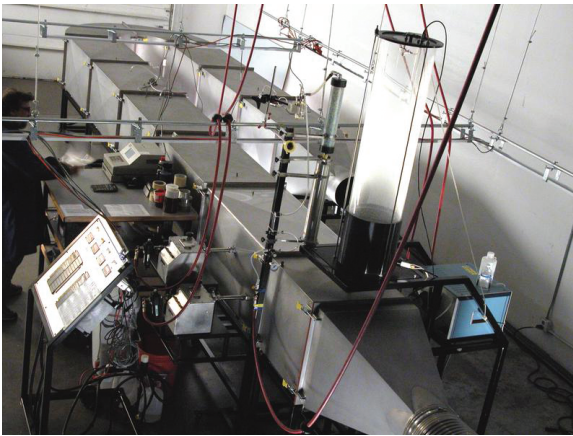


# Results of Independent Lab Comparison of Electronic Air Cleaners

*Clearing the air regarding performance of leading electronic air cleaners*

**Independent Test Objective.** The purpose of this test was to generate unbiased data that could be used to quantify the performance of electronic air cleaners in a way that is most beneficial to the consumer.

**Independent Laboratory Testing.** To help clear the air regarding the true performance and value of today's electronic air cleaners, LMS Technologies, a leading independent test laboratory, has completed a comprehensive and entirely unbiased test of the leading electronic air cleaners in the industry. LMS Technologies, Inc. of Bloomington, MN, is an independent laboratory and global leader of particulate air filtration testing. LMS also performs contamination testing for the food, drug, and semiconductor industries.



*LMS Technologies, Inc. of Bloomington, MN*

**Independent Test Methodology.** LMS independently obtained samples of four leading electronic air cleaners from the open market to ensure a random selection. LMS also selected sizes of each that provided the most consistent comparison.

All tests were conducted following strict industry recognized ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Test Standards 52.1 and 52.2. The electronic air cleaners tested by LMS include:



Aprilaire Model 5000



Carrier Infinity



Trane CleanEffects



Honeywell F300

Research Products Corporation

1015 E. Washington Ave  
Madison, WI 53703

September 2007

Form No. 2322

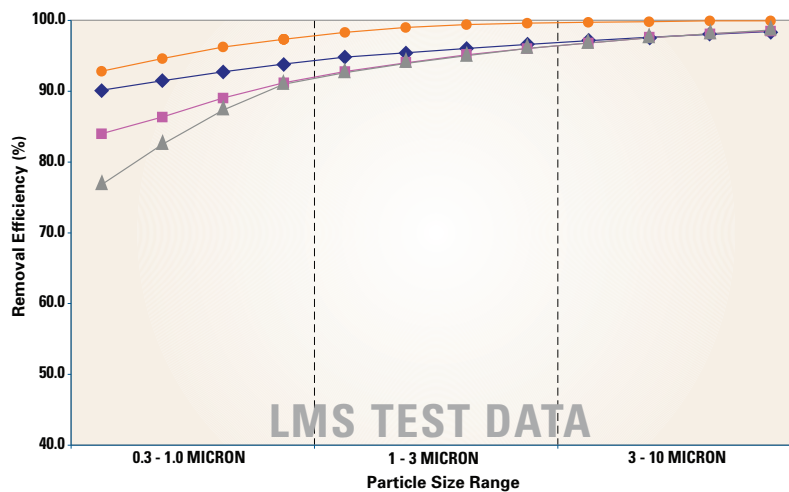
# AIR CLEANING PERFORMANCE

**Efficiency Performance:** Homeowners purchase air cleaners to remove particulate (dust, smoke, allergens, spores, etc...) from the air in their homes. The most important measure of an air cleaner's performance is the percentage of specific sized particles that are removed from the air, or the removal efficiency.

The charts below illustrate how well the four leading electronic air cleaners perform over time as they load with specific sized particles in accordance to ASHRAE test standard 52.2-2007. Particles are sorted into 12 distinct size ranges, then the removal efficiencies are calculated for each range and displayed as data points on the graphs below. You will see that some air cleaners perform very differently when they are brand new and when they load with particles over time.

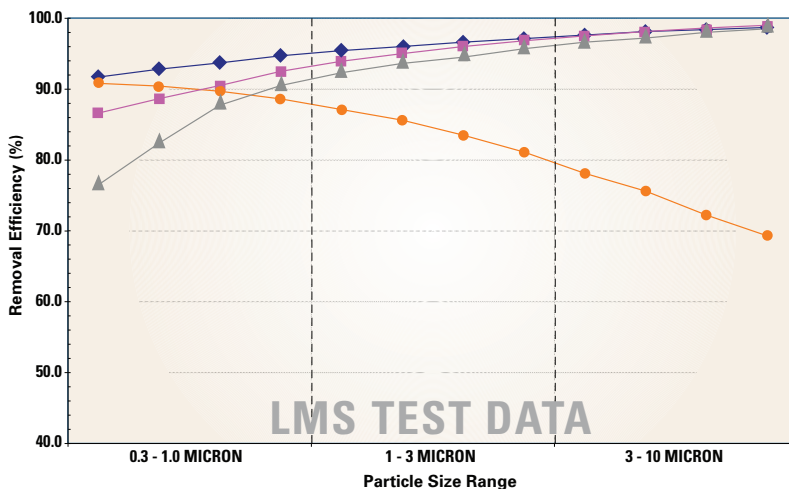


NEW



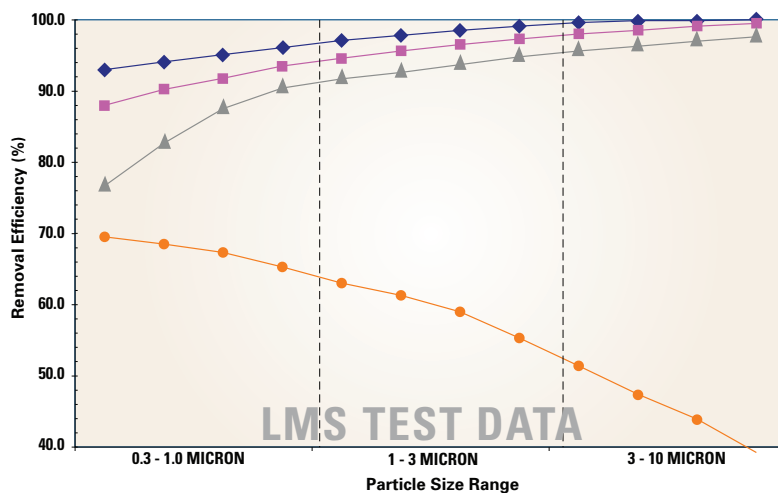
When a new air cleaner is removed from the box and installed, the removal performance is shown in this graph. These performance numbers are often what is reported when some manufacturers publish efficiency numbers. This condition is least important when comparing air cleaners, because it only happens for a very limited time period.

2 MONTHS



Once in service, the air cleaners have removed particulate from the air and performance starts to change. The two month test provides a better real world gauge of efficiency in a residential home. Several models see improvement in performance, while the Trane CleanEffects has a dramatic decrease in performance. This test demonstrates that publishing performance only when new does not give the consumer enough information to make the best buying decision.

6 MONTHS

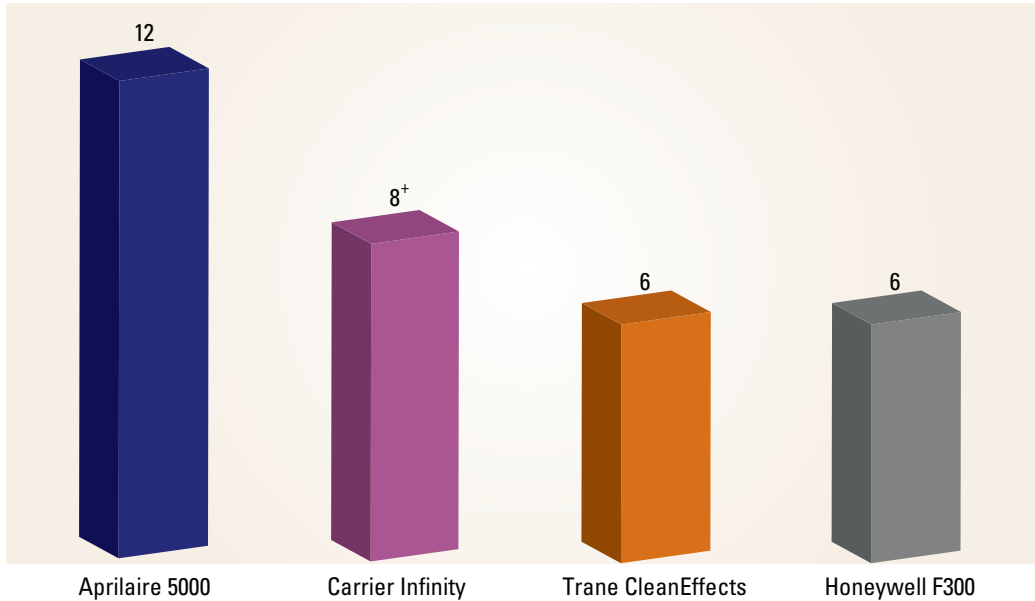


The six month test illustrates performance of air cleaners prior to when most models need some type of maintenance. The Trane product continues to lose performance, capturing less than 50% of particles larger than 4.0 microns (allergens and pollens). The Aprilaire product remains the best performing product, capturing over 99% of all particles over 2.2 microns in size (5 times smaller than what is visible to the naked eye).

Homeowners purchase electronic air cleaners because of their ability to remove the smallest particles (0.3 to 1.0 microns). After weeks of operation, the Aprilaire® Model 5000 outperforms all other products in this important size range.

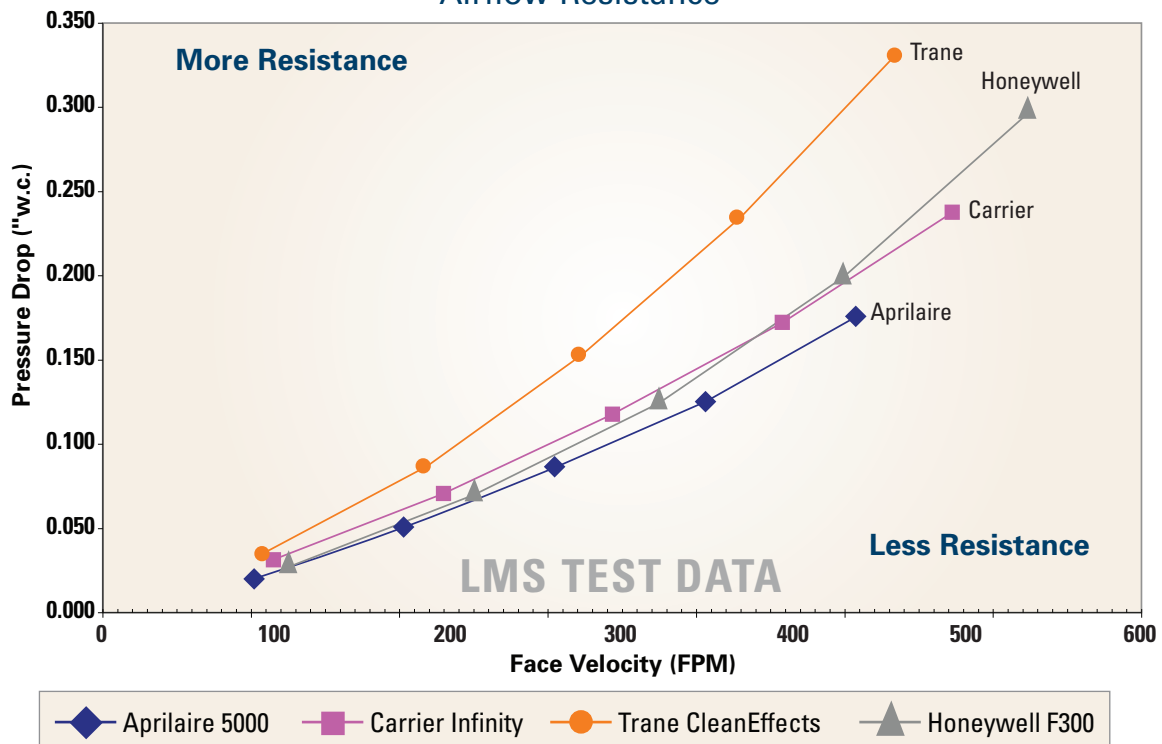
**Maintenance.** All electronic air cleaners tested by LMS require some maintenance in order to retain performance. The most significant maintenance required is the replacement of the media element (Aprilaire and Carrier models) or the cleaning of the collector cells (Trane and Honeywell). The graph below shows the maximum number of months of use before the media element should be replaced or the collector cells cleaned. Information is from the manufacturer's owner's manuals for Aprilaire 5000, Trane CleanEffects and Honeywell F300. Carrier owner's manual does not recommend a time interval for media replacement, so the value was determined by using a dust loading/pressure drop equation to suggest when the media should be changed.\*

**Time Between Media Replacement or Collector Cell Cleaning (In Months)**



**Airflow Resistance.** It is critically important that air cleaners minimize the airflow restriction while cleaning the air within the HVAC system. Restricting the airflow can cause the system to operate inefficiently and waste energy as well as damage expensive HVAC equipment. Less airflow resistance indicates superior performance. The Aprilaire® Model 5000 offers consistently less airflow resistance; 40% less resistance than the Trane CleanEffects, and at least 11% less than all others.

**Airflow Resistance**



**Summary.** The performance of all four electronic air cleaners changed over time. Consumers need to know the performance of electronic air cleaners when they are brand new as well as when they load with particulate over time. The independent testing by LMS Technologies has clearly proven that when considering all the important factors regarding an electronic air cleaner purchase – air cleaning performance, airflow resistance, and maintenance – the Aprilaire® Model 5000 is the best choice:

- *The Model 5000 offers the best air-cleaning performance. The Trane CleanEffects™ model has higher performance right out of the box, however, the CleanEffects quickly loads with particulate and after two months has a significantly lower performance than all other models. The Model 5000 provides the best cleaning performance over time.*
- *The Model 5000 has the lowest resistance to airflow, saving the homeowner energy and minimizing the impact of the air cleaner on the HVAC equipment.*
- *The Model 5000 has the longest recommended service life, requiring less maintenance than other models.*

### LMS Technologies Test Data

Air Cleaner	Initial Particle Removal Efficiency at Various Particle Size Ranges			6 Month Particle Removal Efficiency in Various Particle Size Ranges			Airflow Resistance at 400 fpm ("w.c.")	Service Life (months)
	Smoke & Small Bacteria	Bacteria & Small Spores	Pollen & Spores	Smoke & Small Bacteria	Bacteria & Small Spores	Pollen & Spores		
Aprilaire 5000	92.0%	95.7%	97.8%	94.6%	98.1%	99.9%	0.16	12
Carrier Infinity™	87.6%	94.5%	97.7%	90.9%	96.0%	98.8%	0.18	8
Trane CleanEffects	95.2%	99.1%	99.8%	67.7%	59.7%	45.5%	0.27	6
Honeywell F300	84.4%	94.4%	97.8%	84.3%	93.2%	96.6%	0.18	6

Sources:

LMS Test Reports: 1368, 1372, 1373, 1374, T060707A, T061107A, T061906A

Carrier GAPAA Infinity Air Purifier Installation Instructions, Page 6

Honeywell F300 Owners Guide, Pages 6 - 10

Aprilaire Model 5000 Safety and Installation Manual 10006538, Pages 10 - 11

Trane CleanEffects Users Information Guide 32-5038-01, Pages 3 - 4

For additional details, please see our comprehensive technical white paper which can be found at [www.aprilaire.com/eac/technicalwhitepaper](http://www.aprilaire.com/eac/technicalwhitepaper)

+ See technical whitepaper for detailed explanation.