

D3.2 - Topten HACKS Criteria Paper Comfort Fans



Picture 1: Different types of comfort fans

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About HACKS

The objective of the Heating and Cooling Knowhow and Solutions (HACKS) project is to achieve market transformation for heating and cooling (HAC) appliances and improve comfort and health of European citizens.

Across the EU almost half of all buildings have individual boilers that were installed before 1992 with efficiency of 60% or less. The expected energy savings from a speedy replacement are immense.

To achieve this goal, 17 HACKS partners in 15 countries are working together, thanks to the financial support of the European Horizon 2020 programme.

After scanning market actors, current policies and most commonly used products in each country, starting from April 2020 the HACKS partners will implement involvement campaigns to raise awareness of the economic and environmental benefits brought by good HAC products and solutions:

- HACKS will motivate households equipped with old and inefficient devices – boilers, water heaters, air conditioners, certain types of boilers and stoves, etc. – to replace them with new super efficient equipment.
- In each country, partners will set-up dedicated on-line platforms to assist consumers in their purchasing process. The platforms will propose: tools to assess households' needs and provide customised information; best product lists with technical specifications; direct links to suppliers of most efficient products; and advice on how to use and maintain equipment.
- For those households who need to improve their situation because they feel too hot, too cold, or too humid but who cannot invest in new equipment or can avoid getting equipped, HACKS will propose simple and low costs solutions. It is possible to reduce energy consumption and energy bills while improving winter and summer comfort, air quality and health conditions through the installation of shading devices, thermostats, water saving taps and showerheads, etc.

Beyond households, HACKS will target all relevant stakeholders (“multipliers”) that participate in the decision-making process of consumers by setting up strategic partnerships to facilitate the purchase of energy efficient appliances. HACKS places a strong emphasis on installers but also retailers and consumer organisations because of their proximity to consumers, their capacity to involve them and bring them guidance on energy efficient equipment.

More information on the HACKS project can be found at www.topten.eu/hacks



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Executive summary

The document provides an overview on energy efficient comfort fans under 125 W, the regulations that govern these products and the market development of comfort fans in the European Union. In the EU, manufacturers are required to declare certain product information including the Service Value that determines the number of cubic meters that are being displaced per minute and per Watt.

The most efficient types of comfort fans are ceiling fans. Because of their large blades and their position on the ceiling of the room, they can displace large quantity of air while remaining comfortable for the user. The most efficient comfort fans also include a DC motor.

Topten.eu currently presents on its website a list of energy efficient fan models. The energy efficiency selection criteria are explained as well as the method to gather data to set up a national product list and the type of information to be collected.

Finally, the paper also includes information that can be integrated in consumer recommendations on purchase, maintenance and use of a comfort fan.

With these criteria papers the intention is to be able to identify and select the most energy efficient models available on the market. The primary objective is to help partners on their territory for their Topten and HACKS website, but the technical content may also support anyone willing to find good products from an environmental point of view.

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List of acronyms

DC	Direct current
MEPS	Minimum energy performance standards

1 Topten.eu: Comfort fans – current selection criteria and products selected

1.1 Scope

Comfort fans are appliances primarily designed for creating air movement around or on part of a human body for personal cooling comfort. Some comfort fans can perform additional functionalities such as lighting or air filtering. Unlike air conditioners, fans reduce the perceived temperature by creating a movement of air and not the temperature itself. Hot air mixes up with colder air and reduces the perceived heat by unifying the global temperature. As the airflow is larger, the perceived temperature is even lower.

Within the HACKS project, the fans considered are the ones intended for domestic use, that have a maximum power of 125 W. This is the same scope as for the regulation on air conditioners and comfort fans (No 206/2012).

1.2 Selection Criteria on Topten.eu

A list for comfort fans is currently available on Topten.eu with corresponding selection criteria. The chosen metric to define the energy efficiency of a product is the Service Value ($\text{m}^3/\text{min}/\text{W}$). The higher the service value, the higher is the fan's efficiency. The construction type of the fan also influences the product's energy efficiency. This is why the selection criteria are set according to the construction type of the product.

Table 1: Selection criteria for comfort fans on Topten.ch

Construction type	Service value [$\text{m}^3/\text{min}/\text{W}$]
Tower fan	Min. 0.45
Table fan	Min. 0.80
Floor fan	Min. 0.80
Standing fan	Min. 1.00
Ceiling fan	Min. 2.75

Source: Topten.eu

1.3 Best available products

The most efficient fan type on the market is the ceiling fan. Even with a slow spinning velocity, it can move a large quantity of air in the room, while not making strong wind currents in the room that can be perceived as uncomfortable to the user. The downside of these types of fan is that they need to be fixedly installed to the ceiling. They are still very uncommon in most of Europe while in regions like the United States or South East Asia they are ubiquitous.

Apart from the construction type of the fan, the quality of the motor (DC motors are more efficient) and the design of the blades are aspects that make a fan more efficient and these are valid for all products.

1.4 Expected selection criteria in year 2021

During the next manufacturer survey at the beginning of 2021, Topten will assess whether the criteria can be further strengthened. The current criteria were set on the basis of very little information received from manufacturers. We expect to receive more data from manufacturers in the next round as they have already been informed in the past year of the needed information for the Topten product list and the information requirements set forth in regulation EU 206/2012.

1.5 Technical Background

The main types of comfort fans considered in the HACKS project are the following:



Table fan

Table fans are suitable for individuals but cannot ventilate larger rooms. Table fans are usually not height-adjustable, so the user needs to improvise to set the right height.



Floor fan

Floor fans - sometimes also called air circulators - provide a pleasant circulation of air in a room. They should not be directed against a person because of their strong airflow.



Standing fan

Standing fans are ideal for larger rooms, as they are often height-adjustable and rotatable and can therefore reach the whole space.



Tower fan

Tower fans produce a lower airflow and are less energy efficient than floor fans, but the airflow produced is evenly distributed and can feel more pleasant to the user. The rotor blades are not visible from the outside, which can give a feeling of higher safety to certain people¹.



Ceiling fan

Due to the large rotor blades they are very efficient and quiet. Some models have integrated lamps. Ceiling fans must be installed fixedly.

1.5.1 Maintenance

Maintenance requirements are low for comfort fans. For people prone to allergies, it is recommended to regularly dust the appliance or vacuum it. Tower fans gather the most dust in their rotors and they are more difficult to clean because they need to be taken apart. The efficiency of the product will also suffer if not maintained as the dust will hinder the airflow of the product.

¹ The popular Dyson comfort fans are essentially tower fans. The air is sucked at the bottom of the fan through small holes and expelled above. The oval or circular shape of the fan entrains the air that is around and inside the oval shape to multiply the amount of air being displaced.

Figure 1: Dusty fan that requires some maintenance.

The product cannot operate at full capacity because the airways are obstructed by dust.



Source: <https://www.instructables.com>

Figure 2: Tower fan while being maintained.

With the help of a brush and vacuum cleaner the dust can be for the greatest part removed.



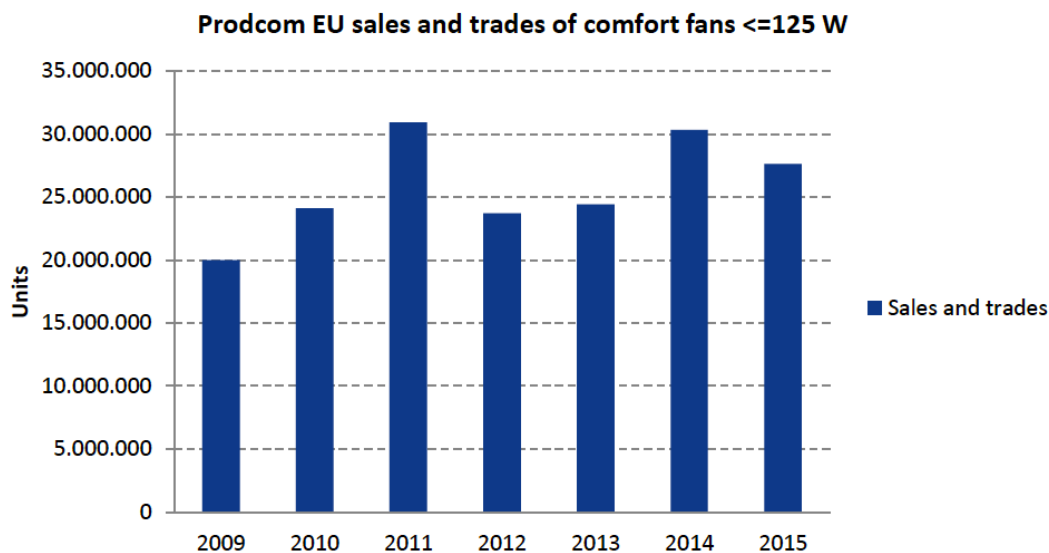
Source: <http://accidentalhandyman.blogspot.com>

1.6 Market in the EU

The preparatory study for air conditioners and comfort fans provided recent data on EU sales of comfort fans in Europe.

From 2009 to 2015, the sales of comfort fans have increased by 5% per year. The sales fluctuations are highly connected with the weather in the year concerned. Data shows that on average, the sales range from 20 to 30 million units per year. In the last years, many retailers were already out of stock in June.

Figure 3: Total EU sales and trading of comfort fans below 125 W from 2009 to 2015



Source: Review study for air conditioners and comfort fans, EC(2018)

Based on the answers from the national HACKS questionnaires, ceiling fans are very common in Spain and Italy, while they are less so in the rest of Europe. In other countries, the portable fans are commonplace. These products are mainly bought as impulse purchases during heat waves.

2 Policy measures, standards and labels (Comfort Fans)

2.1 List of existing regulations (Energy Labelling, Ecodesign, MEPS)

There are currently no minimum energy performance standards (MEPS) in place for comfort fans. These products are included in Regulation No 206/2012 because these products must fulfill given information requirements².

It is foreseen however in the revision of the Ecodesign and Energy Label regulation for air conditioners and comfort fans that MEPS as well as an Energy Label for comfort fans will be introduced. China for instance already have mandatory MEPS and an Energy Label in place and India, a voluntary labelling scheme. It has been observed that some fans sold in Europe and produced in China are being “dumped” on the European market. These products do not fulfill the Chinese minimum Service Value required by their MEPS but are being exported to Europe.

2.2 Explanation of the information requirements

Since 1 January 2013, according to EU 206/2012, the following information requirements (**Error! Reference source not found.**) for comfort fans has to be provided on the technical documentation of the product and on free access websites of manufacturers of air conditioners and comfort fans.

Table 2: Information requirements for comfort fans in Ecodesign regulation 206/2012

Information requirements			
Information to identify the model(s) to which the information relates to [fill in as necessary]			
Description	Symbol	Value	Unit
Maximum fan flow rate	F	$[x,x]$	m^3/min
Fan power input	P	$[x,x]$	W
Service value	SV	$[x,x]$	$(m^3/min)/W$
Standby power consumption	P_{SB}	$[x,x]$	W
Fan sound power level	L_{WA}	$[x]$	dB(A)
Maximum air velocity	c	$[x,x]$	meters/sec
Measurement standard for service value	[state here the reference to measurement standard used]		
Contact details for obtaining more information	Name and address of the manufacturer or of its authorised representative.		

Source: EC, 2012

- Fan power input (PF) means the electric power input of a comfort fan in Watt operating at the declared maximum fan flow rate, measured with the oscillating mechanism active (if/when applicable).
- Service value (SV) $[(m^3 /min)/W]$ means for comfort fans the ratio of the maximum fan flow rate $[m^3 /min]$ and the fan power input $[W]$. The regulation does not specify what measurement standard to use. The only standard available at the moment that measures the

² [Commission Regulation No 206/2012 with regard to ecodesign requirements for air conditioners and comfort fans](#)

Service Value is the IEC 60879 measurement standard. There is no harmonized standard in Europe to measure the air flow, but a European standard could easily be written on the basis of IEC 60879.

- Fan sound power level means the A-weighted sound power level of the comfort fan while providing the maximum fan flow rate, measured at the outlet side.

3 How to gather data

Topten.eu serves as reference and starting point for national Topten product lists.

National product lists should reflect market availability of most efficient products for each country. The following procedure is recommended for data gathering:

- Check what products are listed on topten.eu
- Check which of those products are available in your country
- Check national products which are only available in your country to see if they comply with the selection criteria. Inform Topten.eu about them so they can be added to the topten.eu list.

Because of the information requirements in place, manufacturers are required to declare the information 1) in the technical documentation of the product and 2) on free access websites of manufacturers of air conditioners and comfort fans.

In practice however this information is often missing, and the manufacturer needs to be contacted to provide this data. Often, the manufacturer is just a distributor that has bought products from a manufacturer of white label comfort fans³. In these cases, the retailer should be able to provide the information because he is considered as authorized representative of the product. In practice, while doing the first Topten survey in February 2018, the product managers were not even aware that information requirements were actually in place.

4 Input for Consumer Recommendations

The use of a comfort fan for cooling is a good solution that should be tried before purchasing an air conditioner. In certain climates, the comfort fan will not be sufficient during extreme heat events, however it can still be used during the shoulder season (spring and autumn) or combined with the air conditioner.

Ceiling fans can also be used in the winter as a way to push the warm air downwards especially in rooms with high ceilings. In rooms with a height of up to 2.6 meters, ceiling fans can be operated in reverse to distribute heat: the air flow is directed towards the ceiling and flows down the walls downward. In the occupied zone the air speed is very low and hardly noticeable. This mixes the temperature in the room and creates a pleasant feeling. In summer, the fan should be operated in normal direction of rotation, so that the air flow is directed directly downwards. The air speed in the occupied zone becomes higher and provides cooling.

³ White label products are sold by retailers with their own branding and logo but the products themselves are manufactured by a third party. White labeling occurs when the manufacturer of an item uses the branding requested by the purchaser, or marketer, instead of its own (Investopedia, 2020).

Figure 4: Use of a ceiling fan in summer and winter mode.



Source: Fanimation, How to choose a Fan. <http://www.fanimation.com/how-choose-fan/>

4.1 Purchasing a fan: aspects to consider

When purchasing a fan, the following aspects should be considered:

- The unit should have a high volume flow and a high service value. Anything that is under the Topten selection criteria will not produce a sufficient amount of air to feel a cooling effect.
- The number of rotors and in particular the total rotor area determines the air flow capacity of a fan. The larger the area, the more air is displaced.
- Slow-running fans with a larger diameter are generally more comfortable to the user than (several) smaller fans, as they operate with lower air speed and less noise.
- Attention should also be paid to the noise of the unit when buying it. The declared sound power level corresponds to operation at the highest speed level. At the highest speed level, certain fans can be very loud and therefore difficult to use in settings such as a bedroom or an office. It is advisable to test the volume of the unit in the shop before buying, although it is often underestimated due to the ambient noise.

4.2 Best fan usage

A fan should be positioned in a way that is the most comfortable to the user. Some people prefer a direct breeze, while others not. The following tips may be useful to benefit as much as possible from a fan:

- The unit should be placed in such a way that the generated airflow is not obstructed by any objects and it can flow freely.
- Colder air lies on the floor while warmer air rises to the ceiling. For better cooling, the fan should be placed close to the floor to move the colder air upwards. This can be easily done with a floor fan.
- In the evening or early in the morning, when the air outside is cooler, the fan can be directed outwards to blow the warm air outside. New fresh air can enter the room through a second open window.

5 Terminology

5.1 Product attributes

The following attributes show the information presented currently on the Topten.eu website for each model. The information is useful to buyers and/or relate to the Topten selection criteria. Some information is also relevant for policymakers.

Table 3: Example of attributes for comfort fans

Attribute	Example
Brand	AEG
Model	VL 5528

EAN	4015067200283
Energy (kWh/year)	5.6
Efficiency index (Service Value)	0.90
Construction type	Table
Sound power level (dB)	54
Levels	2
Maximum fan flow rate (m³/min)	15.7
Fan power input (W)	17.5
Height (cm)	39
Width (cm)	27
Depth (cm)	22
Diameter (cm)	23
Weight (kg)	1.2
Link to manufacturer	https://www.etv.de/de/Elektro-Kleingeraete/Ventilatoren
Electricity in 15 years	EUR 17.00
Purchase price	37

Source: [Topten.eu](https://www.topten.eu)

Energy consumption per year

The energy consumption per year is calculated by assuming that the product is 320 hours on-mode and 1120 hours in standby mode (for fixed ceiling fans the standby mode is 8440 hours). The number of hours is based on the assumption of the preparatory study on air conditioners and comfort fans (EC, 2009).

6 References and links

6.1 Useful links

- Topten.ch product list: <https://www.topten.ch/private/products/fans>
- Topten.ch selection criteria: <https://www.topten.ch/private/selection-criteria/auswahlkriterien-ventilatoren>
- Recommendation page on Topten.ch: <https://www.topten.ch/private/adviser/ratgeber-ventilatoren>

6.2 References

- European Commission (2009). Preparatory study on the environmental performance of residential room conditioning appliances (airco and ventilation).
- European Commission (2018). Review of Regulation 206/2012 and 626/2011: Air conditioners and comfort fans. Available on the [eceee website](https://www.eceee.org/)

EU regulations

- Commission Regulation No 206/2012 with regard to ecodesign requirements for air conditioners and comfort fans: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1581340284593&uri=CELEX:32012R0206>