

# AIR PURIFIERS

## Filtering the claims

**Most people buy air purifiers to ease asthma or allergies. But despite product claims, there's little definitive medical evidence that purifiers help relieve respiratory symptoms. Some may pose a threat even to healthy users.**

Electrostatic precipitators are the most heavily promoted purifiers, accounting for about half of the models sold. Oreck and Sharper Image versions are best sellers, despite their lackluster air-cleaning performance in our tests. Electrostatic precipitators trap particles by applying an electrical charge to them as they pass through the unit and depositing them on plates or filters. The process creates some ozone as a byproduct.

While ozone in the upper atmosphere protects us from the sun's ultraviolet rays, ground-level ozone is an irritant that can aggravate asthma and lessen lung function.

Another type of purifier, ozone generators, are a growing part of the market.



**KEEP IT CLEAN** Our long-term tests show that you need to follow recommended maintenance to sustain peak performance.

They create large amounts of ozone by design and claim to use it to purify the air. We rated two such models Not Acceptable because in our latest tests they reached up to 20 times the voluntary ozone standard based on the limit set by the U.S. Food and Drug Administration for medical devices. (See "Not Acceptable: Ozone

generators," on the facing page.) The FDA, though, doesn't consider air purifiers a medical device. And the ozone emissions of home air purifiers aren't regulated by any federal agency. But as we went to press, California banned ozone generators for most uses, effective 2010.

Air purifiers that draw air through fabric filters are among those that do the best job of removing dust and smoke from the air without producing any ozone. Top-rated models such as the Whirlpool Whispure, \$230, performed better at their lowest, quietest speeds than many others did at their higher, noisier settings. But simple steps such as those mentioned in First Things First could improve air quality enough so that you don't need a purifier. Other findings and issues:

**Ozone is a growing concern.** No standard exists for acceptable indoor ozone levels generated by a nonmedical device. Underwriters Laboratories (UL)

### First things first Air purifiers alone won't clean the air or relieve asthma or allergy symptoms.

#### TRY THESE STEPS

Basic steps can be more effective than air purifiers, according to experts, including the U.S. Environmental Protection Agency and the American Lung Association. Less expensive options include:

- Banning indoor smoking
- Keeping pets out of bedrooms
- Removing carpeting and other dust-mite harbors
- Opening windows whenever possible
- Using outdoor-venting fans in the bathroom and kitchen
- Maintaining heating equipment

For more simple ideas, go to [www.ConsumerReports.org/aircleaning](http://www.ConsumerReports.org/aircleaning). Avoid ozone generators, which emit hazardous levels of ozone. They should be used only by professionals after serious contamination from a fire or flood, not for routine air cleaning.

#### FILTERS

**Best** for trapping dust, pollen, and smoke without emitting ozone, an irritant.

**But** effectiveness varies considerably among models. They typically cost more per year for both electricity and replacement filters. Portable models tend to be noisy at high speeds, and do-it-yourself whole-house furnace filters were fair at best for smoke removal.

**How they work** A fan pulls air through a filter. Portable models typically use high-efficiency particulate air (HEPA) filters; whole-house units use pleated fabric filters and are attached to forced-air systems.

**Price** \$100 to \$800 for portables; \$10 to \$30 for better DIY whole-house filters; \$200 to \$500 for whole-house systems (plus \$200 or more for installation).



#### ELECTROSTATIC PRECIPITATORS

**Best** for low operating costs. Some do a fine job of removing dust, pollen, and smoke.

**But** all create some ozone, which can aggravate asthma and decrease lung function. Models with small fans or no fans are ineffective at removing dust and smoke. Models with a fan can be noisy at high speeds. Models with plates need more maintenance than filters.

**How they work** An electrical charge is applied to the particles drawn into the device. Then the particles are captured onto flat plates or filters.

**Price** \$250 to \$800 for portables; \$400 to \$1,150 for professionally installed whole-house models (plus \$200 or more for installation).



certifies electrostatic precipitators using the FDA limit of 50 parts per billion. But that limit is under scrutiny.

"Fifty parts per billion is by no means universally accepted in the scientific community as being a low enough benchmark for ozone," says Richard Shaughnessy, Ph.D., director of the University of Tulsa's Indoor Air Research Program and the author of an analysis prepared for the Consumer Product Safety Commission on research pertaining to the current limit. A recent study of outdoor air in 98 urban areas, led by Michelle L. Bell, assistant professor of environmental health at Yale University, indicated that even low levels of ground-level ozone were associated with increased risk of premature death.

**Ozone has other risks.** Studies increasingly suggest that ozone creates other irritants as it reacts with household products such as scented cleaners and air fresheners. Among these irritants are formaldehyde, a carcinogen; acrolein, a toxic irritant found in cigarette smoke; and ultrafine particles. "Picture ultrafine particle behavior the way you see cigarette smoke behave in a lighted room," says Charles J. Weschler, Ph.D., a researcher at the University of Medicine and Dentistry of New Jersey. "They hang in the air for a long time. The concern is how easily the ultrafine particles are inhaled before they can settle."

**Germ-cleaning claims are oversold.** Many air purifiers claim to rid your home of airborne bacteria and viruses in addition to dust, pollen, and smoke. We ran tests on five portable air purifiers that made those claims. While our tests confirmed that they reduce germs in the air, so should any air purifier that effectively removes dust and smoke.

Still, germ removal isn't a good reason to buy an air purifier. "The limited effectiveness of the home air purifiers may give people a false sense of security," says Edward J. Septimus, M.D., an infectious-disease expert at Methodist Hospital in Houston. "Stick with the basics instead: Wash your hands with soap and water for at least 15 seconds and cover your mouth and nose when you sneeze and cough."

**Ozone testing is in flux.** Even the UL ozone test is under review as UL and in-

dustry and consumer groups, including Consumers Union, the nonprofit publisher of CONSUMER REPORTS, search for a better way to measure the ozone some purifiers emit. "You can get any results you want depending on how you run the current UL test," says Shaughnessy, who is on the committee revising the standard.

In the past we used the UL ozone test, among others. But because of concerns about the UL approach, we tested ozone-producing purifiers using our own test in an airtight, unfurnished room. While that won't exactly reproduce the levels in your home, given the increasing concerns about even low levels of ozone, it's useful to have this worst-case scenario of ozone buildup in a room.

#### IF YOU BUY AN AIR PURIFIER

Consumers Union continues to urge the CPSC to set indoor ozone limits for all air purifiers and mandate performance tests and labels disclosing the results. CU also urges the Federal Trade Commission to investigate air-purifier ads to determine the validity of health-related claims. If you're set on buying one, keep these points in mind:

**Consider whole-house models.** Forced-air heating/cooling systems circulate so much air that they can overwhelm portable purifiers. Whole-house purifiers are a better option. Better products range from \$10 to \$30 for do-it-yourself filters to \$1,000-plus systems that have to be installed by a pro. The latter are more effective at removing dust and smoke. DIY furnace filters do nearly as good a job of removing dust but aren't as good at removing smoke. Buy a whole-house model with a filter rather than an electrostatic precipitator, which produces some ozone.

**Portables: Bigger is better.** Portable air purifiers work best at high speeds but are quietest on low. Run the unit on the higher, louder setting when you're not in the room, and turn it down to low when you're nearby. Or buy a model certified for a larger area. We believe a clean-air delivery rate (CADR) above 350 is excellent, and one below 100 is poor. Look for CADR figures with an Association of Home Appliance Manufacturers (AHAM) logo. Only those were confirmed by AHAM.

## Not Acceptable Ozone generators

Makers of ozone generators often target home users with claims that the devices reduce allergens such as dust, smoke, pollen, germs, and mold using "highly activated oxygen" or "super oxide ions," leaving the fresh scents of thunderstorms and waterfalls in their place. Two companies, Biotech Research and EcoQuest, go much further in their ads.

The \$850 EcoQuest Fresh Air uses "exclusive 'Space Certified' " technology "used to scrub the air inside spacecraft," ads say. BioTech Research says its \$230 EdenPure Area's technology is "used by the federal government to purify air in the Space Shuttle and the International Space Station." And ABC Radio broadcaster Paul Harvey, who claims to use the EdenPure, describes it as "the best air purifier ever created by the hand of man" in an ad.

But our tests found that even at the generators' low everyday settings, their ozone production quickly exceeded the 50 parts per billion (ppb) FDA limit for medical devices. Purifiers aren't considered medical devices by the FDA. Ozone concentrations in our test room measured about 650 to 990 ppb for the EdenPure, depending on the setting. The EcoQuest produced about 110 to 350 ppb at its normal and high settings and up to 4,300 ppb at its "away" settings, which the company says to use only when you and your pets aren't home.

The U.S. Environmental Protection Agency warns that relatively low levels of ozone can cause chest pain and shortness of breath. Ozone may also worsen asthma and compromise the ability of the body to fight respiratory infections. The EPA regulates outdoor ozone levels, but there is no federal agency that regulates indoor levels or air purifiers. As we went to press, California banned the sale of ozone generators for most uses.

Because both of these ozone generators produced very high amounts of ozone and have no way to automatically control its concentration in the air, we consider them Not Acceptable. They were also poor at removing dust and smoke in the air.

About those "space" claims: We sent NASA the ads, and spokeswomen told us that the space shuttle and the space station life-support and environmental-control systems have always relied on filtration to purify the air, not ozone.

# Ratings air purifiers



1 Whirlpool

## CR Quick Recommendations

No air purifier alone will clean the air. Nor should it be the first thing you try. Based on increasing concern about exposure to even small amounts of ozone, we strongly suggest using whole-house and portable air purifiers that rely on filters and produce no ozone.

At their lowest and quietest settings, the top-rated portable air purifiers outperformed or matched most of the other portables in the Ratings. There's no reason to choose any others.

Stick with whole-house systems if you have forced-air heating. The top-rated furnace filters are a simple, inexpensive upgrade from the standard furnace filter. For performance comparable to that of the best portables, opt for a professionally installed system.

Ventilation is still the best way to remove odors from your home. Although our latest tests show that the IQAir (20) and Austin Air (21) removed cooking odors, that capability will be reduced with use. And those models aren't very effective at removing dust or smoke.

The **Ratings** rank air purifiers by overall performance. **Quick Picks** lists models that combine performance and value.

## QUICK PICKS

### Best room air purifiers:

- 1 Whirlpool \$230
- 2 Kenmore \$270

Both combine fine performance with quieter operation, especially when set on low. The Hunter (3) costs a bit less in annual costs but was noisier when run on high. Though the Friedrich (28) and Kenmore (29) were better at dust removal on their high settings, they emitted moderate amounts of ozone in our tests, so we don't suggest you buy them.

### Best whole-house air purifiers:

- 1 Lennox \$350, CR Best Buy
- 9 3M \$20
- 10 3M \$16

The Lennox is the only professionally installed system that does not produce ozone, and it's also the least expensive. But it will cost an extra \$200 or more for installation and has high annual costs for filter replacements. Do-it-yourself furnace filters like the 3M (9, 10) aren't the best if you live with a smoker, but these two were very good at removing dust without significantly limiting the heating/cooling system's airflow.

• **Availability** Most models at stores through April 2008.

● Excellent ● Very good ○ Good ○ Fair ● Poor

## Portables

Within types, in performance order. Blue key numbers indicate Quick Picks.

Key number	Brand & model	Price	Annual costs		Overall score	Test results							
			Energy	Filter		Dust removal	Smoke removal	Noise	Ozone emission				
						High speed	Low speed	High speed	Low speed	High speed	Low speed		
						P	F	G	VG	E			

### FILTER PURIFIERS Most use HEPA filtration, and none emit ozone.

1	Whirlpool Whispure AP45030S	\$230	\$77	\$130	63	●	○	○	○	○	○	-
2	Kenmore Progressive 83202 Whirlpool AP510303	270	81	145	57	●	○	○	○	○	○	-
3	Hunter Permalife 30547	270	128	44	56	●	○	○	○	○	○	-
4	Blueair 601	600	60	200	46	●	○	○	○	○	○	-
5	3M Ultra Slim Air Purifier FAP03-RS	200	105	68	45	●	○	○	○	○	○	-
6	Honeywell Enviracaire 50250	170	56	60	45	○	○	○	○	○	○	-
7	Blueair 501	500	64	176	44	●	○	○	○	○	○	-
8	Hunter Quietflo 30401	260	149	120	44	○	○	○	○	○	○	-
9	Vornado 35 AQS35	200	130	95	44	●	○	○	○	○	○	-
10	Bionaire Galileo BAP1250-U	200	79	102	42	○	○	○	○	○	○	-
11	Holmes HAP756	140	77	105	41	○	○	○	○	○	○	-
12	Holmes HAP726	125	126	70	39	○	○	○	○	○	○	-
13	Sharp Plasmacluster FP-P60CX	400	34	20	35	○	○	○	○	○	○	-
14	Panasonic F-P20HU1	100	102	77	35	○	○	○	○	○	○	-
15	Holmes Harmony HAP422-U	85	58	160	34	○	○	○	○	○	○	-
16	Atmosphere (Quixtar.com) Air Purifier	970	27	869	33	○	○	○	○	○	○	-
17	Honeywell QuietClean HFD-120-Q	150	32	0	33	○	○	○	○	○	○	-
18	TrueAir 04492	130	47	0	32	○	○	○	○	○	○	-
19	Winix PlasmaWave 5000	300	36	100	32	○	○	○	○	○	○	-
20	IQAir HealthPro Plus	800	124	230	32	○	○	○	○	○	○	-
21	Austin Air HealthMate HM-400	450	96	95	30	○	○	○	○	○	○	-
22	Amcor AMI30	120	80	34	28	○	○	○	○	○	○	-
23	Bionaire Permotech BAP1500	150	61	0	27	○	○	○	○	○	○	-
24	3M Ultra Slim FAP04-RC	300	42	80	26	○	○	○	○	○	○	-
25	SoleusAir SA-150R	200	44	18	26	○	○	○	○	○	○	-
26	Zojirushi PA-MTC14	170	35	24	24	○	○	○	○	○	○	-
27	Blueair Airpod	100	6	76	16	○	○	○	○	○	○	-

### ELECTROSTATIC PRECIPITATORS All produce some ozone; none exceeded the 50-ppb voluntary FDA limit.

28	Friedrich C-90B	500	48	80	64	●	○	○	○	○	○	M
29	Kenmore (Sears) K6 85264	370	129	0	57	●	○	○	○	○	○	M
30	Bio-Net EGF Enhanced	750	90	122	39	○	○	○	○	○	○	L
31	Sharper Image Hybrid Germicidal Purifier SI724GRY	500	10	0	34	○	○	○	○	○	○	L
32	Ionic Pro Pure Pro 200	200	31	0	31	○	○	○	○	○	○	M
33	Brookstone Pure-Ion Advanced	300	70	0	30	○	○	○	○	○	○	L
34	Honeywell QuietClean HFD-135	300	51	90	26	○	○	○	○	○	○	L



2 Kenmore



1 Lennox



9 3M

## closeup

### ELECTROSTATIC PRECIPITATOR ADVICE

For the past 15 years, CONSUMER REPORTS has recommended some electrostatic precipitators. The Friedrich C-90B and Aprilaire 5000 were effective air purifiers with low annual maintenance costs but produced small amounts of ozone. These portable and whole-house purifiers apply an electrical charge to the particles drawn into the device and produce some ozone as a byproduct.

These products' performance

has not changed significantly, but our advice has. We now believe that air purifiers that emit even small amounts of ozone (less than 50 parts per billion) are not your best choice. Research is increasingly warning against adding ozone to indoor air. But more studies need to be conducted to determine the effects of low-level ozone exposure.

If you own one of these models, we suggest that you err on the side of caution. If a member of your household has asthma or allergy symptoms that aren't improving, even though you've removed allergy and asthma triggers and keep your home well ventilated, you might want to consider switching to one of our highly rated, filter-based models if you still want a purifier.



Friedrich C-90B

Key number	Brand & model	Price	Annual costs		Overall score	Test results						
			Energy	Filter		Dust removal	Smoke removal	Noise	Ozone emission			
						High speed	Low speed	High speed	Low speed	High speed	Low speed	
						P	F	G	VG	E		

#### ELECTROSTATIC PRECIPITATORS *continued*

35	Oreck XL Tower Professional	700	43	50	24	●	●	●	●	●	●	L
36	Oreck XL Tabletop Professional AIRPS	470	33	38	17	●	●	●	●	○	●	L

① Uses a nonreplaceable filter as well as electrostatic technology.

### Whole-house

Key number	Brand & model	Price	Annual cost	Overall score	Test results				
					Dust removal	Smoke removal	Airflow resistance	Ozone emission	
	Similar models, in small type, are comparable to tested model.								
					P	F	G	VG	E

#### PRO-INSTALLED FILTER SYSTEM *Uses non-HEPA filtration and emits no ozone.*

CR BEST BUY	1	Lennox Healthy Climate HC16	\$ 350	\$99	84	●	●	●	-
-------------	---	-----------------------------	--------	------	----	---	---	---	---

#### PRO-INSTALLED ELECTROSTATIC PRECIPITATORS *All emit some ozone; none exceeded the 50-ppb voluntary FDA limit.*

2	Trane Clean Effects ② American Standard Accuclean ②	1,025	16	89	●	●	●	L
3	Aprilaire 5000 ①	450	36	87	●	●	●	L
4	Carrier Infinity Air Purifier GAPA ① Bryant Perfect Air	1,135	89	84	●	●	●	L
5	Trion SE1400	700	33	83	●	●	●	M
6	Trane Perfect Fit TFE210A9FR3	600	22	83	●	●	●	M
7	Carrier EACB	500	29	82	●	●	●	M
8	Honeywell F300	600	25	77	●	●	●	M

#### DO-IT-YOURSELF *Standard, non-HEPA filters, about 1-inch thick. They emit no ozone.*

9	3M Filtrete 1700	20	80	52	●	●	●	-
10	3M Filtrete Ultra Allergen Reduction 1250	16	64	48	●	●	●	-
11	True Blue RP8202014	15	60	43	●	●	○	-
12	3M Filtrete Micro Allergen Reduction 1000	10	40	42	○	●	●	-
13	Precisionaire NaturalAire Elite	13	52	37	○	●	●	-
14	American Air Filter Breathe Right Allergen Barrier	19	76	35	○	●	●	-
15	3M Filtrete Dust and Pollen Reduction 600	8	32	34	○	●	●	-
16	Web Hepa-Pure	30	120	33	○	●	○	-
17	American Air Filter Dirt Demon Dust Shield	3	12	19	●	●	○	-
18	Precisionaire NaturalAire Plus	4	16	17	●	●	●	-
19	Web The Original WEB	20	0	15	●	●	●	-
20	American Air Filter ElectroKlean	26	0	14	●	●	●	-
21	Precisionaire EZ Flow	1	12	14	●	●	●	-
22	Web WEB Lifetime	20	0	13	●	●	●	-
23	American Air Filter StrataDensity ③	2	6	12	●	●	●	-

① Uses non-HEPA filtration as well as an electrostatic precipitator. ② Recalled because electrical arcing inside the collection cells can pose a fire hazard. ③ Comes in four-pack.

### Guide to the Ratings

**Overall score** is mainly how well models removed dust and smoke from a test chamber, plus quietness for room models and airflow resistance for whole-house. **Dust** and **smoke** are how well models cleared the air of fine clay dust and cigarette smoke. Pollen removal is typically similar to dust removal. **Noise** for room models denotes instrument and panel judgments at highest and lowest speeds. **Airflow resistance** reflects how freely air passed through the unit. **Annual cost** is our estimate based on continuous operation. **Ozone emission** is our classification of ozone generated by a product in our tests: 1 to 25 parts per billion (ppb) is low (L); 26 to 50 ppb, medium (M). For whole-house products, ozone calculations are adjusted to be comparable to those for portables. **Price** is approximate retail. Scores for previously tested models may have changed based on the performance of newly tested models and testing changes.