Eurovent Position Paper PP – 2025-04-08

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Proposed changes to the calculation of $SFP_{int\text{-}limit}$ for NRVUs in the revised Regulation (EU) 1253/2014

In a nutshell

With this position paper, members of the Eurovent Product Group 'Air Handling Units' point out the identified concerns regarding the calculation of the $SFP_{int\text{-}limit}$ in the current proposal recommended for adoption in the revised regulation and propose modification aiming at:

- **Eliminating an excessive increase of $SFP_{int\ limit}$ at high energy recovery efficiency.**
- **Providing the same $SFP_{int\text{-}limit}$ bonus due to a higher actual η_{e_nrvu} than the minimum limit regardless of the design outdoor temperature.**

Introduction

The follow-up study consultant recommended in its Phase 1.1: Technical Analysis (Draft)[1] document to accept the new 'known/unknow place of installation' approach for $\eta_{e\_nrvu\_min}$ and SFP_{int_limit}. It was also recommended to adopt in the revised regulation the suggested by Eurovent changes to formulas as outlined in Section 1.4 of PP – 2021-04-30[2]. These recommendations were very much appreciated by Eurovent members.

However, in further analysing the impact and practical implementation of the proposed new formulas, we have encountered significant issues that we believe require further attention and modification. The identified issues, proposed changes and detailed clarifications are presented in the following sections.

Identified issues

When examining the formulas, we have noticed that the current proposal for the correction factor (E) which allows an additional SFP_{int} limit if the actual efficiency of energy recovery (η_{e_nrvu}) is higher than $\eta_{e\_nrvu\_limit}$ for a given design outdoor temperature (ODA), results in very high E-factor values (going to infinity) at high actual efficiencies (above approximately 85%, which can be easily achieved by available technology).

$$E = \frac{\eta_{e\_act}}{1 - \eta_{e\_act}} \cdot \frac{1 - \eta_{e\_ref}}{\eta_{e\_ref}}$$

This is incorrect from the perspective of the coefficient of energy recovery performance (ε), which in this case can be defined as a ratio between the additional heat gain (due to higher efficiency) and the additional maximum additional fan power.

$$\varepsilon = \frac{\Delta\Phi_{HRC}}{\Delta SFP_{int-limit}}$$

[1] https://eco-ventilation-review.eu/wp-content/uploads/2024/06/Ventilation-Study-Phase-1.1-Technical-Analysis-Final-for-Upload-June-2024.pdf

[2] https://www.eurovent.eu/wp-content/uploads/position-papers-files-public/pp-2021-04-30-eurovent-comments-on-draft-revised-eu1253-and-eu1254-1.pdf

With increasing efficiency this coefficient tends to zero, which contradicts the similar concept of the heat pump performance efficiency.

Furthermore, we have noticed that with the current E-factor function, additional limit for SFP_{int} depends on the design outdoor temperature. This means that a unit with a high energy recovery efficiency installed in cold climate would have to meet a more stringent $SFP_{int\text{-}limit}$ than the same unit installed in warm climate. In the opinion of Eurovent members, the $SFP_{int\text{-}limit}$ bonus for a higher energy recovery efficiency should be the same regardless of the place of installation.

The issues raised are illustrated in Diagram 1.

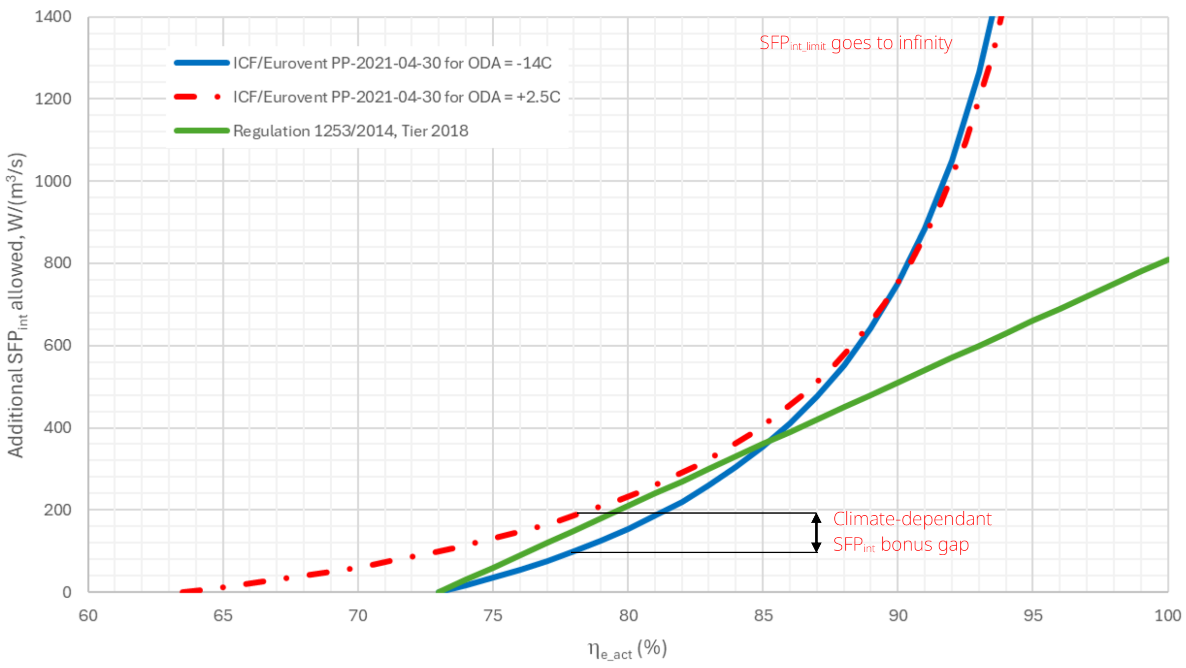

Diagram 1. Additional SFP_{int} limit for different ODA temperatures and the SFP_{int} bonus gap. Data refers to: other ERC type (without moisture recovery), q_{nom} > 2 m³/s, C = 1, F_{sup} = 150 (ISO ePM1 >50% ≈ F7), F_{exh} =120 (ISO ePM10 >50% ≈ M5)

Proposed modifications

To eliminate the pointed issues, while maintaining unchanged the overall concept of the new approach based on Dr Kaup's original study, we propose the following:

- Adjust (decrease gradient) the function of the correction factor E for high efficiency values.
- Calculate SFP_{int_limit} as a function of the actual η_{e_nrvu} and not the design outdoor temperature to exclude the influence of climate.
- Adjust the SFP_{int_limit} function so that for a unit without any controls (C = 1), it gives limits approx. 10% lower than the current 2018 values, and for a unit with controls corresponding to C = 1.1, it gives the same limits as the current 2018 values.

In addition, to facilitate the implementation of the new approach, we propose to simplify the set of formulas by embedding both the SFP_{HRS_base} and E into the following single equation for SP_{int_limit} with coefficients depending on the range of nominal air flowrate (q_{nom}) and the type of energy recovery system:

$SFP_{int\_limit} = 0.95 \cdot C \cdot (a \cdot \eta_{e\_nrvu\_act}^2 + b \cdot \eta_{e\_nrvu\_act} + c + F_{sup} + F_{exh})$ if $q_{nom} \geq 2\ m^3/s$

$SFP_{int\_limit} = 0.95 \cdot C \cdot (a \cdot \eta_{e\_nrvu\_act}^2 + b \cdot \eta_{e\_nrvu\_act} + c - 140 \cdot q_{nom} + F_{sup} + F_{exh})$ if $q_{nom} < 2\ m^3/s$

Where:

$\eta_{e\_nrvu\_act}$ - actual efficiency of energy recovery, %-points

C, F_{sup}, F_{exh} - the same and unchanged factors as in the previous documents[1,2]

a, b, c - coefficients given in Table 1

Energy recovery system	Nominal air flow rate q_{nom}	Parameters of the polynomial *a*	*b*	*c*
run-around HRS	≥ 2 m^3/s	0.794	-82.6	2892
	< 2 m^3/s	0.794	-82.6	3172
moisture HRS	≥ 2 m^3/s	0.794	-93.7	3043
	< 2 m^3/s	0.794	-93.7	3323
other HRS	≥ 2 m^3/s	0.794	-90.6	2864
	< 2 m^3/s	0.794	-90.6	3144

Table 1. Parameters for the polynomials for different ERS and air flow ranges.

Effect of proposed modifications

With the proposed new formulas:

- Up to a temperature efficiency of around 85% the SFP_{int_limit} increases exactly as in the previous proposal and then continues to increase at a low gradient.
- The additional SFP_{int_limit} value due to a $\eta_{e\_nrvu\_act}$ higher than the $\eta_{e\_nrvu\_limit}$ is the same regardless of the outdoor design temperature
- The SFP_{int_limit} for the ODA temperature-dependent $\eta_{e\_nrvu\_limit}$ is 10% lower than the current 2018 limit for a unit without any controls (C = 1) and the same as current 2018 limit for a unit with controls corresponding to C = 1.1.
- The maximum pressure drop associated with the energy recovery system (on both sides) corresponds much better to the actual performance of the available technology.

These effects are illustrated in Diagram 2 and Diagram 3 below.

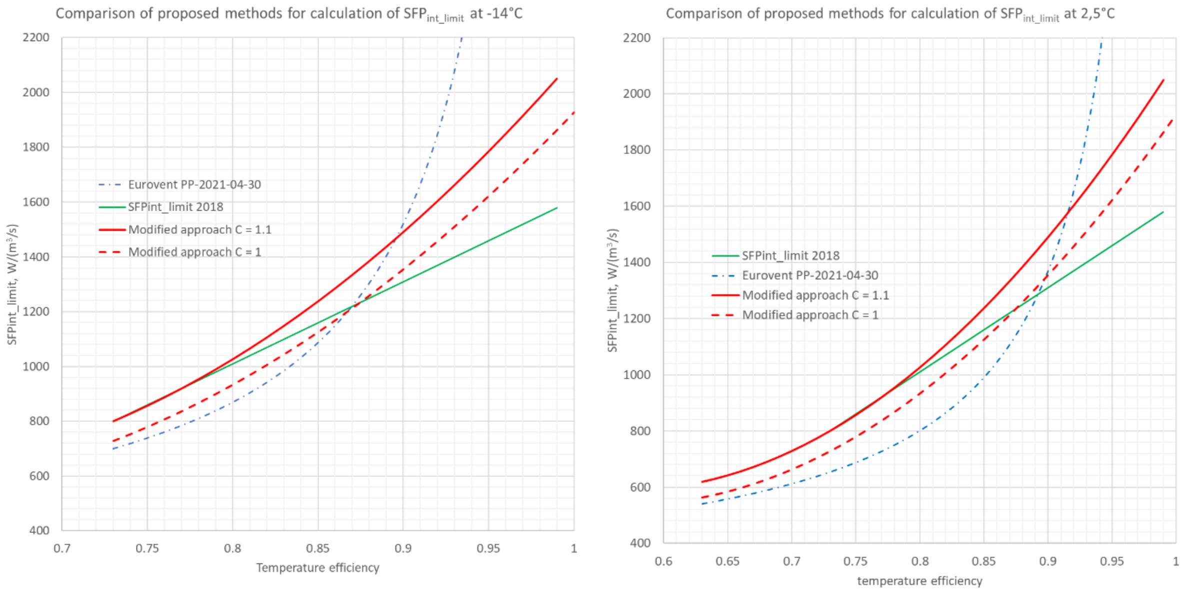

Diagram 2. Comparison of SFP_{int_limit} for the new modified approach, the previous proposal and the current Regulation for outdoor temperature of -14°C and +2.5°C. Data refers to: other ERC type (without moisture recovery), q_{nom} > 2 m³/s, F_{sup} = 150 (ISO ePM1 >50% ≈ F7), F_{exh} =135 (ISO ePM2.5 >50%)

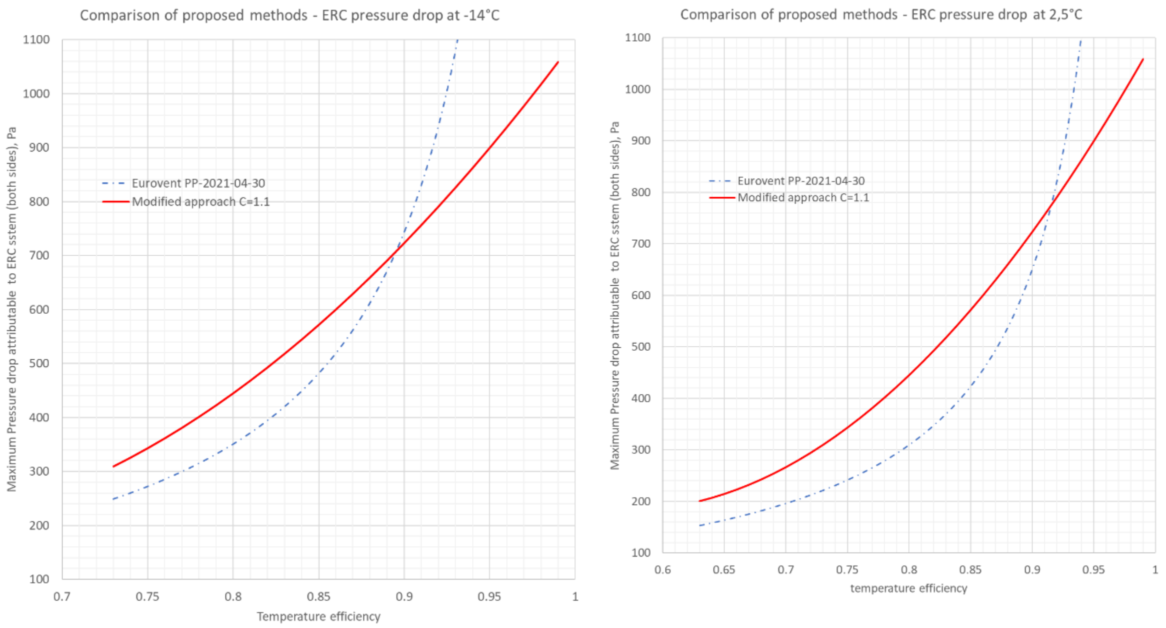

Diagram 3. Comparison of maximum pressured drop attributable to the energy recovery system (both sides) for the new modified approach and the previous proposal for outdoor temperature of -14°C and +2.5°C. Data refers to: other ERC type (without moisture recovery), q_{nom} > 2 m³/s, F_{sup} = 150 (ISO ePM1 >50% ≈ F7), F_{exh} =135 (ISO ePM2.5 >50%), total efficieny of the fans = 60%, C = 1.1

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1. Who receives which number of votes? At Eurovent, the number of votes is never determined by organisation sizes, country sizes, or membership fee levels. SMEs and large multinationals receive the same number of votes within our technical working groups: 2 votes if belonging to a national Member Association, 1 vote if not. In our General Assembly and 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.

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Eurovent is the voice of the European HVACR industry, representing over 100 companies directly and more than 1.000 indirectly through our 16 national associations. The majority are small and medium-sized companies that manufacture indoor climate, process cooling, and cold chain technologies across more than 350 manufacturing sites in Europe. They generate a combined annual turnover of more than 30 billion EUR and employ over 150.000 Europeans in good quality tech jobs.

Mission

Eurovent's mission is to bring together HVACR technology providers to collaborate with policymakers and other stakeholders towards conditions that foster fair competition, innovation, and sustainable growth for the European HVACR industry.

Vision

Eurovent's vision is an innovative and competitive European HVACR industry that enables sustainable development in Europe and globally, which works for people, businesses, and the environment.

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