

EUROVENT



Energy costs are skyrocketing worldwide. Furthermore, according to an earlier forecast by the World Bank's Energy Group, total energy consumption is expected to continue rising significantly over the next 50 years.

Ventilation of buildings is associated with high costs. It is estimated that the average energy costs for filters account for about 30% of the total costs of a ventilation system. By selecting a suitable filter—that is, a product with a lower pressure drop curve—energy savings can be achieved while maintaining or even improving IAQ (Indoor Air Quality). Nanowave® products stand out in particular, featuring low start-up resistance, a flat pressure drop curve, and excellent efficiency. Recognizing that air filters are the most cost-effective and easiest components to replace, savings can be achieved quickly.

General experience has shown that a typical ventilation system that has been in operation for at least six months incurs 1 euro in additional energy costs per filter for every 1 Pascal of pressure drop. At current energy prices, this can be many times higher. A poorly designed filter can result in a pressure difference of over 50 Pascals compared to a well-designed filter, even if it has the same filtration efficiency. In other words, this causes unnecessary annual energy costs of over 50 euros per filter.

Comparison Method for Air Filters

With the help of Eurovent's objective energy efficiency classification, operators can now much more easily find the right filter in terms of both energy efficiency and indoor air quality. All air filters can now be rated on a scale from A+ to E, where A+ represents the lowest energy consumption and E the highest.

This certification program applies to general-purpose air filter products for ventilation purposes with the classifications ISO ePM₁, ISO ePM_(2.5), and ISO ePM₁₀ according to ISO 16890-1:2016. In accordance with standard EN 15805:2010, products with a standard frame size of 592 x 592 mm are tested at a nominal air flow rate between 0.24 and 1.5 m³/s (typically 0.944 m³/s = 3,400 m³/h).

The new standard measures both filter efficiency and pressure drop as a function of dust load. The representative energy consumption level is calculated based on the average pressure drop at average dust load. Using this data, a filter's energy performance is simulated for a one-year operating period in an independent laboratory. This representative energy value is then used to classify air filters into energy classes.

Calculation according to the Eurovent energy efficiency classification:

$$W = \frac{q_V \cdot \Delta p \cdot t}{\eta \cdot 1000}$$

It is important to note that a manufacturer joining the Eurovent program must hold certificates for all relevant products in accordance with ISO ePM₁, ISO ePM_(2.5), and ISO ePM₁₀ (ISO Coarse is not within the scope). Participation in the program is the result of a lengthy process and involves numerous obligations, meaning that only the best manufacturers hold Eurovent certification. Eurovent-certified manufacturers ensure consistent and transparent product quality, which also serves as a quality guarantee for the user.



Comparison tables based on Eurovent measurement data

Class F7 bag filters (according to the former designation), in standard size, with a depth of 635 mm:

Type	Number of bags	Energy consumption (kWh/year)	Initial pressure drop (at nominal airflow)	Classification ISO 16890	ePM ₁ Average	ePM ₁ Minimum
Synthetic A	8	1778 (D)	100 Pa	ISO ePM ₁ 55%	55%	50%
Synthetic B	8	>2050 (E)	120 Pa	ISO ePM ₁ 60%	64%	60%
Fiber	8	1223 (C)	90 Pa	ISO ePM ₁ 65%	65%	65%
Nanowave	8	1048 (B)	80 Pa	ISO ePM ₁ 65%	65%	52%
Synthetic A	10	1382 (C)	90 Pa	ISO ePM ₁ 55%	55%	50%
Synthetic B	10	2031 (D)	120 Pa	ISO ePM ₁ 60%	64%	60%
Fiberglass	10	1098 (B)	85 Pa	ISO ePM ₁ 65%	65%	65%
Nanowave	10	757 (A+)	60 Pa	ISO ePM ₁ 65%	65%	52%

The final pressure drop of filters can be interpreted from several perspectives. According to the EN 13053 standard, it is recommended to operate the filter up to an initial pressure drop of +100 Pa or up to three times the initial pressure drop (whichever is lower). Manufacturers of ventilation equipment may also specify limit values, which are primarily calculated based on the maximum system resistance and typically range between 150 and 250 Pa. As a general rule, from an energy efficiency perspective, it is not recommended to operate filters with a resistance exceeding 250 Pa. Of course, the mechanical stability of the products is also guaranteed at higher resistance levels. It should also be noted that the pocket length significantly influences the product's initial resistance: with the same number of pockets and a pocket length of 535 mm, an initial pressure drop of +20–25% can be expected, but with a pocket length of 360 mm, this rises to +60–70%!

From an energy efficiency perspective, a compact filter can be a much more cost-effective solution than a filter with short pockets! In this table, we compare a pocket filter with a depth of 360 mm and 8 pockets with the recommended compact filter.

Type	Number of pockets	Energy consumption (kWh/year)	Initial pressure drop (at nominal airflow)	Classification	ePM ₁ Average	ePM ₁ Minimum
Synthetic 360	8	>2050 (E)	195 Pa	ISO ePM ₁ 60%	60%	50%
Compact	-	992 (B)	75 Pa	ISO ePM ₁ 60%	62%	55%

The Eurovent data shows that significant energy savings can be achieved by increasing the number of pockets, using a more advanced filter media, or using compact filters instead of short products. Based on the data above, with an average electricity price of €0.16/kWh, the annual operating costs of the filters are as follows:

Type	Number of Bags	Energy consumption (kWh/year)	Operating costs (€/filter)
Synthetic A	8	1,778 (D)	€284.48
Synthetic B	8	>2050 (E)	>€328.00
Fiberglass	8	1223 (C)	€195.68
Nanowave	8	1048 (B)	€167.68
Synthetic 360	8	>2050 (E)	>€328.00
Compact	-	992 (B)	€158.72

Based on the calculated operating costs, it becomes clear that while modern, energy-efficient solutions may involve higher initial costs, they can save many times the price difference during operation thanks to their higher energy efficiency!

Class F9 bag filters (according to the former designation), in standard size, with a depth of 635 mm:

This table lists two base models from different manufacturers, as achieving higher efficiency in this filter class requires significant energy costs. Here, the performance advantage of the Nanowave product is particularly striking.

Type	Number of bags	Energy consumption (kWh/year)	Initial pressure drop (at rated airflow)	Classification	ePM ₁ Average	ePM ₁ Minimum
Synthetic A	8	>2150 (E)	170 Pa	ISO ePM ₁ 75%	75%	70%
Synthetic B	8	2345 (D)	180 Pa	ISO ePM ₁ 80%	84%	73%
Fiber	8	2061 (D)	165 Pa	ISO ePM ₁ 85%	85%	85%
Nanowave	8	1529 (C)	135 Pa	ISO ePM ₁ 85%	85%	80%
Synthetic A	10	>2150 (E)	145 Pa	ISO ePM ₁ 75%	75%	70%
Synthetic B	10	2245 (D)	175 Pa	ISO ePM ₁ 80%	84%	73%
Fiber	10	1643 (C)	139 Pa	ISO ePM ₁ 85%	85%	85%
Nanowave	10	1170 (A+)	87 Pa	ISO ePM ₁ 90%	91%	88%

The final pressure drop across filters can be interpreted in several ways. According to the EN 13053 standard, it is recommended to operate the filter until an initial pressure drop of +100 Pa is reached or until the pressure drop reaches three times the initial value (whichever is lower). Manufacturers of ventilation systems may also specify limit values, which are primarily calculated based on the maximum system resistance and typically range between 200 and 300 Pa. In general, from an energy efficiency perspective, it is by no means recommended to operate filters with a resistance exceeding 300 Pa. Of course, the mechanical stability of the products is also guaranteed at higher resistance levels. It should also be noted that the pocket length significantly influences the product's initial resistance: with the same number of pockets and a pocket length of 535 mm, an initial pressure drop of +20–25% can be expected, but with a pocket length of 360 mm, this rises to +80–90%!

From an energy efficiency perspective, a compact filter can be a much more cost-effective solution than a filter with short pockets! In this table, we compare a pocket filter with a depth of 360 mm and 10 pockets with the recommended compact filter.

Type	Number of pockets	Energy consumption (kWh/year)	Initial pressure drop (at nominal airflow)	Classification	ePM ₁ Average	ePM ₁ Minimum
Synthetic 360	10	>2400 (E)	330 Pa	ISO ePM ₁ 80%	80%	73%
Compact	-	1228 (A)	95 Pa	ISO ePM ₁ 80%	84%	83%

The Eurovent data shows that significant energy savings can be achieved by increasing the number of pockets, using a more advanced filter media, or using compact filters instead of short products. Based on the data above, with an average electricity price of €0.16/kWh, the annual operating costs of the filters are as follows:

Type	Number of Bags	Energy consumption (kWh/year)	Operating costs (per filter)
Synthetic A	8	>2150 (E)	>€344.00
Synthetic B	8	2345 (D)	€376.00
Fiberglass	8	2061 (D)	\$329.76
Nanowave	8	1529 (C)	\$244.64
Synthetic 360	10	>2400 (E)	>€384.00
Compact	-	1228 (A)	€196.48

Based on the calculated operating costs, it is clear that while modern, energy-efficient solutions may have higher upfront costs, their superior energy efficiency during operation can save you many times the price difference!