

**NC STATE UNIVERSITY**

College of Agriculture &amp; Life Sciences

Family and Consumer Sciences



**This document contains information on portable and in-duct air filters for the home.**

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## Air Filters and Cleaners

Perhaps you or a family member suffers from seasonal allergies, and you've heard that an air cleaner can keep pollen out of the house. Or, you may want to reduce cooking and smoke odors at home or in the office. How do you decide if you need an air cleaner? And if you do need one, which one is right for your situation?

Your first line of defense is to replace indoor air by fresh, outside air on a regular basis. You can open doors and windows and add exhaust fans. You also should minimize sources of contamination inside your home. For example, good housekeeping can help control dust and dust mite problems.

Common airborne particles range in size from .001 to 100 microns. A micron is about one twenty-five thousandth of an inch. To get an idea of size, a hair from your head is about 250 microns in diameter. Your body can filter larger contaminants above 10 microns in size. A regular furnace filter removes some other contaminants. Problems can occur when smaller particles are present or when someone is unusually sensitive to a particular contaminant. Smaller airborne particles like tobacco smoke and fine household dust can enter the deeper parts of the lungs. Air cleaners remove some but not all particles from the air.

Air cleaners can be divided into two basic groups: portable or table-top models, and those you install with or in place of an existing furnace and air conditioner filter.

### Portable Air Cleaners

*Portable air cleaners are made to clean air in smaller areas, not the whole house. Air cleaners usually use filters, electrical attraction, or ozone to remove small particles from the air.*

**Filters trap particles.** The finer the filter, the smaller the particles it traps. HEPA (high efficiency particulate arresting) filters are the best. They can capture up to 99 percent of particles down to 0.3 microns in size. But gas molecules, which include radon, tobacco smoke, etc., are extremely small and can still pass through a HEPA filter. An activated carbon or charcoal filter usually is added to trap gas molecules.

**Pleated** (also called "**media**" filters) use materials like the HEPA filters, but they capture fewer particles because they are less tightly packed. They are 40 to 95 percent effective and remove most household dust.

**Electrical attraction** is used in electronic cleaners. This type of cleaner uses electrostatic precipitation, static charge, or particle ionization to remove particles drawn in by a fan through a

foam pre-filter. Larger particles are trapped at this point. Particles are then charged by a high-voltage wire and captured in the precipitating cell. A carbon filter removes odors and a post-filter removes other particles.

When a pre-filter is used, the electrostatic precipitator can remove mold, bacteria, tobacco smoke, and most household dust. Regular maintenance is a must.

An **electret cleaner** uses polyester and cellulose fibers with a static charge to trap particles in addition to the foam pre-filter and carbon filter.

A **negative ionizer** also uses a foam pre-filter and carbon filter. It is unique because it has charged wires, which create ions. The fan blows these charged particles into the room and they collect on walls and room surfaces. The fan and pre-filter should reduce soiling and staining from the particles.

**Ozone generation** is a type of air cleaner that uses a high-voltage electrical charge to change oxygen to ozone. High concentrations of ozone can destroy gas molecules and some microorganisms, such as mold spores. *The North Carolina Department of Environmental, Health, and Natural Resources recommends that this type of cleaner NOT be used.* Ozone can have adverse health effects.

**Performance Standards** There are no universal standards, but you can ask about a unit's clean air delivery rate, which is abbreviated "CADR." This tells you the cubic feet the unit delivers each minute. Usually the CADR will show specifications for removing dust, pollen, and smoke. When two units have the same CADR, the one with the lower total air flow will be more efficient.

**Maintenance** You may have to change or clean filters. With the electrostatic precipitator, you'll need to wash the electronic cell every two to three months.

## In-Duct Air Cleaners

*Air cleaners can be designed to fit into the house's heating and air conditioning system ductwork.*

**Pleated (media) filters** are more efficient than the standard fiber filter, but not as effective as an electrostatic filter. The media filter is more expensive than a common furnace filter, and it requires more fan energy. It needs to be replaced regularly. It will last longer if you install a regular furnace filter in front of the pleated media filter.

**Electret or electrostatic filters** can be used to replace a standard furnace filter. An electrostatic filter installed in the return air duct near the furnace removes finer particles from the air. You will have to clean the removable dust collecting plate regularly.

The **electrostatic precipitator** is a more expensive alternative. These filters are as effective as portable units, but they must be installed by a contractor and may affect the air flow and efficiency of your furnace and air conditioning system.

If filters slow air flow through the ducts, your heating or air conditioning system must run longer. This increases your operating costs. If the filter is not properly fitted, unfiltered air may pass around it.

Filters that have no separate fan are effective only when the heating and cooling system fan is running.

## Summary

If natural ventilation and exhaust fans do not take care of the problem, you may need an air cleaner. You need to decide whether you have problems in a room or small space or if you have air quality problems throughout the house. When the problems are throughout the house, in-duct filters are an alternative. Otherwise, a portable cleaner may be a better choice.

When considering air cleaners, compare the clean air delivery standard (CADR) and needed maintenance.

For more information on air quality inside your home, see [Mold, dust mites, fungi, spores, and pollen: Bioaerosols in the human environment](#).

## References

"A Guide to Air Cleaners: Contaminant, Location Are Important to Selecting Equipment," *Indoor Air Review*, March, 1993: 31-32.

"Household Air Cleaners," *Consumer Reports*, October, 1992: 657-662.

"North Carolina Cautions Against Use of Ozone-Generating Air Purifiers, Recommends Addressing Pollution Source," *Indoor Air Review*, July, 1992: 11.

"Air Filters--How Effective Are They?" *Indoor Air Quality Update*, August, 1991, Vol. 4, No. 8: 1-7.

*Fine Particle Pollution: Residential Air Quality*. North Central Regional Publication 393, October, 1991. Cooperative Extension Services: Illinois, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota; and U.S. Department of Agriculture, Washington, D.C.

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