



# Air Filtration: Lifecycle Costing Explained

The HVAC industry has made great strides in technological innovation and performance related to air filtration. Even so, many businesses continue to focus primarily on initial purchase price when specifying air filtration, mistakenly thinking that price is the only selling feature for air filters. This may be one reason why low-priced “throw-away” panel filters are still specified despite their low filtration efficiencies (less than 20 percent for particles of 3-10 microns) and their role in coil fouling, which leads to costly and time-consuming maintenance.

One of the problems is that the air filtration industry is extremely competitive with many non-differentiated, substitutable products. In addition, the initial purchase price of a filter is tangible. One can see the cost savings and resultant effect on budget immediately. This is the same reason coupons work so effectively in the consumer retail market; they provide instant satisfaction.

A better approach is to focus on value instead of price. Some may dismiss “value” as only a buzzword, and others may argue that price rules over features. And while price will always be a consideration, it’s important to understand that “price” only encompasses the initial cash outlay for acquiring a product. In fact, “price” is only a component of the bigger “cost” picture.

## Meeting Facility Needs

Facility managers have two diverse constituents to support: tenants and building owners. Tenants want clean air, and building owners want happy tenants who stay. This arrangement works as long as the cost of providing the clean air does not exceed the facility management budget. If the cost of providing clean air exceeds the existing budget or the budget is reduced, the facility manager is faced with a decision. He or she can continue to provide high-quality, clean indoor air to the tenants, or he/she can focus on meeting budget, which could potentially jeopardize the health, productivity and general satisfaction of the tenant.

Most likely, facility managers will focus primarily on meeting budget. And when operating budgets decline, facility managers will look for opportunities to reduce expenditures of products purchased. However, this may not be the best approach, especially if it involves sacrificing product quality or performance.

## Air Filtration and Energy

Reflecting back to the concept that price is a component of a total cost, consider what an HVAC filter costs to operate. Studies have shown that investment and maintenance count for about 18.5 percent of the cost to operate a filter, while energy accounts for about 81 percent of the annual cost. The numbers in the table below show the breakdown for various types of filters and verify that energy provides the biggest opportunity for cost savings.

	Initial Cost	Energy Cost	Initial Cost % of Total	Energy Cost % of Total
MERV 8-11 Pleated Filter	\$4	\$46	8%	92%
MERV 14 Rigid Box Filter	\$70	\$304	19%	81%

Smart facility owners will want their facility managers concentrating their money-saving efforts on the area of greatest opportunity. They may be surprised to learn that the area of greatest opportunity is not the initial filter price, but the related energy costs. That’s why it’s important to focus on cost-savings instead of price-savings. Cost savings relate to costs as a whole,

and include the larger energy costs as well as reduced labor costs possible when upgrading to a higher capacity filter that doesn't need to be changed as frequently. Price savings refers to the relatively small amount of savings that can be achieved by negotiating with suppliers on purchase price.

It's important for everyone involved in facility management and maintenance to understand the nuances of air filtration costs. In many cases, one department (and budget) may be responsible for purchasing air filters and filter service contracts while another is responsible for energy expenditures. The problem inherent in this system is that the filter purchaser can easily and innocently make a costly decision for the enterprise by choosing to purchase filters without considering their energy consumption implications, or worse, their impact on air quality and tenant satisfaction.

### The Value of Energy Savings

The cost-savings stream associated with energy can be estimated by examining the overall impact of a filter's pressure drop (otherwise known as resistance to air flow) on energy costs. In this example, two commercially available filter products are compared. Notice that these two filters are essentially identical except for the initial air flow resistance, which is mainly due to the type of filtration media used in constructing the filter:

	Filter A	Filter B
Efficiency	MERV 14	MERV 14
Filter Style	12" Deep Rigid	12" Deep Rigid
Media Area	120 sq. ft.	120 sq. ft.
Initial Price	\$70	\$70
<b>Initial Airflow Resistance</b>	<b>0.45" Water Gauge (WG)</b>	<b>0.65" Water Gauge</b>
Final Airflow Resistance	1.50" WG	1.50" WG
Dust Holding Capacity	300g	300g
Filter Life	12 months	12 months
<b>Energy Cost per Filter</b>	<b>\$277/year</b>	<b>\$306/year</b>
Calculation: Energy Consumption = Q*dP*t/n/1000		
Assumes 24/7/365 operation, energy cost of \$0.08/kWh, fan, motor, drive efficiency (n) of 58%		

Running the above information through a simple **energy cost model** results in an energy cost difference of \$29 per year (using the same assumptions for both filters). While \$29 per year may not sound significant, keep in mind that the savings is per filter.

### Still not convinced?

Try thinking about the cost savings in another way:

- The \$29 saved with Filter A offsets 41 percent of the initial filter price.

- Filter A reduces filter-related energy consumption by 10 percent.
- Filter A reduces filter-related energy costs by 10 percent.
- Depending upon the local source of electricity, Filter A may also reduce greenhouse gas emissions due to lower energy use.

The important point is that there is likely more money to be saved in energy cost than there is in the initial filter price. In addition, the money saved with reduced energy costs may be a good way to "pay" for upgraded filter efficiency and upgraded indoor air quality.

### Did You Know?

The cost of energy used to operate an air filter can be more than 8 times the initial purchase price of the filter.

### Energy-Saving Filters

For those who may think that such a "magical money-saving filter" doesn't exist, remember that the data presented above was generated from commercially available filters. In fact, development of newer materials has provided the filter industry with a chance to produce mechano-electret filter media, which has less resistance to air flow, thus reducing electricity costs in use while maintaining high particle capture efficiencies. With a lower resistance to air flow, the HVAC system needs to overcome less resistance to deliver the required air flow, thus reducing the system's energy consumption and contribution to greenhouse gas emissions – a wise sustainability strategy.

Once you've specified that energy-efficient air filtration system, don't put off regular filter change-outs in an effort to save money. Delaying change-outs can cause the filter to run longer at peak airflow resistance and energy use.

When evaluating your current air filtration strategy, the best approach is one that allows you to find the right balance between indoor air quality and the full lifecycle costs. The most energy-efficient air filters that provide the level of air quality your tenants demand is a winning combination. When considering the energy costs of various filter media technologies versus their air filtration efficiencies, ask your filter supplier or HVAC maintenance contractor the following questions:

- At a given performance level, how much money could be saved by using a filter with a lower resistance to airflow?
- What amount of reduction in airflow resistance offsets the difference in initial filter price?

Answering those questions should lead you to the advantages of HVAC air filters with media that has a combination of a robust mechanical structure and an electret charge.