Team member	Phone	Email	Version
Morten Schmelzer	+32 (0)466 90 04 01	morten.schmelzer@eurovent.eu	2019-03-28

Eurovent consolidated Position Paper concerning Revision of Commission Regulation (EU) No 1253/2014 (Ventilation Units)

Scope: **Non-Residential Ventilation Units**

In a nutshell

Within this Position Paper, the Eurovent Association provides its in-depth, preliminary positions concerning the ongoing review of Commission Regulation (EU) No 1253/2014 (ecodesign requirements for ventilation units).

While strongly supporting the European Union's Ecodesign concept and increasing minimum energy efficiency requirements as a means to support innovation and competitiveness of our industry, our members also acknowledge the need to further develop the Ventilation Units Regulations based on market experiences made.

Given the large amount of input, this Position Paper is being split into the following sections:

Important remarks

This Position Paper covers non-residential ventilation units only. Residential ventilation units are being dealt with in a separate Position by our Product Group 'Residential Air Handling Units'.

While no major changes are being expected, these Positions remain subject to a final vote by members of the Eurovent Product Group 'Air Handling Units' on 15 April 2019 in Vilnius, Lithuania.

Authors

The above-mentioned Positions derive from 1,5 years of joint efforts of the Eurovent Product Group 'Air Handling Units', which represents more than 120 manufacturers of non-residential ventilation units across Europe (incl. Russia and Turkey). Whenever necessary, our Product Groups 'Energy Recovery Components' and 'Air Filters' as well as statistical experts of Eurovent Market Intelligence were consulted to guarantee the highest possible validity.

Review background

In February 2019, the European Commission has initiated the Review Study concerning its Ecodesign and Energy Labelling Regulations on Ventilation Units. The review is being carried out by VHK and managed by Vito. It will include the review of existing Regulations EU 1253/2014 (Ecodesign requirements for ventilation units) and EU 1254/2014 (energy labelling of residential ventilation units).

I. Eurovent Position 1 of 5: Request to provide further clarifications and amendments in the regulatory text

In a nutshell

With this Position Paper, Eurovent and its members provide the European Commission with a proposal of amendments in the regulatory text to limit space for its interpretation. It shall also better regulate several ambiguous issues, which have appeared in the market after publication of the first EU Ventilation Unit Regulation. The proposed amendments derive from the Eurovent/EVIA Guidance Document on Ecodesign requirements for Ventilation Units, which has been developed taking into account practical experiences of manufactures associated with Eurovent and EVIA.

Background

According to Article 8, the European Commission Regulation (EU) No 1253/2014 (Ventilation Units) is subject to review. Eurovent holds that this opportunity should be used to improve content which leaves too much room for different interpretations.

Proposal

Below, Eurovent provides concrete proposals of regulatory text updates. To provide for transparency and consistency, on the top of each table the related issues addressed in the Eurovent/EVIA document are referred.

[Q6] What is meant by 'toxic, highly corrosive or flammable or in environments with abrasive substances', Article 1 (f), (v)?
[E104] Which ventilation units are not in the scope?
[E140] Repair and exchange of complete units, subassemblies and components. What is meant by repair and changing the entire unit?
[R5] Question on scope for various types of ventilation units
[E139] Is a unit supplying a professional kitchen in the scope?
[Q8] Are professional range hoods in scope to Regulation 1253/2014?
[Q11] Are products designed for 100% recirculation considered as ventilation units?

Reference	Current text	Proposed amended text
Article 1 Point 2 (f) (v)	2. This Regulation shall not apply to ventilation units which: ... (f) are exclusively specified as operating: ... (v) in toxic, highly corrosive or flammable environments or in environments with abrasive substances; (g) include a heat exchanger and a heat pump for heat recovery or allowing heat transfer or extraction being additional to that of the heat recovery system, except heat transfer for frost protection or defrosting;	2. This Regulation shall not apply to ventilation units which: ... (f) are exclusively specified as operating: ... (v) in toxic, highly corrosive or flammable environments or in environments with abrasive substances and are exclusively designed for extract of air from such an environment without any purpose of ventilation. This can be for example an extract air unit for a laboratory fume hood or a technical extraction system of a machinery. ~~(g) include a heat exchanger and a heat pump for heat recovery or allowing heat transfer or extraction being additional to that~~

		~~of the heat recovery system, except heat transfer for frost protection or defrosting;~~ **EUROVENT Proposal** NRVU including a heat exchanger and a heat pump for heat recovery or allowing heat transfer or extraction being additional to that of the heat recovery system shall be covered in the scope of Regulation 1253/2014. Minimum requirements for this kind of units should allow for energy impact of the heat pump and additional pressure drop over an evaporator and a condenser. new point (?)consist of single components that are used for exchanging similar old existing components or adding components (replacement of components). new point (?) are used for replacing of old worn units in construction objects having a status of the historic landmarked building, where fitting the ErP compliant unit is not feasible. new point (?) are exclusively intended for dehumidification or de-chlorination of spaces not designed for human occupancy. new point (?) Devices equipped with at least one impeller, one motor and a casing, intended exclusively to operate as a commercial kitchen ventilation hood and not covered in the scope of Commission Regulation (EU) No 66/2014 new point (?) have a connection to the outdoor with a supply/exhaust air flow rate in regular heating operation (whenever using heat recovery) below 10%, of the total declared air flow rate, nevertheless capable of operating with 100% outdoor air at designed air flow rate exclusively for free-cooling purposes.

[Q25] What is it meant for 'nominal flow rate' for NRVUs under Regulation 1253/2014? At which conditions shall a manufacturer refer to? [Q26] What is the demand for fluid mixture in Run around coil (RAC) system? [E138] How to calculate heat recovery efficiency with unbalanced air volume flow? – with consideration of RAC systems with 2 or more coils on exhaust [NEW] How to declare the thermal efficiency of a run-around coil HRS with additional heat injection		
Reference	Current text	Proposed amended text
Annex I Point 2 (11)	(11) 'thermal efficiency of a non-residential HRS (η_{t_nrvu})' means the ratio between supply air temperature gain and the exhaust air temperature loss, both relative to the outdoor temperature, measured under dry reference conditions, with balanced mass flow, an indoor-outdoor air temperature difference of 20 K, excluding thermal heat gain from fan motors and from internal leakages;	(11) 'thermal efficiency of a non-residential HRS (η_{t_nrvu})' means the ratio between supply air temperature gain and the exhaust air temperature loss, both relative to the outdoor temperature, measured under dry reference conditions, with balanced mass flow, at the highest designed outdoor air flow rate through HRS when the thermal by-pass facility is not in use, an indoor-outdoor air temperature difference of 20 K, excluding thermal heat gain from fan motors and from internal leakages; Thermal efficiency of a run-around HRS allowing for heat transfer (injection) being additional to that of the heat recovery system shall be declared under condition when this additional heat transfer is active. The negative impact of heat injection on the thermal efficiency of the round-around HRS shall be considered. At the same time the positive impact of heat (or cooling energy) injection on the electrical power consumption should be also considered. Thermal efficiency of run-around HRS shall be declared for a system filled with a mixture of water and antifreeze fluid as defined by a manufacturer for the design conditions. If nothing is specified it is considered that the brine in the HRS is a mixture with 25 % ethylene glycol and 75% water. For a HRS of which design does not enable operation with balanced mass flow, and for a combined run-around HRS comprising multiple coils, the

		thermal efficiency shall be calculated as explained in ANNEX IX
Annex IX Point 1	THERMAL EFFICIENCY OF A NON-RESIDENTIAL HEAT RECOVERY SYSTEM The thermal efficiency of a non-residential heat recovery system is defined as $\eta_{t\_nrvu} = (t_2'' - t_2') / (t_1' - t_2')$ where: …….	THERMAL EFFICIENCY OF A NON-RESIDENTIAL HEAT RECOVERY SYSTEM The thermal efficiency of a non-residential heat recovery system is defined as $\eta_{t\_nrvu} = (t_2'' - t_2') / (t_1' - t_2')$. For an HRS of which design does not enable operation with balanced mass flow, the thermal efficiency at balanced conditions is calculated as: $\eta_{t\_nrvu} = \frac{1}{1 + \frac{1}{NTU}}$ $NTU(Z \neq 1) = \frac{1}{Z-1} * ln\left(\frac{1-\eta_{tt}}{1-Z*\eta_{tt}}\right)$ $Z = \frac{qm_{SUP}}{qm_{ETA}}$ where: η_{tt} - thermal efficiency at unbalance mass flows qm_{SUP} – mass flow of supply air qm_{ETA} – mass flow of extract air If supply and/or exhaust air side consists of more than one air stream (e.g. run around coils systems), then the SFPint.air_side shall be calculated for each side by using the following formula (ref. EN 13053: $SFP_{\text{int,air\_side}} = \frac{P_{\text{el,int,1}} + P_{\text{el,int,2}} + \cdots + P_{\text{el,int,n}}}{q_{\text{v,1}} + q_{\text{v,2}} + \cdots + q_{\text{v,n}}}$ *SFP_{int}* is the sum of *$SFP_{int, supply}$* and *$SFP_{int, exhaust}$* if both supply and exhaust air side exist.

[E117] Is it possible to install one UVU for supply and one UVU for exhaust in a building or part of a building?		
Reference	Current text	Proposed amended text
Article 2	For the purposes of this Regulation the following definitions shall apply:	For the purposes of this Regulation the following definitions shall apply:

	.... (6) 'bidirectional ventilation unit' (BVU) means a ventilation unit which produces an air flow between indoors and outdoors and is equipped with both exhaust and supply fans;	.... (6) 'bidirectional ventilation unit' (BVU) means a ventilation unit which produces an air flow between indoors and outdoors and is equipped with both exhaust and supply fans. As a BVU should be considered also two or more units combined with a run-around HRS and two or more units directly (without building sided ductwork) connected with a mixing chamber;

[E104] Definition of Ventilation Unit - What is meant by 'to replace utilised air by outdoor air'?		
Reference	Current text	Proposed amended text
Article 2 Point 1	'ventilation unit (VU)' means an electricity driven appliance equipped with at least one impeller, one motor and a casing and intended to replace utilised air by outdoor air in a building or a part of a building;	'ventilation unit (VU)' means an electricity driven appliance equipped with at least one impeller, one motor and a casing and intended to replace utilised air by outdoor air in a building or a part of a building. The utilised air means the polluted air due to the presence of human beings and their use of the building including emissions from materials, equipment, internal and external heat gains.

[E135] How to declare a ventilation unit with recirculation		
Reference	Current text	Proposed amended text
Annex I Point 2 (9)	'internal pressure drop of ventilation components (Δps,int)' (expressed in Pa) means the sum of the static pressure drops of a reference configuration of a BVU or an UVU at nominal flow rate;	'internal pressure drop of ventilation components (Δps,int)' (expressed in Pa) means the sum of the static pressure drops of a reference configuration of a BVU or an UVU at nominal flow rate. For the BVU including recirculation air and with outdoor air flow rate between 10% and 100% of nominal flow rate, static pressure drops of the reference configuration are considered for maximum declared outdoor air flow rate under winter heating conditions (whenever heat recovery is used).
Annex I Point 2 (11)	(11) 'thermal efficiency of a non-residential HRS (η_{t_nrvu})' means the ratio between supply air temperature gain and the exhaust air temperature loss, both	(11) 'thermal efficiency of a non-residential HRS (η_{t_nrvu})' means the ratio between supply air temperature gain and the exhaust air temperature loss, both relative

	relative to the outdoor temperature, measured under dry reference conditions, with balanced mass flow, an indoor-outdoor air temperature difference of 20 K, excluding thermal heat gain from fan motors and from internal leakages;	to the outdoor temperature, measured under dry reference conditions, with balanced mass flow, an indoor-outdoor air temperature difference of 20 K, excluding thermal heat gain from fan motors and from internal leakages. For a BVU including recirculation air and with outdoor air flow rate between 10% and 100% of the nominal flow rate, the maximum declared outdoor air flow rate under winter heating conditions (whenever heat recovery is used) is considered.
Annex V	Information requirements for NRVUs as referred to in Article 4(2)	Information requirements for NRVUs as referred to in Article 4(2) ...... new point (?) declared maximum outdoor air flow for a BVU operating with recirculation under winter heating conditions (whenever heat recovery is used)
Annex I	2. Definitions for NRVU, in addition to the definitions in Annex I Part 1:	2. Definitions for NRVU, in addition to the definitions in Annex I Part 1: new point (?) 'declared maximum outdoor air flow rate' means for a BVU operating with recirculation air the maximum designed air flow rate of outdoor air between 10% and 100% of the nominal flow rate, under winter heating conditions, whenever heat recovery is used.

[Q20] How should an NRVU be declared in the case that the design point is not known at the time it is placed on the market

[E132] Shall non-residential BVU be declared at one point or as a valid area?

Reference	Current text	Proposed amended text
Annex V	Information requirements for NRVUs as referred to in Article 4(2) ... (f) thermal efficiency of heat recovery...; (g) nominal NRVU flow rate in m^3/s; ... (i) SFPint in $W/(m^3/s)$; ...	Information requirements for NRVUs as referred to in Article 4(2) ... (f) thermal efficiency of heat recovery...; (g) nominal NRVU flow rate in m^3/s; ... (i) SFPint in $W/(m^3/s)$; ...

	(k) nominal external pressure (Δps, ext) in Pa; … (s) internet address for disassembly instructions as referred to in point 3.	(k) nominal external pressure (Δps, ext) in Pa; … (s) internet address for disassembly instructions as referred to in point 3. If the working point is not specified by the customer, the manufacturer can declare the 'flow rate – external pressure' performance graph showing an area in which the min. requirements are met. The area is circumscribed by at least five points indicating all cross sections. (An example of graphical representation of the area is shown in the EU FAQ document – figure 6). For each of this point information required in (f), (g), (j) and (k) must be specified.

[E106] What is part of an UVU and what is an external component?		
Reference	Current text	Proposed amended text
Article 2 Point 5	(5) 'unidirectional ventilation unit' (UVU) means a ventilation unit producing an air flow in one direction only, either from indoors to outdoors (exhaust) or from outdoors to indoors (supply), where the mechanically produced air flow is balanced by natural air supply or exhaust;	(5) 'unidirectional ventilation unit' (UVU) means a ventilation unit producing an air flow in one direction only, either from indoors to outdoors (exhaust) or from outdoors to indoors (supply), where the mechanically produced air flow is balanced by natural air supply or exhaust; Components to be considered is only fan including casing without any other accessories. Filters as part of the unit have to be considered according reference design described in *ANNEX IX*

[E141] What exactly is meant with a thermal by-pass?		
Reference	Current text	Proposed amended text
ANNEX III Point 2	The HRS shall have a thermal by-pass facility	The HRS shall have a thermal by-pass facility, except for duly justified cases (notably swimming-pool or high supply air temperature application), requiring heat recovery all year long.

II. Eurovent Position 2 of 5: The appropriateness of taking into account the effects of low-energy consuming filters on the energy efficiency

In a nutshell

Taking into account the effects of low-energy air filters on the energy efficiency of ventilation units constitutes a mandatory revision item. Eurovent and its members believe that this revision provides for a major opportunity to rightly account not only for a higher energy efficiency, but also a better indoor air quality and machine maintenance.

Within this Position Paper, Eurovent thus suggests to the European Commission to:

1. **Set focus on the filter media velocity,**
2. **Limit the velocity on the filter media for all filters inside the unit according to EN ISO 16890 classes,**
3. **Define the maximum final pressure difference for filters,**
4. **Strengthen the mandatory information requirements both on the printout and on the filter sections,**
5. **Introduce a filter correction factor.**

Background

The European Commission Regulation (EU) No 1253/2014 (Ventilation Units) states within Article 8 that the review shall assess **"the appropriateness of taking into account the effects of low-energy consuming filters on the energy efficiency".**

Proposal

1. Set focus on filter media velocity

Based on a survey conducted within Eurovent among 100+ manufacturers within our Product Group "Air Handling Units" and "Residential Air Handling Units", Eurovent holds that it is not sufficient to take into consideration only the clean pressure drops as in the current Regulation in place (SFP_{int}), but to instead go a step further.

We propose to additionally take into account the complete surface of a filter, and to calculate the velocity in this area by applying the following formula:

Air flow of the unit in m^3/s / Active area of the filter media in m^2

The surface area has to be provided by filter suppliers or, if not, can be easily measured. For market surveillance authorities, this would also be easily manageable.

2. Limit velocity on the filter media

Eurovent proposes to limit the velocity on the filter media for all filters inside the unit (and not only the reference configurations). We propose the limit of 0.2 m/s for filter classes according to EN ISO 16890 and EN 1822. Today, for bag filters, there are already requirements from European standardisation that go in a similar direction. According to EN 13053-2018, if bag filters are used, the filter area should be at least 10 m^2 per 1 m^2 equipment cross-section.

We propose to expand those requirements and implement them into the regulation.

3. Define the maximum final pressure difference for filters

As per EN 13053-2018, we suggest introducing the following maximum final pressure difference for filters in the Regulation:

Filter class	Final pressure difference
ISO coarse	The smaller value of either adding 50 Pa to the clean filter pressure difference or three times the pressure difference of clean filters.
ISO ePM1, ISO ePM2,5, ISO ePM10	The smaller value of either adding 100 Pa to the clean filter pressure difference or three times the pressure difference of clean filters.

4. Strengthen information requirements

Efficient filters tend to be applied when a unit is placed on the market for the first time. After that, it is usually left to building maintenance to monitor the air filters installed in units and to replace them when considered necessary. This is the optimal scenario. Yet, the market reality often looks different in many EU Member States. Given the high impact of an air filter on energy efficiency and indoor air quality, Eurovent thus strongly believes that the information requirements should be strengthened in order to guide people towards choosing the right replacement filter while replacing it at the right intervals.

4.1 Product information on the data sheet

ANNEX V of the current Regulation in place states the information requirements for NRVUs. This information should be expanded and additionally include:

- Velocity to the filter media
- Filter classes (as they are of high IAQ relevance)
- Clean pressure drops
- Maximum final pressure difference for filters

The following NRVU information requirement within ANNEX X (q) should be extended as follows:

> (q) description of visual filter warning for NRVUs intended for use with filters, including text pointing out the importance of regular filter changes for performance, hygienic aspect and energy efficiency of the unit, **and a recommendation on filter exchange intervals.**

4.2 Information requirements on the filter section

Taking into account requirements set within EN 13053-2018, Eurovent suggest introducing the following mandatory information requirements on the filter section in a clear, visible form (e.g. label):

- Filter class,
- Type of filter,
- Final pressure drop.

On changing the filter, the user shall check and update this information.

5. Introduce a filter correction factor

5.1 General principles

In line with EVIA's proposal, Eurovent recommends changing the formula of the SFP limit requirement to make the limit dependent on the filtration level of the used filter.

For this, a typical value of filter SFP for each filter classified according to EN ISO 16890 from ISO Coarse ≥ 60% (G4) to ISO ePM1 ≥ 80% (F9) would need to be introduced.

If there are several filter stages, all filters are to be considered ventilation components, meaning that the filter SFP value is to be applied to each filter.

This procedure shall be used for BVU's as well as for UVU's.

5.2 Proposed SFP values per filter type

For each upcoming Tier of the future Regulation, Eurovent proposes to reduce the SFP values compared to the 2018 requirements. Doing so reflects our industry's mission to increasing filtration efficiencies while contributing to a better indoor air quality. The following values are being proposed:

	2018 requirements							
Filter class EN 779	ISO ePM_1	SFP	ISO $ePM_{2.5}$	SFP	ISO ePM_{10}	SFP	ISO Coarse	SFP
G4							≥ 60%	90
M5					≥ 50%	150		
M6			≥ 50%	170				
F7	≥ 50%	190						
F8	≥ 70%	230						
F9	≥ 80%	260						

	Tier 1 of the future Regulation							
Filter class EN 779	ISO ePM_1	SFP	ISO $ePM_{2.5}$	SFP	ISO ePM_{10}	SFP	ISO Coarse	SFP
G4							≥ 60%	**70**
M5					≥ 50%	**120**		
M6			≥ 50%	**135**				
F7	≥ 50%	**150**						
F8	≥ 70%	**185**						
F9	≥ 80%	**210**						

For Tier 2 of the future Regulation, these SFP levels should be further reduced.

Example SFP requirements (taking into account 2018 requirements mentioned above)

Current requirements for BVU NRVU

Run around coil energy recovery components:

$$1600 + E - 300 * \frac{q_{nom}}{2} - F \; if \; q_{nom} \leq 2 \, m^3/s \; and$$

$$1300 + E - F \; if \; q_{nom} \geq 2 \, m^3/s$$

All others ERCs:

$$1100 + E - 300 * \frac{q_{nom}}{2} - F \; if \; q_{nom} \leq 2 \, m^3/s \; and$$

$$800 + E - F \; if \; q_{nom} \geq 2 \, m^3/s$$

UVU intended to be used with filters:

$$250$$

F = 150 if medium filter is missing

F = 190 if fine filter is missing

Proposed requirement

Run around coil ERC:

$$\mathbf{1260} + E - 300 * \frac{q_{nom}}{2} + \boldsymbol{F_{sup}} + \boldsymbol{F_{exh}} \; if \; q_{nom} \leq 2 \, m^3/s \; and$$

$$\mathbf{960} + E + \boldsymbol{F_{sup}} + \boldsymbol{F_{exh}} \; if \; q_{nom} \geq 2 \, m^3/s$$

All others ERCs:

$$\mathbf{760} + E - 300 * \frac{q_{nom}}{2} + \boldsymbol{F_{sup}} + \boldsymbol{F_{exh}} \; if \; q_{nom} \leq 2 \, m^3/s \; and$$

$$\mathbf{460} + E + \boldsymbol{F_{sup}} + \boldsymbol{F_{exh}} \; if \; q_{nom} \geq 2 \, m^3/s$$

UVU intended to be used with filters

$$230 + \boldsymbol{F_{sup}} (\boldsymbol{or} \; \boldsymbol{F_{exh}})$$

F_{sup} and F_{exh}: values from table above

III. Eurovent Position 3 of 5: The appropriateness of introducing new requirements for NRVUs concerning leakages

In a nutshell

Within this Position Paper, Eurovent suggests the European Commission to introduce new requirements for all NRVUs in order to prevent problems caused by leakages. The reasons for this are outlined in the following Position Paper, where we:

1. **Re-define and rename the crucial terms concerning leakages, namely "internal leakage" and "carry over",**
2. **Define potential leakage problems and take into consideration their possible solutions,**
3. **Introduce requirements on NRVU concerning leakages to prevent the mentioned problems.**

Background

The European Commission Regulation (EU) No 1253/2014 (Ventilation Units) states within Article 8 that the review shall include an assessment of "the need to set requirements on air leakage rates".

Reasoning

Based on the expertise of manufacturers within the Eurovent Product Group 'Air Handling Units' (PG-AHU), Eurovent holds that in order to assure proper implementation of the revised Regulation, it is necessary to define "*required supply air flow rate*" and re-define the terms "*nominal flow rate*", "*internal leakage*" and "*carry over*" of the current Regulation.

The conclusion of the definition (1) in Article 2 is that the supply air flow of a ventilation unit (VU) shall contain the design outdoor air flow.

Leakages associated with a bidirectional ventilation unit (BVU) will impact the nominal flow rate and the pressure balance in a building. The leakages must therefore be taken in consideration.

Internal leakage in heat recovery exchangers can cause waste of energy and can have negative impact on indoor air quality. Furthermore, the ventilation units are tested on site during commissioning and market surveillance. If the internal leakages are not taken into calculation in air flows and power consumption, there is a large risk that the unit fails during commissioning and market surveillance.

The current definition does neither provide for an added value, nor correct information to make an evaluation of the performance of an Energy Recovery Component by consumers, nor decision-makers about internal leakages and exhaust air leakage in supply air in actual design conditions or in actual ventilation unit configuration.

There is a need to re-define the terminology and use design conditions instead of actual conditions (non-residential units only). Failing to use design conditions and having unclear or no definition of OACF and EATR in design conditions could lead into problems with market surveillance and a significant rise of the power consumption (up to 40% higher).

1. Proposal for new definitions and redefinitions

1.1 Required supply air flow rate

We propose, in Article 2 – "*Definitions*", to add a new definition "*Required supply air flow rate*" as follows:

"Required supply flow rate (qreq - expressed in m³/s)" means the required design outdoor flow rate of an NRVU – BVU at standard air conditions 20°C and 101.325 Pa, whereby the unit is installed complete (e.g. including filters) and according to the manufacturer instructions.

1.2 Nominal flow rate

We propose, in *Article 2 – "Definitions",* to redefine the term *"nominal flow rate"* as follows:

Current definition

"Nominal flow rate (q_{nom}) (expressed in m³/s)" means the declared design flow rate of an NRVU at standard air conditions 20°C and 101.325 Pa, whereby the unit is installed complete (e.g. including filters) and according to the manufacturer instructions.

Proposal

"Nominal flow rate (qnom - expressed in m³/s)" means the declared design flow rate of an NRVU distributed to and/or extracted from the building, including any leakages or any pressure balancing flow, at standard air conditions 20°C and 101.325 Pa, whereby the unit is installed complete (e.g. including filters) and according to the manufacturer instructions.

1.3 Internal leakages

We propose, in *Article 2 – "Definitions",* to redefine the term *"internal leakage"* as follows:

Current definition

"Internal leakage rate" means <u>the fraction of extract air present in the supply air</u> of ventilation units with HRS as a result of leakage between extract and supply airflows inside the casing when the unit is operated at reference air volume flow, measured at the ducts; the test shall be performed for RVUs at 100 Pa, and for NRVUs at 250 Pa.

Proposal

"Internal leakage rate" is air leakage inside the casing between supply and exhaust airflows when the unit is operated at nominal flow rate and designed pressure relations. The Internal leakage rate is quantified with Outdoor Air Correction Factor (OACF) defined as the Ratio of outdoor air flow measured in outdoor duct to supply air flow measure in supply air duct, where internal leakage rate is OACF-1.

Comment

Respectively, the difference from present definition shows that the internal leakage can occur in both directions, and it is calculated or measured on actual design pressure condition.

1.4 Carry over

Moreover, we propose, in Article 2 – "*Definitions*", to redefine the term "*carry over*" as follows:

Current definition

"Carry over" means the percentage of the exhaust air which is returned to the supply air for a regenerative heat exchanger according to the reference flow.

Proposal

"Exhaust air leakage rate" means the percentage of the exhaust air which is returned to supply air for a heat exchanger when the unit is operated at nominal flow rate, measured at the supply air duct. The exhaust air leakage is calculated or measured at actual design pressure conditions and reference air volume flow. "Exhaust air leakage" is quantified with Exhaust Air Transfer Ratio (EATR).

Comment

As shown above, the definition needs to be changed from *"Carry over"* to *"Exhaust air leakage rate"* and be given in actual design pressure conditions and supply air flow. The *"Carry Over"* wording has a limited use, as it is commonly used only for regenerative heat exchangers carry over due to rotation being only a small part of exhaust air transfer or internal leakage.

2. Proposal to define problems of impact of OACF and EATR on different subjects and proposed solutions

This chapter defines the problems with leakages and proposes possible solutions for Non-Residential Ventilation Units (NRVU) with Heat Recovery Section (HRS). All types of HRS (rotary, plate etc.) may have leakages which have to be handled except Run-Around-Coils (RAC) must have Exhaust Air Transfer Ratio (EATR) below 0.1 %. The external leakage rate for all NRVUs must fulfil real unit casing leakage class L3(R) according to EN 1886 (max leakage rate depending on if unit operating pressure is negative or positive: 1.32 $l \times s^{-1} \times m^{-2}$ at 400 Pa negative test pressure / 1.90 $l \times s^{-1} \times m^{-2}$ at 700 Pa positive test pressure, the surface is the outer surface of the NRVU).

2.1 Indoor Air Quality

Internal leakages from extract air and/or external leakages, both of which are directed at supply air, will contaminate the air to the building. The standard EN 16798-3 states: *"The **outdoor air rates** shall be specified in design of the system. If supply air also contains recirculation air, this shall be noted in design documentation, too. Only extract air of category ETA1 can be recirculated to the other rooms. Extract air of category ETA2 can be recirculated to the same room."* This can be handled by one of three options:

A. If Exhaust Air Transfer Ratio (EATR) and external leakage, at design conditions, are both less than 1%, the AHU is acceptable without further actions.
B. If EATR is higher than 1% and the extract air fulfils category ETA1 and/or external leakage is higher than 1% and the AHU surrounding air fulfils category ETA1, at design conditions, the supply air shall be compensated to include required amount of outdoor air.
C. If EATR is higher than 1% and the extract air does not fulfil category ETA1 and/or external leakage is higher than 1% and the AHU surrounding air does not fulfil category ETA1, at design conditions, the intended AHU can't be used at all without correcting the leaks.

2.2 Fair competition

Construction and **maintenance** of good tightness on an AHU and the configuration of a correct internal leakage direction is costly. Moreover, to show unavoidable leaks in printouts is a considerable drawback. All AHU internal, including HRS leaks and external leaks, and their impact must be handled and shown in printouts. This also has an impact on market surveillance.

2.3 Transparency

A manufacturer can gain benefits by not handling leaks. Printouts of properties and data of an AHU must contain OACF and EATR at design conditions. Today, exhaust air leakages can be considerable; up to 20%-30%.

2.4 Energy Efficiency

Internal leakages need to be compensated with increased air flow through the AHU and increased pressure drops in all passed components along its path, which, together, will increase the fan power consumption. It can also influence the efficiency of the HRS depending on where the leakage passes the barrier between supply air side and exhaust air side and in what direction. All relevant parts and impacts, at design conditions, must be handled and be shown in printouts. Ignorance of leakage treatment has a negative impact on ErP compliance and market surveillance.

3. Proposal for newly introduced requirements for NRVUs

In order to avoid the above-mentioned problems with leakages, Eurovent and its members propose the European Commission to introduce and implement the following measures in the next ErP regulation:

3.1 External leakage rate for a NRVU

The external leakage rate for a Non-Residential Ventilation Unit (NRVU) must be limited, depending on the unit operating pressure conditions.
For negative pressure to: 1,32 $l \times s^{-1} \times m^{-2}$ at 400 Pa negative test pressure
For positive pressure to: 1,90 $l \times s^{-1} \times m^{-2}$ at 700 Pa positive test pressure.
the surface is the outer surface of the NRVU.

3.2 NRVU including all Heat Recovery Sections (HRS) except Run-Around-Coils (RAC)

3.2.1 EATR

Maximum EATR at design conditions ≤ 5%
For EATR < 1% at design conditions – no additional compensation action required

For 1% ≤ EATR ≤ 5% at design conditions
nominal supply flow rate shall be increased with the EATR percentage to compensate the exhaust air leakage at design conditions and ensure the *required supply flow rate* (required design outdoor flow rate) to be delivered.

3.2.2 OACF

At design conditions OACF must be within the range of 0.9 to 1.1

3.3 NRVU including RAC

EATR < 0,1% at design conditions (if there is a common wall between supply and extract air)

3.4 SFP_{int} for NRVU

SFP_{int} for NRVU shall include all impacts of internal (OACF and EATR) and external leakages at nominal conditions to ensure that the *required supply flow rate* (required design outdoor flow rate) will be delivered. The impacts include increased airflow and pressure losses.

3.4.1 Correction of airflows due to internal leakages

3.4.1.1 Regarding EATR and supply flow rate

Comments
Actual supply flow must be increased to ensure that it contains the correct outdoor flow.

The power consumption of the supply fan will increase by increased air flow and the resulting increased pressure drops and the heat recovery temperature efficiency may decrease.

3.4.1.2 Regarding EATR and extract flow rate

A. EATR </= 1% = No action required
B. EATR > 1% = The flow rate extracted from the building shall contain the required design extract flow rate added with required supply air flow rate multiplied with EATR

Comments

Throttling of the extract air (or other means) to handle the EATR – the power consumption of the exhaust fan will increase by the pressure drop of the throttling.

The addition of the difference between actual supply flow rate and required supply air flow rate must be done to maintain the balance in the building.

3.4.1.3 Regarding OACF

OACF has an impact on corrections in outdoor air flow and exhaust air flow from the ventilation unit to outdoors. Air flow corrections need to be used in air flow calculation for fans and for pressure losses in influenced components to obtain the correct SFP_{int}.

When calculating the power consumption of the supply and exhaust air fan, the respective fan shall be calculated taking into consideration the possible increased airflow as well as all increased pressure drops due to the influence of increased airflows (the heat recovery temperature efficiency will be marginal affected) and/or increased pressure drops due to the actual differential pressure between supply and extract air side (will impact on e.g. plate heat exchangers).

For the BVU including recirculation air and with outdoor air flow rate between 10% and 100% of nominal flow rate, static pressure drops of the reference configuration are considered for maximum declared outdoor air flow rate under winter heating conditions (whenever heat recovery is used).

3.4.2 Proposal to information requirements for NRVU

The following characteristics are proposed to be added to the present list:

- Exhaust air leakage rate (EATR)
- Outdoor air correction Factor (OACF)

IV. Eurovent Position 4 of 5: The need to set a further tier with tightened Ecodesign requirements for energy recovery taking into consideration different ambient conditions

In a nutshell

With this Position Paper, Eurovent and its members provide the European Commission with a proposal concerning new requirements for energy recovery for NRVUs. Besides the energy efficiency increase, this proposal aims to be better reflect different ambient conditions while matching ecodesign requirements with the Energy Performance of Buildings Directive (EPBD).

Within this Paper, we address the following needs:

1. **Joint assessment of temperature and moisture recovery efficiency,**
2. **Information request on energy consumption for HRS defrosting purposes.**

Background

The European Commission Regulation (EU) No 1253/2014 (Ventilation Units) states within Article 8 the review shall include an assessment of **"the need to set a further tier with tightened ecodesign requirements".**

Proposal

1. Consideration of the moisture recovery efficiency in the ecodesign benchmark for NRVUs

There is no doubt that recovery of sensible heat utilised for warming up the outdoor air supplied to a building in cold period significantly impacts energy consumption for ventilation. Nevertheless, the demand for sensible energy for ventilation differs considerably depending on the climate conditions. This means applying too high thermal efficiency in warm climate countries is not economically legitimised.

Thus, Eurovent holds that setting any higher requirements for minimum thermal efficiency of the HRS would have to be accompanied by the introduction of different thresholds for respective climate zones. The definition of thresholds should be reinforced by in-depth studies.

Moreover, Eurovent members are of the opinion that moisture recovery should be consider in the Ecodesign requirements to better match the performance of a unit to the actual ambient climate conditions and the application type.

The detailed proposal of new requirement and its justification is outlined below. Explanation of the proposed conversion factor for the thermal and humidity efficiency is presented in the Appendix I.

This proposal provides the freedom of choosing the best option for a specific application without introducing a complex climate zones classification. The decision what should be the relation between thermal and humidity efficiency in a specific case would be left to a planner who knows best the system requirements and operating condition.

1.1 Impact of the moisture recovery on energy savings

Energy transferred in exhaust air comprises both the sensible part (temperature) and the latent part (moisture content). Some types of heat exchangers enable recovery of both sensible and latent energy. Recovery of latent energy is by far more relevant in warm climate countries since it leads to further reduction of cooling energy demand compared to sole sensible heat recovery. This in turn, is particularly important in the light of EPBD requirements tending to turn buildings across Europe into nZEBs and addressing the increasing role of cooling energy demand in the total energy consumption balance of a building. A considerable part of this energy is related to ventilation systems. Moreover, the latent energy recovery facilitates maintaining better Indoor Environment Quality (IEQ).

In many applications, indoor humidity control is necessary and required due to comfort or technological reasons. This entails a need to use heat exchangers offering not only the sensitive heat recovery, but recovery of moisture as well. It should be also noted that recovery of moisture, aside from reducing the cooling demand, results in lowering the risk of exchanger freezing, what again leads to considerable energy savings.

However, exchangers for moisture recovery feature higher pressure drops compared to exchangers for sensitive heat recovery only. Since the current ecodesign benchmarks consider only the thermal efficiency, units which must be equipped with moisture recovery exchangers (sorption rotors, enthalpy plate exchangers) due to system design requirements, are at a disadvantage.

1.2 Eurovent proposal of new requirements for minimum HRS efficiency

Taking into consideration the above, Eurovent suggests introducing separate minimum requirements for the HRS featuring only recovery of sensible heat and for the HRS offering both the sensible heat recovery and the moisture recovery under summer conditions.

Only sensible heat recovery exchangers
For the sensible heat recovery exchangers, we suggest maintaining the current requirements for minimum thermal efficiency η_{t_nrvu}:

η_{t_nrvu} = 73% for all HRS expect run-around HRS
η_{t_nrvu} = 68% for run-around HRS

Sensible heat and moisture recovery exchangers
Instead of setting minimum requirements for η_{t_nrvu} , we suggest for the sensible and latent heat recovery exchangers introducing minimum requirements for the efficiency of energy recovery (η_e) defined as:

$$\eta_{e\_nrvu} = \eta_{t\_nrvu} + c \cdot \eta_{x\_c} = \eta_{t\_nrvu} + 0.08 \cdot \eta_{x\_c}$$

Where

η_{t_nrvu}	-	thermal efficiency
η_{x_c}	-	humidity efficiency for cooling conditions defined as per prEN 308 (exhaust air 25°C DB/18°C WB, outdoor air 35°C DB / 25°C WB)
c	-	conversion factor of the humidity efficiency to the thermal efficiency (see Appendix I)

Based on the Eurovent members' expertise, we suggest setting the following requirement for minimum efficiency of energy recovery η_{e_nrvu}

η_{e_nrvu} = 75%

and defining the efficiency bonus as $E = (\eta_{e\_nrvu} - 0.73) \cdot 3000$

The value of 0.73 in the formula for the efficiency bonus (E) is proposed because of the additional pressure drop given by treatment for moisture transfer under non-condensing conditions.

The tabled approach provides for optimum adjustment of η_{t_nrvu} and η_{x_c} in warm climate countries (or applications), where the recovery of moisture is more relevant than recovery of sensible heat, yet still ensuring appropriate recovery of energy. By modifying the efficiency bonus (E) calculation, it also allows for higher air pressure drop typical for moisture recovery HRS.

2. Inclusion of information on annual consumption of energy attributable to HRS defrosting into the information request for NRVUs (Annex V of the Regulation 1253/2014)

The current methodology of the energy efficiency assessment for NRVUs does not distinguish a type of HRS applied in a ventilation unit in terms of its sensitivity to freezing. This could lead to confusing conclusions, particularly when comparing ventilation units operating in cold climate countries.

To ensure continuous, undisturbed operation of the exchanger in cold climate conditions, additional energy for defrosting might need to be supplied. This is not covered in the current Ecodesign benchmark for NRVUs.

To provide for level-playing field for all manufacturers, Eurovent suggest including in the information request (Annex V of the Regulation) an indication of annual energy consumption for defrosting, attributable to applied HRS, most preferably expressed in kWh/a.

Moreover, Eurovent holds that

1. The displayed defrosting energy should be determined based on a simplified calculation method for common reference conditions (climate zone, operating time, temperature and moisture content of extract air)
2. Considered climate zones should be the same as already applied in the assessment for RVUs (Cold, Average, Warm)
3. The calculation method should take into consideration the defrosting strategy and control logic (either offered by an integrated control system or provided in a manufacturer's manual)

Figures calculated separately for each climate zone should be presented in the information requirements.

3. Following revised requirements of ecodesign regulation for fans

Being currently under revision Commission Regulation (EU) 327/2011 implementing ecodesign requirements for fans is expected to introduce new, higher target energy efficiencies reflecting fan technology progress. The Eurovent members are of an opinion, that in the revised regulation for ventilation units, the maximum internal specific fan power factors (SFP_{int_limit}) should be adjusted accordingly to requirements of revised Regulation 327/2011.

Appendix to Eurovent Position 4 of 5: Additional justification to consider the impact of moisture recovery on overall energy saving

Given that providing for correct indoor environmental quality (including humidity indoors) is a common requirement, the presented below case-study for various European climate conditions illustrates potential savings of electric energy for cooling, resulting from applying a heat exchanger offering moisture recovery.

The study includes four locations (Milano, Valencia, München and Oslo) and collates energy consumption for cooling of systems equipped with a sorption rotary heat exchanger (60% humidity recovery efficiency), and an exchanger featuring only the sensitive heat recovery.

The analyses below simulate the energy consumption in different European climate zones.

Simulation

Balanced air mass flow rate 6000 kg/h (5000 m3/h),

Supply air in heating conditions: 19° and 4.9 g humidity (results in 22°30% Inside Air conditions, respectively Return Air conditions)

Supply air in cooling conditions: 19° and 8.7 g humidity (results in 22°53% Inside Air conditions, respectively Return Air conditions)

Baseline: η_t – 73%, no humidity transfer

Sorption Rotary heat exchanger with 73% and 60% humidity efficiency

$$\eta_{e\_nrvu} = \eta_{t\_nrvu} + c \cdot \eta_{x\text{-cooling conditions}}$$

c = 0.08

Outcomes of the simulations prove that the value of **c** conversion factor equal to 0.08 reflects correctly total energy saving even for the worst climatic conditions.

	Milan		Valencia		Munich		Oslo	
	kWh	%	kWh	%	kWh	%	kWh	%
Cooling conditions								
Total demand	42 908	100%	83 740	100%	16 410	100%	1245	100%
sensible recovery 73%	11 202	26%	12 000	14%	3 468	21%	306	25%
latent recovery 60%	10 612	25%	34 434	41%	4 533	28%	6	0%
Heating conditions								
Total demand	109 005	100%	56 940	100%	153 009	100%	193852	100%
sensible recovery 73%	83 053	76%	46 625	82%	120 124	79%	143440	74%
latent recovery 60%	10 790	10%	4 941	9%	11 471	7%	18846	10%
Total								
Demand cooling/heating	151 913	100%	140 680	100%	169 419	100%	195097	100%
Sensible saving 73%	94 255	62%	58 625	42%	123 592	73%	143746	74%
latent recovery 60%	21 402	14%	39 375	28%	16 004	9%	18852	10%
Total Energy saving 73%/60%	115 657	76%	98 000	70%	139 596	82%	162598	83%

V. Eurovent Position 5 of 5: The appropriateness of considering the positive effects of high-quality control systems on the energy efficiency, quality, and safety of non-residential ventilation units (NRVUs)

In a nutshell

Within this Position Paper, Eurovent recommends the European Commission to incorporate minimum requirements for control systems within non-residential, Bidirectional Ventilation Units (BVUs) into the future EU Ventilation Units Regulation. This is to further increase the energy efficiency, safety, and quality of ventilation units placed on the European market.

Background

Increasing minimum energy efficiency levels along the lines of the current Regulation in place has its physical and practical limits, as can be specifically observed in warmer climate zones of Southern Europe. A pure focus on, for instance, heat recovery has led to units being applied in some regions that do not make economic sense and are not justifiable over a product's life cycle.

Thus, instead of solely focussing on increasing minimum efficiency levels, Eurovent strongly recommends the European Commission and study consultants to have a closer look at control systems, which have a significant impact on the energy efficient and secure functioning of a NRVU.

Main reasons for introducing control system requirements

A unit can be well structured and include high quality fans, heat exchangers, filters, and the like. Yet, without a proper control system, which can dynamically manage and react to all kinds of scenarios, positive aspects of a unit can easily diminish.

Only with a high-quality controller, it can be ensured that NRVUs are performing in the most energy efficient and secure manner, while at the same time reducing subsequent changes to a unit – bearing risks in terms of warranty, hygiene, corrosion, tightness, and related issues.

Strengthening controller requirements within the future Regulation would also support evolutions within the latest revision of the Energy Performance of Buildings Directive (EPBD), which strongly promotes Building Management Systems (BMS), and the use of smart technologies in buildings in general.

Minimum requirements

To further increase the energy efficiency, safety, and quality of ventilation units, our members thus ask the European Commission that the following minimum requirements concerning control systems should be met by each Bidirectional Ventilation Unit (BVU) placed on the European market.

Eurovent and its members have defined the following requirements in a manner open to all types of technologies. In some cases, requirements are being applied over two Tiers to allow the market sufficient time to adapt.

The control system shall, at minimum, be able to...

- **Communicate with Building Management Systems by either receiving analogue and/or digital systems**
- **Manage the fresh air supply through demand control**
  - Tier 1: At least by time or presence
  - Tier 2: Through an automatic control linked to the air quality determined by a sensor
- **Speed control the fans**
  - To note: This is already a requirement within the current Regulation
- **Monitor filter dust**
  - To note: This is already a requirement within the current Regulation
- **Continuously control the heat recovery efficiency depending on the actually demanded supply air temperature**
  - To note: Thermal bypass requirements are already being dealt with within the current Regulation
- **Monitor core information**
  - Tier 1: Malfunctions concerning the fan(s) and heat recovery system(s)
  - Tier 2: Current technical data as, for instance, airflows, temperatures and power consumption

Positive impact

By incorporating these minimum requirements in the future Regulation, it would be ensured that all ventilation units placed on the European market meet essential quality criteria. Furthermore, and most importantly, it would make it much more likely that a unit performs as envisaged by the Ecodesign regulation not only on paper, but also in real-life conditions.

Market surveillance

The verification of minimum controller requirements by market surveillance authorities can be easily ensured through a documentation review. All controller functions have to be described in the documentation of a ventilation unit.

Eurovent and transparency

When assessing position papers, are you aware whom you are dealing with?

Eurovent's structure rests upon democratic decision-making procedures between its members and their representatives. The more than 1.000 organisations within the Eurovent network count on us to represent their needs in a fair and transparent manner. Accordingly, we can answer policy makers' questions regarding our representativeness and decisions-making processes as follows:

1. Who receives which number of votes? At Eurovent, the number of votes is never related to organisation sizes, country sizes, or membership fee levels. No matter if SMEs or large organisations, each company receives one vote within our technical working groups. In our General Assembly or Eurovent Commission ('steering committee'), our national member associations receive two votes per country.	**2. Who has the final decision-making power?** The Eurovent Commission acts as the association's 'steering committee'. It defines the overall association roadmap, makes decisions on horizontal topics, and mediates in case manufacturers cannot agree within technical working groups. The Commission consists of national member associations, receiving two votes per country independent from its size or economic weight.
3. How European is the association? More than 90 per cent of manufacturers within Eurovent manufacture in and come from Europe. They employ around 150.000 people in Europe largely within the secondary sector. Our structure as an umbrella enables us to consolidate manufacturers' positions across the industry, ensuring a broad and credible representation.	**4. How representative is the organisation?** Eurovent represents more than 1.000 companies of all sizes spread widely across 20+ European countries, which are treated equally. As each country receives the same number of votes, there is no 'leading' country. Our national member associations ensure a wide-ranging national outreach also to remote locations.

Check on us in the European Union Transparency Register under identification no. 89424237848-89.

We are Europe's Industry Association for Indoor Climate (HVAC), Process Cooling, and Food Cold Chain Technologies – thinking 'Beyond HVACR'

Eurovent is Europe's Industry Association for Indoor Climate (HVAC), Process Cooling, and Food Cold Chain Technologies. Its members from throughout Europe, the Middle East and Africa represent more than 1.000 companies, the majority small and medium-sized manufacturers. Based on objective and verifiable data, these account for a combined annual turnover of more than 30bn Euros, employing around 150.000 people within the association's geographic area. This makes Eurovent one of the largest cross-regional industry committees of its kind. The organisation's activities are based on highly valued democratic decision-making principles, ensuring a level-playing field for the entire industry independent from organisation sizes or membership fees.

Eurovent's roots date back to 1958. Over the years, the Brussels-based organisation has become a well-respected and known stakeholder that builds bridges between manufacturers it represents, associations, legislators and standardisation bodies on a national, regional and international level. While Eurovent strongly supports energy-efficient and sustainable technologies, it advocates a holistic approach that also integrates health, life and work quality as well as safety aspects. Eurovent holds in-depth relations with partner associations around the globe. It is a founding member of the ICARHMA network, supporter of REHVA, and contributor to various EU and UN initiatives.