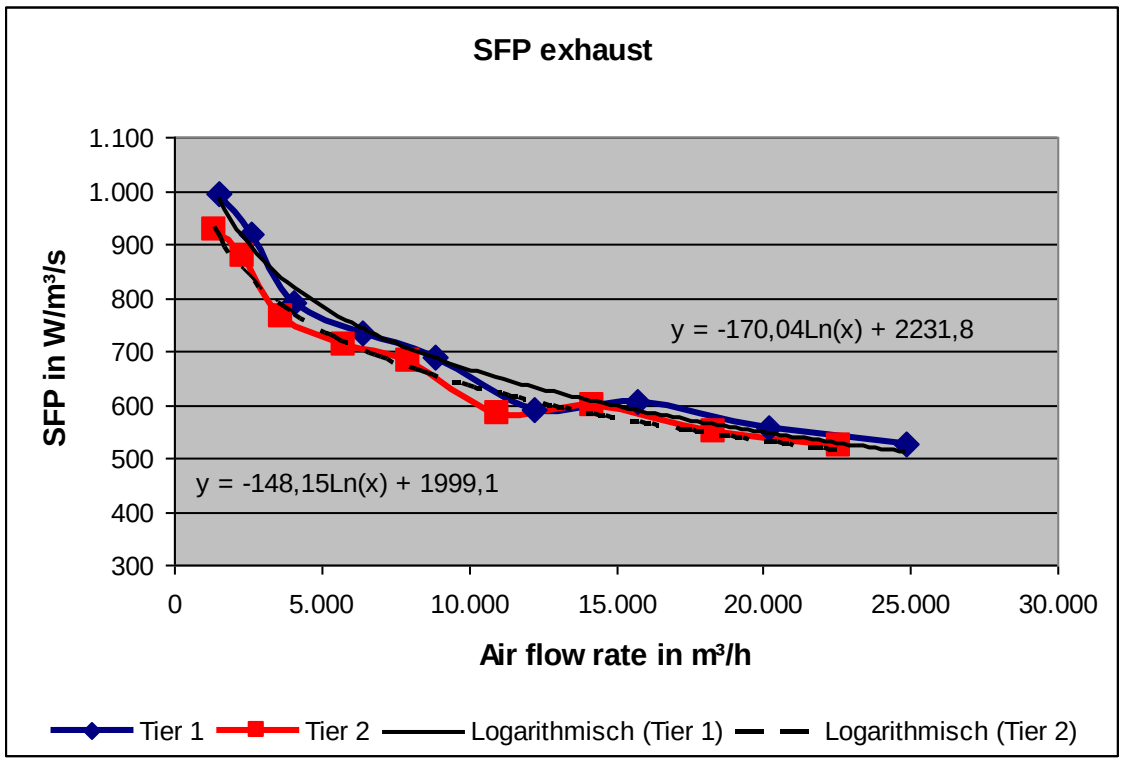


Figure 7: Proposal for max SFP values for HR ventilation units.

If the requirement on heat recovery will be lowered to 71 % thermal efficiency in tier 2 the effect on SFP will be significant:

If the SFP-approach will be used in an application where higher HR-efficiencies than the minimum must be installed in the requirements on SFP must be corrected.
For example: If the efficiency if higher than 75 % (or 71 %) a additional SFP of 300 W/m³/s could be used.

8. General aspects

EVIA still highlights the following aspects:

- Minimum requirements of acoustics in NRVU do not make sense > shift to the product information