

Air Cleaners

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Introduction:

The quality of the indoor environment depends largely on “what’s in the air.” The presence of airborne pollutants can cause health problems for the home’s occupants.

It is important to realize that the most effective, and usually least costly, methods to limit indoor pollutants are:

Source control: Find out where the pollutants come from, what they consist of, and reduce or eliminate these sources. This task can involve actions such as controlling moisture, reducing mold growth, choosing “low emission” furnishings and coatings, and/or reducing dust-producing activities indoors.

Ventilation: Homes need to have a sufficient amount of outdoor air to dilute and remove pollutants and moisture that are produced indoors, and to supply combustion devices (and occupants) with oxygen. The amount of fresh air that is brought in is limited by the cost of heating or cooling the outside air.

If air quality is still a problem after attending to source control and ventilation, especially with respect to dust, an air cleaner may be of help. In terms of health effects, dust particle size is of great importance. Particles smaller than about 10 microns in diameter are the most problematic from a health standpoint, so it is most important for an air cleaner to remove these. It is important to note that there is little research evidence that directly links the use of air cleaners to improved health.

Air Cleaners: What You Need to Know

About Whole House Air Cleaners

The commonplace “furnace filter” is not designed to remove fine particles and dust. Replacement filters, composed of a pleated, paper-like material, are readily available, inexpensive, and provide modest, but considerably improved filtering capability. These filters will block air flow as they accumulate dust, so they will need to be regularly checked and replaced every few months during operation (they only filter the air while the blower is operating). Some of these filters are made of a charged material (electret) to enhance particle capture.

Electrostatic air cleaners can be mounted into the ductwork near the furnace or air conditioner. A static electric charge is added to the dust particles, which are then deposited on an oppositely charged plate in the unit. This plate must occasionally be removed and washed. Thus, periodic maintenance is required with these filters, too. The main disadvantages of this type of unit are its cost and the cost of installation and wiring (if it is installed in an existing system). There is also a modest electrical operating cost associated with these systems.

HEPA (High Efficiency Particulate Air) filters have the capability of trapping extremely small particles, including those less than 1 micron in diameter. This represents an extremely high filtration capability. HEPA units are usually constructed with a prefilter of some type so that the HEPA filter does not become quickly clogged with larger particles. This type of filtration system is expensive. Typically, the prefilter will need to be replaced yearly, and the HEPA filter every two or three years. This can be a significant expense.

About Portable Air Cleaners

There are two kinds of portable air cleaners on the market: small tabletop units and larger console units that can be moved from room to room. Limited research suggests that tabletop units provide little benefit, except in the area next to the machine. Room-sized units can often provide better cleaning in a given room than a whole house cleaner. The technology of portable air cleaners is similar to that for whole-house devices.

The simplest portable cleaners have a filter that will need replacement at regular intervals. Better quality air cleaners incorporate a HEPA or HEPA-type filter. The HEPA filter is expensive, sometimes costing half as much as the entire appliance. (True HEPA filters must meet precise standards relating to the percentage of specific particles captured in a laboratory test. Some filters, described as HEPA-type filters are now being sold. These contain a filter made with HEPA materials, but do not quite meet the efficiency standards of true HEPA filters.)

The simplest electronic air cleaners are negative ion generators. These devices produce negative charges that attach to dust particles. The particles then attach to walls and other household surfaces, creating cleaning prob-



lems. More advanced units, now called electrostatic precipitators, are provided with charged plates to collect the dust particles that are charged by the cleaner (two stage designs are better than one stage designs). The plates must be regularly cleaned to maintain efficiency. Note that some of these units can produce ozone.

There are other air cleaners that combine two or more of these and other technologies. Some, for example, can remove pollutant gases and odors from the air. Since no single material can remove all objectionable gases from the air, a unit bought for this purpose may not be appropriate. Moreover, as the chemical filter becomes loaded, it should be replaced (but there is no sure way to tell when this is necessary). If the gas/odor filter is not replaced, it may actually release pollutant gases back into the air if conditions are right. There is no easy way to tell if this is happening.

About Air Cleaner Performance

The buyer may be confronted with a variety of manufacturers' claims about the performance and "efficiency" of various units. Several different performance standards exist, relating to different jobs that different filters are supposed to do. Some of this information may mislead buyers seeking the control of fine particulates. For example, a good performance on an efficiency test that measures the capture of large particles does not mean that small particles will be controlled. (For instance, furnace filters are rated according to the ASHRAE 52.1-76 standard, which can show a high "efficiency" at capturing dirt, but which has no relevancy to fine particles.

OZONE

Ozone is a molecule composed of three oxygen atoms. It is a highly reactive chemical that is sometimes used to clear pollution in unoccupied buildings. It is also a strong lung irritant. People with asthma can be especially sensitive to ozone, and it can bring on attacks. A potential disadvantage of electrostatic air cleaners is that they may produce ozone. Some air cleaners, moreover, are designed to produce small amounts of ozone as part of the air cleaning strategy. Many health authorities, as well as the American Lung Association, do not recommend the use of such cleaners for occupied spaces.

not conform to this very high standard, capturing instead a smaller percentage of the particles of most concern. While not quite as good, they may still offer satisfactory performance.)

A recent survey of a few retail outlets revealed that most room sized air cleaners incorporate HEPA filters. Abundant information, including CADR, is provided on the packaging. Most helpful are charts showing the recommended room size, based on the CADR, for individual models (take room measurements before shopping

A revised standard, ASHRAE 52.2, seeks to remedy this.)

Terms to look for in portable air cleaners include "Clean Air Delivery Rate" (CADR), which is based on removal of smoke, dust, and pollen particles. The "CADR" refers to the cubic feet of clean air delivered per minute. HEPA units are tested according to the DOP test—Military Standard 282. This standard requires removal of 99.97% of 0.3 micron particles. (Filters described as HEPA-type may

for an air cleaner). While it may take some effort to wade through all the text, good selection information is available on most packaging.

Consumer publications such as *Consumer Reports* occasionally publish comparison reports of such appliances and can be a source of good information.

References

- American Lung Association (no date, c. 1996). Residential Air Cleaning Devices: Types, Effectiveness and Health Impact.
- US Environmental Protection Agency (1990). Residential Air Cleaning Devices: A Summary of Available Information.

VACUUM CLEANERS

The air that is sucked up by vacuum cleaners is blown back into the room, hopefully without the dust. Unfortunately, this is not always the case. Sometimes it is the smallest and most problematic particles that are recirculated into the air. Until recently, high performance vacuums were not readily available on the retail market. Now it is possible to buy vacuums with HEPA or HEPA-type filters. This is good news for those who are sensitive to dust. However, buyers should take into consideration the appliance's suction power (related to the vacuum's amperage) and not buy the product solely because of a good filter. The filter alone will not assure satisfactory performance if dust pickup is inadequate. On the other hand, a good vacuum cleaner can play an important role in controlling dust. (For the workshop, it is now possible to buy HEPA filters to fit older model shop vacuums.)

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