

Self-Supported Pleats: What You Need to Know

Self-supported pleat filters were developed in the late 1990s to replace wire-supported HVAC pleat filters in the North American market. Today, they are available from a limited number of national manufacturers at MERV 6, 7 and 8 performance levels.

Manufacturers of these filters have invested in automated equipment that allows them to produce filters with very stiff media that requires no wire backing for support and little in the way of framing. These investments have allowed the manufacturers to reduce their labor costs and use their lower-cost position to sell their filters as commodities based almost exclusively on price.

Self-supported pleated filters, however, have some serious drawbacks in use. For example, to make the filter media stiff enough to be pleated without wire support, manufacturers tend to produce a structure that compromises air permeability. The result is a filter that is not as efficient at total or composite particle removal over all particle size ranges as many wire-backed pleated filters, and is frequently more restrictive to airflow.

This airflow restriction causes the HVAC system to work harder to push air through the filter, thus increasing energy costs.

Pay Attention to Cost-In-Use

Even with the tremendous technological strides the air filtration industry has made, and with the myriad of filter media and finished filter types available, some purchasers continue to focus almost solely on the initial purchase price when specifying air filtration, mistakenly thinking that price is the only selling feature for air filters.



Recent studies suggest the appropriate minimum air filter efficiency for office buildings is MERV 7 to 11 or better to provide good HVAC system cleanliness and efficient operation.

One of the problems with considering only the lower purchase price of self-supported pleated filters is that the filter's purchase price only encompasses the initial cash outlay for acquiring the filter. In fact, the purchase "price" is only one small component of the filter's actual "cost."

Studies have shown that the initial investment (purchase price) and maintenance count for about 18 percent of the cost to operate a filter. Energy costs associated with the filter in-use account for about 81 percent of the annual cost. The numbers in the table below provide an example of the breakdown for a typical self-supported pleated filter and a supported pleated filter.

	Initial Cost	Energy Cost*	Initial Cost % of Total	Energy Cost % of Total
MERV 8 Pleated Filter	\$5.00	\$55.11	8.5%	91.5%
MERV 8 Self-Supported Pleated Filter	\$4.00	\$59.11	6.3%	93.7%

*Energy cost calculated per filter on 3 months life, terminal resistance of 1" W.G., 24x7x365 operation, \$0.10/kWh energy cost, typical fan efficiencies.



The higher energy cost of the self-supported pleated filter is related to the resistance of the air passing through the filter. The lower the filter's resistance to airflow, the lower the energy consumption will be.

Filters made with depth-loading media using a density gradient structure can help to reduce pressure drop, enhance dust loading and prevent face loading of the filter.

Self-supported pleated filters may have a higher resistance to airflow than supported pleated filters because they use more binders and glues to impart stiffness to the media. Those binders and glues can clog the "pores" of the filter, cutting down on airflow, which makes the HVAC system fan work harder. On the other hand, filter media for supported pleated filters (such as media made by **KIMBERLY-CLARK PROFESSIONAL**[®]) contains no binders and glues, thus ensuring low airflow resistance and lowering HVAC system energy costs because the fan does not need to work as hard to push the required air through the system.

Self-supported pleated filters also tend to have lower dust holding capacity than supported pleated filters, meaning that the self-supported pleated filter is not able to hold as high a particulate mass before reaching terminal airflow resistance. This can result in a higher filter change-out frequency than with a supported pleated filter, which increases the filter maintenance costs – another aspect of its cost-in-use.

Sometimes the dust holding capacity is so poor that self-supported pleated filters can very quickly become so completely loaded with dust that the force of the air handler can blow the filter right out of its housing and into the fan. Some self-supported pleated filter makers have responded to this by adding additional framing, but this step does not resolve the airflow resistance and dust holding capacity issues.

IAQ Issues

Filter purchasers would be wise to investigate the fine particle removal efficiencies of self-supported pleated filters before buying as well. Remember that there's more to a filter's filtration efficiency than just its MERV. That's why it is important to review the efficiency values that are included in the ASHRAE 52.2 test report.

When evaluating self-supported pleated filters, pay special attention to the efficiency of the filter over all three particle size ranges: E1 (very fine particles in the 0.3 to 1.0 micrometer range), E2 (fine particles in the 1.0 to 3.0 micrometer range) and E3 (coarse particles in the 3.0 to 10.0 micrometer range). Testing has shown that self-supported pleated filters tend to have lower E1 and E2 efficiencies than supported pleated filters.

Most of the respirable dust and particles people breathe into their lungs is three micrometers or smaller, so high E1 and E2 efficiencies are critical to providing for good indoor air quality (IAQ).

High E1 and E2 efficiencies are possible with supported media filters utilizing electret-charged filter media. This is because while sub-micron particles are much smaller than the void spaces present in most commercial electret media, the electrostatic forces within the media structure allow those particles to be removed with high efficiency.



50 percent of illnesses are linked to poor IAQ, and poor IAQ costs the U.S. economy \$160 billion a year.

Sustainability Issues

Facilities looking to improve their environmental sustainability performance by reducing the amount of waste sent to landfills also should consider the amount of filter media that goes into a self-supported pleated filter – filter media that subsequently will be sent to a landfill upon disposal.

In most cases, self-supported pleated filters use more and heavier media, which is needed to help impart stiffness and durability. However, supported pleated filters of the same filtration efficiency tend to contain less media for less of an environmental impact upon disposal.

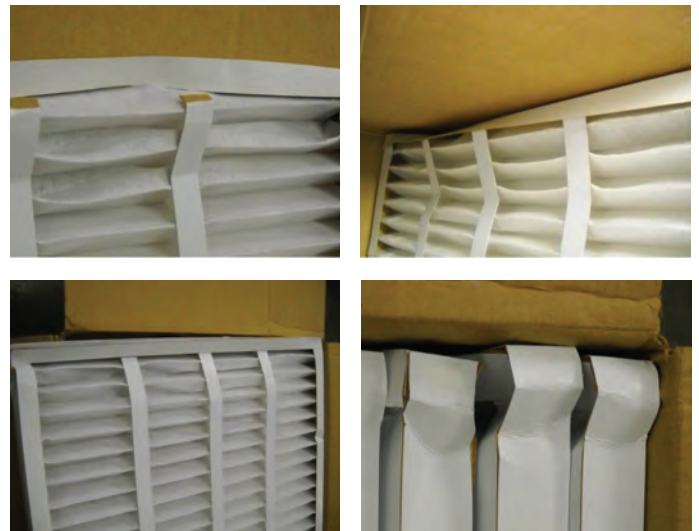
The longer filter life of a supported pleated filter (which doesn't need to be changed as often thanks to a longer time until terminal airflow resistance than self-supported pleated filters) also translates into fewer filters being disposed of during a particular timeframe.

Not Indestructible

In general, self-supported pleated filters are typically durable and stand up well to shipping. However, this isn't always the

case, as seen in the photos below of self-supported pleated filters shipped via a well-respected ground shipping carrier.

Those who may be tempted to use damaged filters should consider the potential effects of bypass air. Bypass can occur when filter media is not properly sealed in the filter frame, when filters are not properly installed and gasketed in filter racks, or when air handler doors and ducts are not properly sealed. Bypass air can cause contamination in housings, coils, fans and ducts, and can increase system operating costs in addition to decreasing a filter's performance and affecting IAQ.



Don't Be Swayed By Price, Consider Total Cost-in-Use in Your Decision

Even as the national economy moves toward recovery, many businesses (rightly so) will continue to look for opportunities to save money when it comes to spending on consumables. While reducing costs is a sound business practice, air filter purchasers need to be more thorough and look beyond the initial purchase price to the filter's total cost in use.

Now is the time to review your filter specification to ensure you have fully optimized the cost-benefit value. To assist you with this review, KIMBERLY-CLARK PROFESSIONAL* offers a **free online filter cost calculator** (http://www.kcfiltration.com/resource/calculator/KC_calc.html) to help you make a more informed decision.

