

# Points to Consider When Buying an In-Room Air Purifier

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Use of air filtration not only makes air clean and pure, but also enhances a person's energy, alertness, and comfort. At the same time, it helps individuals with respiratory ailments enhance their quality of life. Air purifiers also help alleviate allergy and asthma symptoms.

With in-room air filtration fast becoming recognised as a legitimate tool for improving personal and public health, air purifiers are being used not only in the home, but also in the office, hospital, laboratory, restaurant, hotel and school.

To make the most of this useful technology, it is essential to do some basic research before purchasing a unit. Before purchase, an analysis of room size, the allergens and pollutants that may be present and any personal health concerns should be made. Doing a proper analysis will allow matching the need with the technology and save time and money in the long run.

## Available Technologies

In-room air purification systems utilise two basic technologies: mechanical or electrostatic filtration, or a combination of both. Mechanical filtration is based on four well-understood principles that describe air flow between obstructions (filter fibres) and the behaviour of particles as they ride the air stream through the filter media.

High Efficiency Particulate Air (HEPA) filters use all four principles to capture particles of varying sizes. They are especially efficient at capturing the mid-range particles that pose the greatest threat to human health. HEPA filters are recognised as effective by the American Medical Association, the American Lung Association, and the American Academy of Allergy, Asthma and Immunology.

To increase the percentage of small particles intercepted, electrostatic filters use an electric charge to boost the force of attraction between particles and filter fibres. Passive electrostatic filtration charges the filter media, achieving high efficiency at first; as the charge decays, efficiency gradually diminishes. Active electrostatic systems continually charge either the filter fibres or the particles, maintaining consistent efficiency levels over time.

In its publication *Indoor Air Pollution: An Introduction for Health Professionals*, the Environmental Protection Agency (EPA) in the United States notes that air cleaners



using active electrostatic technology alone are ineffective in removing mid-range and large particles. Hybrid systems offer an effective solution. They combine mechanical and electrostatic technologies, often achieving significantly better performance than either method alone.

At Blueair, we employ a successful hybrid system. Our patented HEPASilent™ filter technology utilises all four principles of mechanical filtration and adds ionisation to achieve higher efficiency in capturing the small particles trapped by interception.

The following tips and tools can help individuals understand what an in-room air purification system can--and can't--do. These tips can also help individuals compare performance between the hundreds of makes and models on the market.

## 1. CADR/Filter Efficiency

An important criteria to consider in selecting an air purifier is air cleaner performance. Known as the Clean Air Delivery Rate (CADR), this is a measure of total volume of air that a particular air purification system cleanses of a specific pollutant in one minute. CADR test results can be converted to cubic metres per hour (m<sup>3</sup>/hr), with a number rating for three "yardstick" particles: tobacco smoke, dust and pollen.

The higher the CADR test numbers, the better the unit's overall ability to clean indoor air.

Next, ascertain the highest percentage of particles removed and the smallest particle size captured. Filter efficiency for a particular air filter model may differ for particles of different sizes. For example, Blueair's hybrid HEPASilent<sup>®</sup> system is rated at 99.9% efficiency at 0.3 micron and 99.97% efficiency at 0.1 micron.

Buyers need not rely solely on a manufacturer's efficiency claims. Instead, consult the Association of Home Appliance Manufacturers (AHAM), an independent industry organisation that publishes the results of their overall room air cleaner performance tests. AHAM's performance tests are recognised as accurate and impartial by the EPA and the American Lung Association. Ratings can be found online at [www.cadr.org](http://www.cadr.org).

## 2. Capacity

After filter efficiency, air volume capacity is key to selecting the best in-room air cleaner. The unit must be rated to handle the total volume of air in the room where it operates. This value is expressed as recommended room size. The unit's published room size rating should be the same as AHAM's recommended room size.

AHAM room size recommendations are expressed in square metres and they assume an 2.5 metre ceiling. Simply measure the room's length and width, multiply to obtain square metres, and compare with AHAM recommendations.

Be sure to include ceiling height in calculating the unit's air processing capability. Ceiling height makes a big difference in the cubic metres of a room.

Now compare your result to the AHAM recommendations. If you have high ceilings, this extra step is critical to choosing an air cleaner with adequate capacity for the room.

## 3. Specific Health Concerns

Air cleaning alone cannot adequately remove all of the pollutants typically found in indoor air. However, when combined with source removal and adequate ventilation, the EPA considers air cleaning a viable means of improving indoor air quality. With the exception of allergens and airborne pathogens, the size of a given particle determines the degree of potential threat to human health. Generally, airborne particles are identified by the EPA as small (0.1 to 0.3 micron), mid-range (0.3 to 0.9 micron) and large (1.0 micron or larger).

### Mid-Range Particles

Mid-range particles (0.3 to 0.9 micron) include house and textile dust, pollen, pet dander, dust mites and their feces, many bacteria, auto exhaust, mould spores, and particles from laser printers and copiers.

Particles of this size present the greatest health concern because they are small enough to get past the cilia in the nasal passages and too large to be easily exhaled. Particles in this size range are more likely to become lodged in lung tissue and are suspect in a wide range of health problems related to indoor air pollution, from headaches and dizziness to cardiovascular disease and cancer.

Look for an air filter with high efficiency for mid-range particles when respiratory conditions are present, when allergens are a concern, and when asthma is triggered by pollen, pet dander, mould, or dust mite allergen. HEPA filters generally capture mid-range particles, although efficiency varies among makes and models.

### Small Particles

Small particles (0.1 to 0.3 micron) include many viruses, bacteria and exhaust particles. Although these small particles are inhaled and exhaled more easily than mid-range particles, even these minute particles may irritate already compromised breathing passages and lungs.

Look for high efficiency for small particles when respiratory conditions, immune disorders or cardiovascular disease are present, and when asthma is triggered by strong odours and fumes. HEPA filters capture small particles; most electrostatic systems report high efficiency levels at this range. Blueair's HEPASilent<sup>®</sup> filters capture 99.97% of particles at 0.1 micron and are among the most efficient in the industry.

#### Large Particles

Large particles (1.0 micron and larger) are usually trapped by cilia in the nasal passages before reaching the lungs. Large particles include house dust and some of the larger pollen and bacteria.

Look for high efficiency for large particles when sinus conditions or immune disorders are present, and when asthma is triggered by pollen. All HEPA filters capture particles of this size, while electrostatic filters generally do not.

#### Airborne Pathogens

Airborne pathogens range in size from .018 micron to as large as 1.325 microns. While many bacteria and viruses fall within HEPA and electrostatic capture ranges, some pathogens that are capable of movement may be able to pass through the filter media, and the mucilaginous coatings of some bacteria may affect the filter's ability to trap them.

Current concerns over anthrax bacteria have prompted a closer examination of the efficacy of home air filtration against specific airborne pathogens, as opposed to non-living particles. At Blueair, we have initiated testing specifically for airborne pathogen efficacy.

Keep in mind that any air filter model's efficiency may differ for particles of different sizes. For example, the Blueair hybrid HEPASilent<sup>®</sup> system is rated at 99.9% efficiency at 0.3 micron and 99.97% efficiency at 0.1 micron. The addition of



active electrostatic filtration to HEPA filtration allows Blueair units to achieve higher efficiency for small particles trapped by interception/diffusion.

#### 4. Legitimacy of Manufacturer Claims

Health organisations and government agencies rarely endorse a particular in-room air purifier brand or model. When it comes to comparing individual makes and models, the most reliable source for unbiased information is the Association of Home Appliance Manufacturers (AHAM) and the ENERGY STAR programme of the EPA and the U.S. Department of Energy.

AHAM certifies performance testing results for home appliances, including room air cleaners, through a voluntary certification program. The organisation's standardized test of overall performance for air cleaners (known as ANSI/AHAM AC-1) is recognised by the EPA, the Federal Trade Commission and the American Lung Association. Test results and comparison information can be found online at [www.cadr.org](http://www.cadr.org).

In contrast, the ENERGY STAR programme designates energy efficient products. This programme's intent is to reduce greenhouse gas emissions by setting an energy standard that helps consumers identify qualifying air purifiers (see [www.energystar.org](http://www.energystar.org)).

As with any appliance purchase, it's important to check the manufacturer's legitimacy and confirm performance claims before you buy. Common sense red flags might include uncorroborated filter efficiency and air volume capacity statements, unwillingness to submit an air cleaner for independent AHAM testing, no physical address on brochures or websites, lack of detailed information on filter composition or technology, or the promise of extremely long filter life when compared to similar units.

#### 5. Indoor Environmental Factors

From dust and humidity to the types of particulates likely to be present, indoor environmental conditions vary widely. Consider which types of particles affect the patient's respiratory health and how environmental conditions might impact an in-room air cleaner's performance and maintenance requirements.

Dust: Some units include a built-in pre-filter, which can help strain out large dust particles before they fill the spaces between HEPA filter fibres. You can also trap dust by installing vent filters over central heating and air conditioning registers.

**Humidity:** Environments with high relative humidity levels (over 50%) are of concern when allergies or asthma are triggered by mould and mildew spores and when immune disorders are present.

Absorbent HEPA filter media retain ambient moisture and create an ideal internal environment for mould and bacterial growth. To combat this growth, some manufacturers recommend periodic filter sterilisation or the addition of chemical-based bacteriostats.

Hydrophobic filter media, such as the polypropylene employed in Blueair's HEPASilent<sup>®</sup> filter, counter mould and bacterial growth by eliminating moisture retention in the first place. Water-repellent fibres perform as well as absorbent fibres in the context of HEPA filtration, while remaining dry and free from water-related mould and bacteria colonisation.

**Tobacco Smoke:** Due to its pervasiveness and the complexity of its composition, tobacco smoke is a particular challenge for current air filtration technology, as are other gaseous pollutants.

Tobacco smoke is one of the three "yardstick" pollutants in AHAM's CADR testing. When tobacco smoke is present in the indoor environment, study AHAM's CADR test results for the units you are considering. The higher the CADR results for tobacco smoke, the better the unit's ability to remove it. Keep in mind: the EPA's Office of Air and Radiation (OAR) notes that while HEPA filters can remove some tobacco smoke particles, none remove all of the 4,000 chemicals that comprise tobacco smoke.

**VOCs:** Volatile organic compounds (VOCs) are gaseous components introduced into room air through the indoor use of pesticides, glues, solvents and cleaning agents. They include a staggering variety of chemicals emitted as gases from petroleum-based solids and liquids.

More often an industrial problem, VOCs are likely to be present in homes where graphic production, crafts involving glues and paints, photographic processing, and auto or other repairs involving solvents take place. VOC levels may rise during remodeling and redecorating, and following pest control or aggressive cleaning activities.

In environments where VOC sources may be present, look for a filter incorporating activated carbon compounds as a filter media. Activated carbon compounds can effectively adsorb gaseous pollutants, notes the OAR in its publication *Residential Air Cleaners: Summary of Available Information*. However, filter replacement is critical to avoid the eventual release of VOCs from the saturated filter. The OAR recommends changing the filters as recommended by the maker to reduce the risk of outgassing.

## **6. Operating Cost**

Replacement filters are an ongoing expense for the life of the unit. Check the manufacturer's recommended replacement interval and the filter cost, as well as any shipping charge. The OAR notes that the most effective units are generally also the most costly to purchase and maintain.

The operating expense most often overlooked when selecting an air cleaner is the energy cost. Filter efficiency claims are based on constant, rather than intermittent, operation. The energy cost of 24 hour per day use should be considered during the selection process. Look for the unit's energy use, expressed as watts, on the same page of the brochure, warranty or website where dimensions and other technical specifications are listed.

## **7. Construction Quality**

In-room air filters are an investment. As with any appliance, look for a system with quality construction, especially internal moving components such as fans and blowers. Check the warranty to make sure it covers internal components. The unit should be listed with an organisation such as the Underwriters Laboratory or ETL and should meet U.S. standards for safety. Overseas, look for ETL Semko.

The durability of materials used for the cabinet is a strong secondary consideration. Because portable in-room units are subject to more handling than fixed systems, units with metal housings are likely to hold up better in the long term than units with plastic cabinets. Also, plastics generally resonate more with fans or other internal components; an air cleaner housed in a metal cabinet is likely to produce less operating noise.

## 8. Ease of Use

Replacing filters and periodic internal cleaning, if required, can be a physical challenge for people with limited mobility or dexterity. Filter change can be as simple as lifting the unit's lid and sliding filters in and out, or a complicated operation involving hand tools. If the patient will be the one responsible for maintenance, it's important to take his or her physical abilities and dexterity into account. At Blueair we have designed our units for easy filter change, with no heavy lifting or tools required.

Operating instructions should include detailed directions for filter replacement and periodic internal cleaning. Internal cleaning is a particular issue with electrostatic precipitators, in which filters are cleaned and sterilised rather than replaced.

## 9. Warranty

As with any appliance, choose an established manufacturer with a comprehensive, long-term warranty. Normally, warranties be made available at the point of purchase, even when purchases are made through the mail or online.

Consider both the length of the warranty and what is covered. Most in-room air cleaner manufacturers offer a limited warranty for a specific period of time. A limited warranty covers only those components specified, and may not cover the cost of diagnosis, labour and/or shipping in the event of product failure. Most warranties are less than half of what Blueair offers.

## 10. Bells and Whistles

Operating noise can be a significant factor when using the unit in a sick room or bedroom, or for that matter a restaurant or hotel, especially if the unit is run 24 hours per day as recommended. Knowing this, a manufacturer may claim that their product is "whisper quiet" or "virtually noiseless." Confirm vague claims by requesting specific operating noise values, expressed in decibels. On the lowest setting (the typical operating speed), Blueair units are about as quiet as the average desktop computer--approximately 35 decibels.

The draft created by the unit's air processing system is not as easily quantifiable as noise or efficiency levels. Generally, a draft must be evaluated by seeing (or feeling) the unit in operation. Some in-room air cleaners direct a strong stream of air from one or two exit points, while others diffuse air through many exit points to mitigate uncomfortable drafts.

Evaluate the space required for the unit. Note that while cabinet sizes vary, it is not accurate to assume that a large unit is more effective or, conversely, that a smaller unit is less effective. Efficiency is generally unrelated to size. Your in-room air purifier selection should be based first on efficiency and air volume capacity; then, use space requirements to narrow the choice between units of similar efficiency.

Don't forget to check operating instructions for placement advice. Most units require specific clearance from walls and windows in order to operate effectively. Look for a unit that physically fits within the environment in which the unit will be operating.

In conclusion, in-room air filtration is recognised as a legitimate tool for improving personal and public health by the Environmental Protection Agency, the American Medical Association, the American Lung Association, and the American Academy of Allergy, Asthma and Immunology. But, before you buy, do your homework. Make sure the unit's capacity matches your needs and of course your health concerns.

Founded in Sweden in 1996 by Bengt Rittri, Blueair air purifiers have a reputation for quality design and performance. The Blueair air purifier is a recipient of one of the most prestigious design awards in Scandinavia. A unit resides in the permanent Contemporary Swedish Design Exhibit in Stockholm.

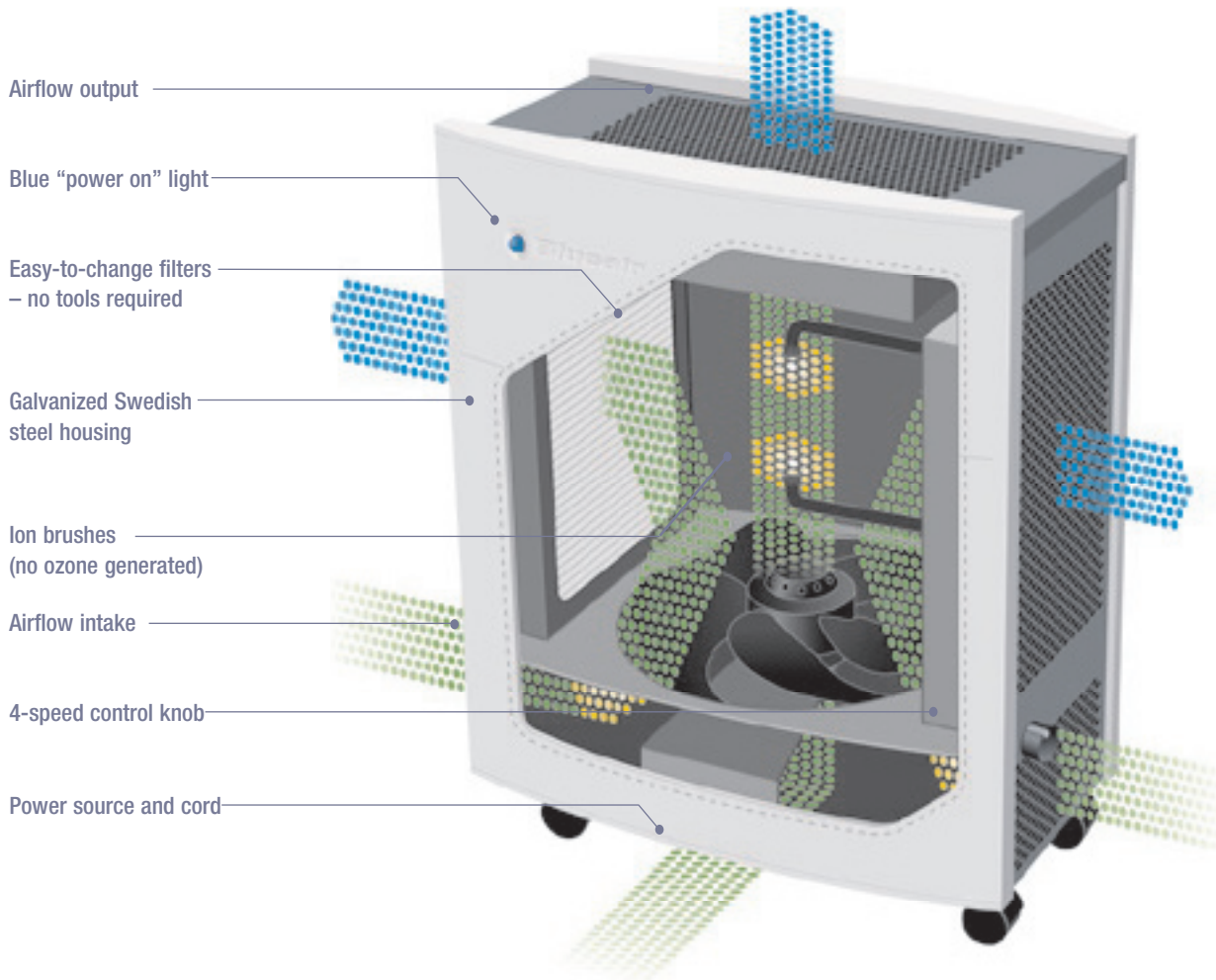
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# HOW IT WORKS



We live in a dirty world, even indoors. The air in a typical home often contains more particles and gases than the outdoor air in large cities. Millions of small particles such as dust, pollen, smoke, soot, bacteria and mites are present in every square metre of indoor air.

You can't see or smell the particles, but they can affect your body. You can feel them in your throat; they can irritate your eyes. Many particles in the indoor air are harmful to your health and can trigger allergic reactions.