CLEAN AIR SOLUTIONS

FILTER Sales & Service Inc.

Our Hotels Are Thinking Green!

FILTER Sales & Service Inc.

A great opportunity at an opportune time

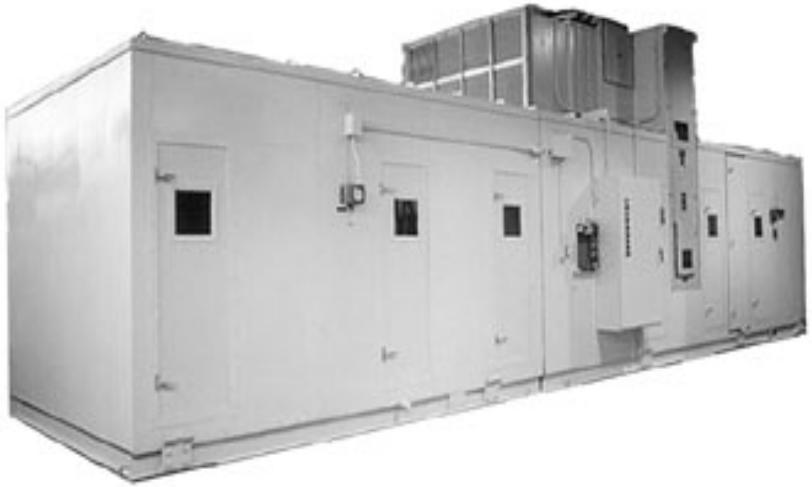
Agenda items

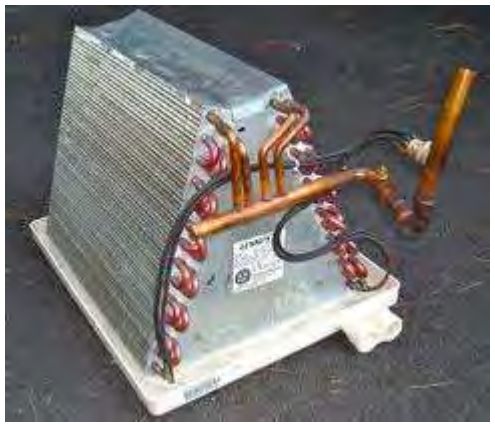
- Energy Today
- Life Cycle Cost
- Unique Approach To Clean Air

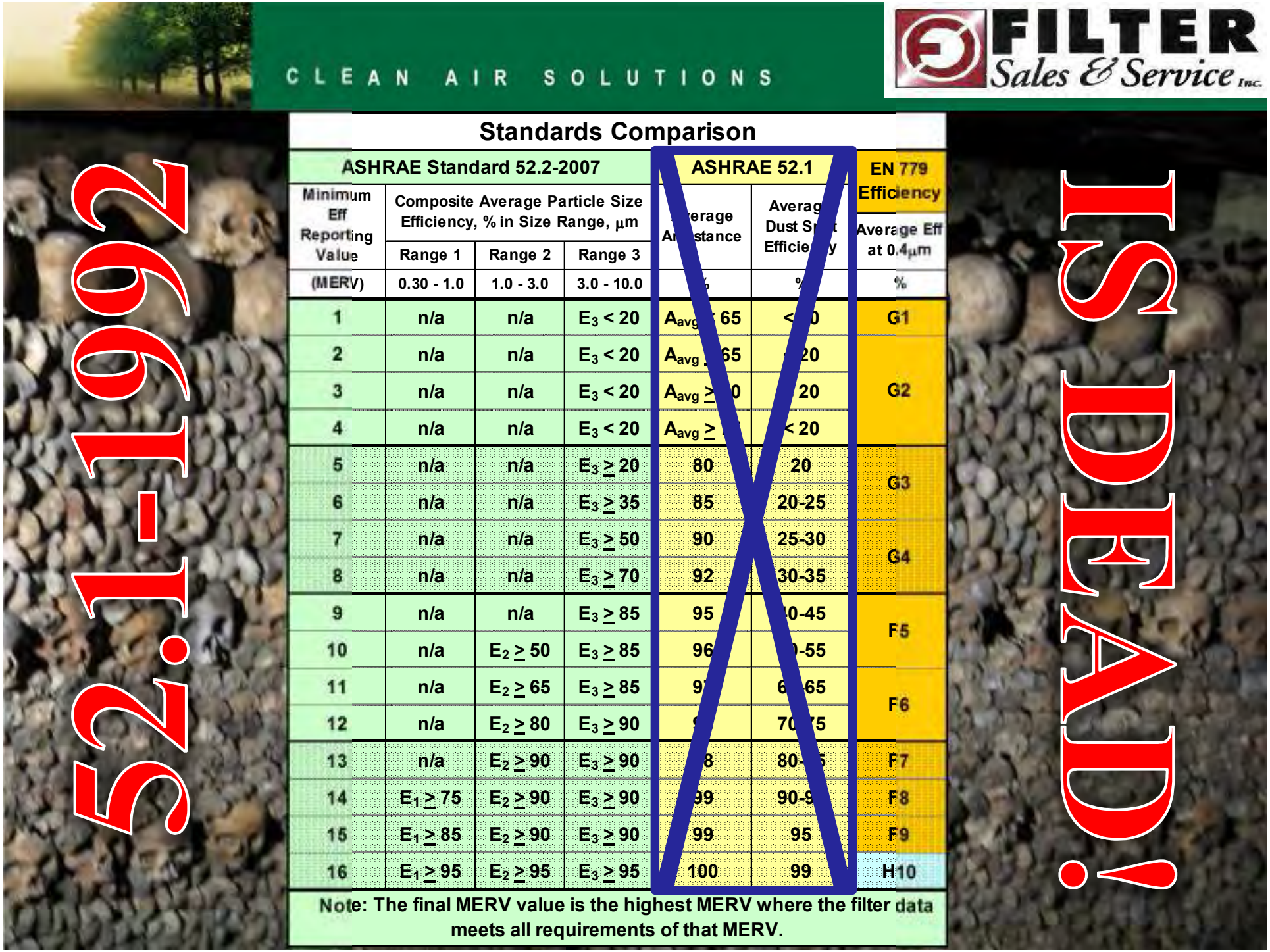
- Choosing the Proper Filtration
- To Protect - Décor

Protecting the Guests?

Protect the Equipment





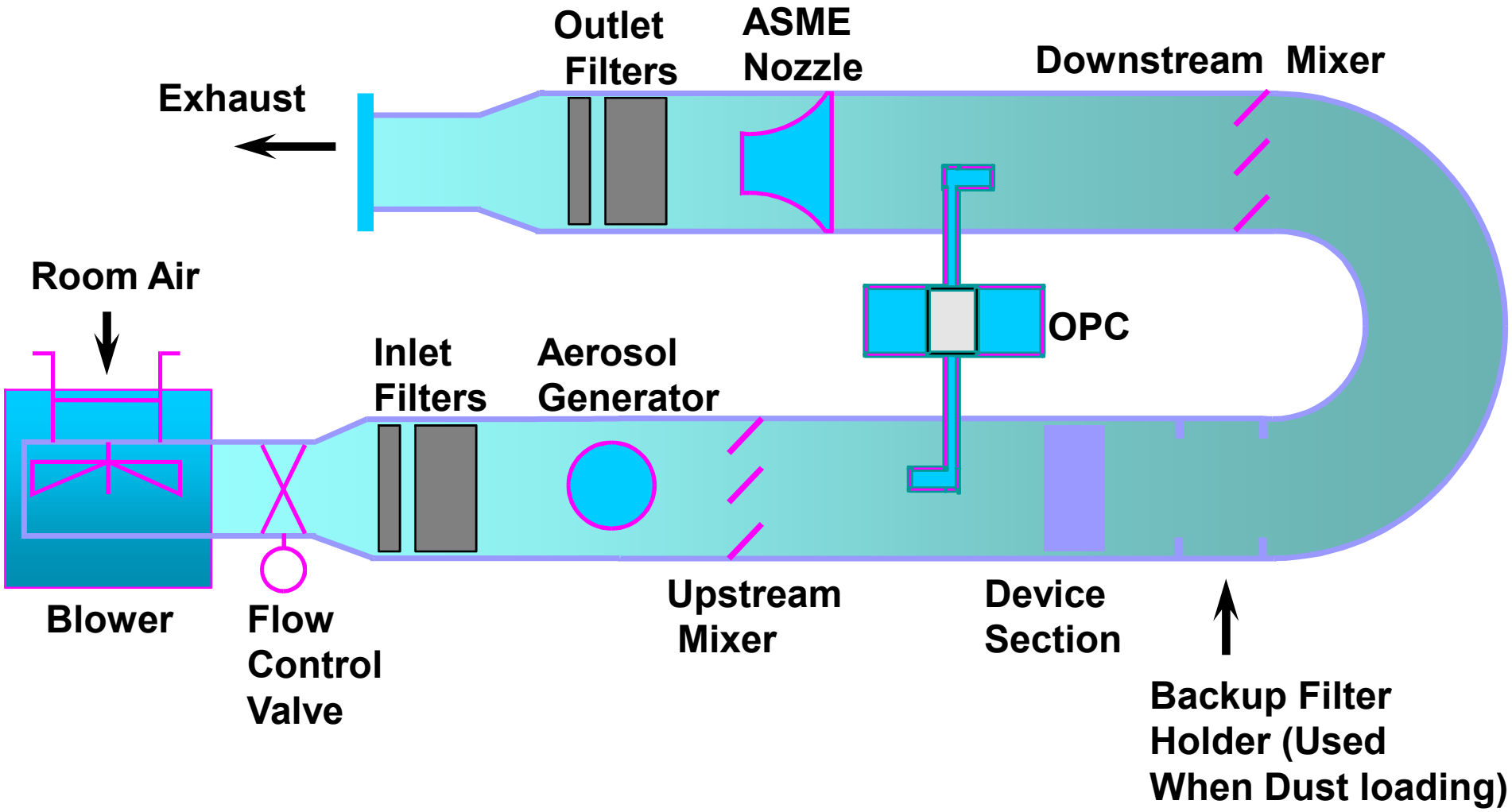


Standards Comparison

ASHRAE Standard 52.2-2007				ASHRAE 52.1		EN 779 Efficiency
Minimum Eff Reporting Value	Composite Average Particle Size Efficiency, % in Size Range, µm			Average Arrestance	Average Dust Spot Efficiency	Average Eff at 0.4µm
	Range 1	Range 2	Range 3			
(MERV)	0.30 - 1.0	1.0 - 3.0	3.0 - 10.0	%	%	%
1	n/a	n/a	$E_3 < 20$	A_{avg} < 65	< 20	G1
2	n/a	n/a	$E_3 < 20$	$A_{avg} \geq$ 65	< 20	G2
3	n/a	n/a	$E_3 < 20$	$A_{avg} \geq$ 70	< 20	
4	n/a	n/a	$E_3 < 20$	$A_{avg} \geq$ 75	< 20	
5	n/a	n/a	$E_3 \geq 20$	80	20	G3
6	n/a	n/a	$E_3 \geq 35$	85	20-25	
7	n/a	n/a	$E_3 \geq 50$	90	25-30	G4
8	n/a	n/a	$E_3 \geq 70$	92	30-35	
9	n/a	n/a	$E_3 \geq 85$	95	40-45	F5
10	n/a	$E_2 \geq 50$	$E_3 \geq 85$	96	50-55	
11	n/a	$E_2 \geq 65$	$E_3 \geq 85$	97	60-65	F6
12	n/a	$E_2 \geq 80$	$E_3 \geq 90$	98	70-75	
13	n/a	$E_2 \geq 90$	$E_3 \geq 90$	98	80-85	F7
14	$E_1 \geq 75$	$E_2 \geq 90$	$E_3 \geq 90$	99	90-95	F8
15	$E_1 \geq 85$	$E_2 \geq 90$	$E_3 \geq 90$	99	95	F9
16	$E_1 \geq 95$	$E_2 \geq 95$	$E_3 \geq 95$	100	99	H10

Note: The final MERV value is the highest MERV where the filter data meets all requirements of that MERV.

Test Duct Configuration



CLEAN AIR SOLUTIONS

TYPICAL 52.2 COMPLETE LOADING TEST DATA

Size Range (microns)	Fractional Efficiency (%) @ ΔP ("W.G.)						Composite Minimums
	0.285	0.320	0.464	0.643	0.822	1.000	
0.3-0.4	2.7	6.7	17.2	29.4	37.1	37.9	2.7
0.4-0.55	7.8	15.9	27.7	43.3	53.2	54.6	7.8
0.55-0.7	11.2	30.2	46.0	60.7	70.5	71.6	11.2
0.7-1.0	17.6	42.6	59.3	73.7	81.3	81.8	17.6
1.0-1.3	20.4	51.6	70.3	80.8	83.7	85.2	20.4
1.3-1.6	23.9	58.2	76.5	84.7	86.1	87.2	23.9
1.6-2.2	28.3	69.9	84.1	89.1	90.2	91.0	28.3
2.2-3.0	36.3	83.9	91.9	94.2	94.4	93.2	36.3
3.0-4.0	39.4	89.4	93.7	95.8	96.4	94.9	39.4
4.0-5.5	42.8	90.6	95.3	96.5	97.9	95.6	42.8
5.5-7.0	46.5	92.3	97.1	98.0	98.4	97.9	46.5
7.0-10.0	50.4	94.8	97.5	98.3	100.0	99.2	50.4
	Initial						

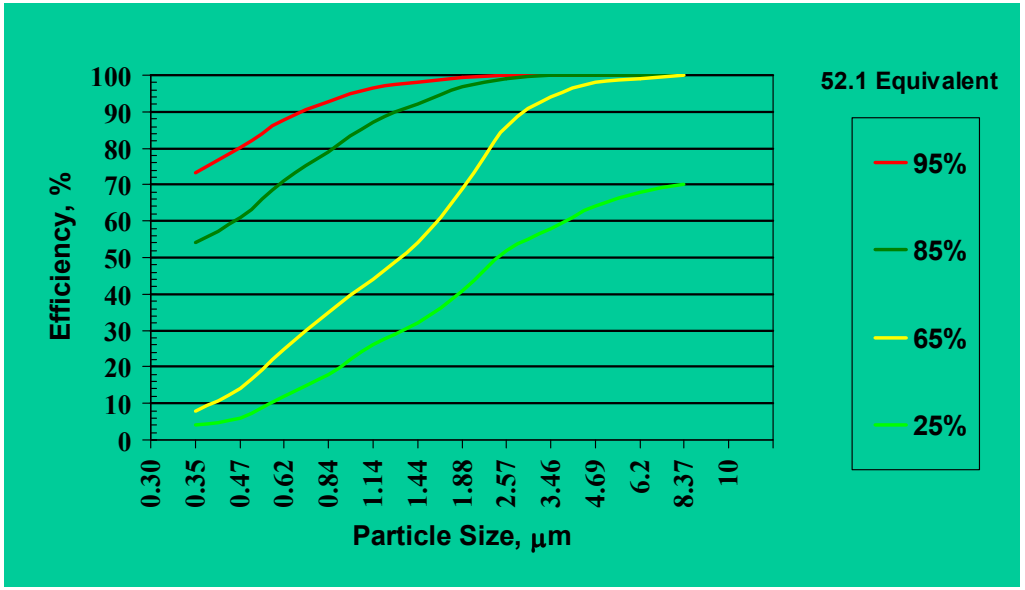
Minimum Efficiency Reporting Value: MERV 6 @500FPM

Composite Average Efficiency:

0.3 to 1.0 Micron	1.0 to 3.0 Micron	3.0 to 10.0 Micron
$E_1 = 9.8$	$E_2 = 27.2$	$E_3 = 44.8$

ASHRAE 52.2

- Minimum Efficiency Reported Value (MERV) Efficiency by particle size reported as one number – 1 to 16



Typical Minimum Efficiency Reporting Curves

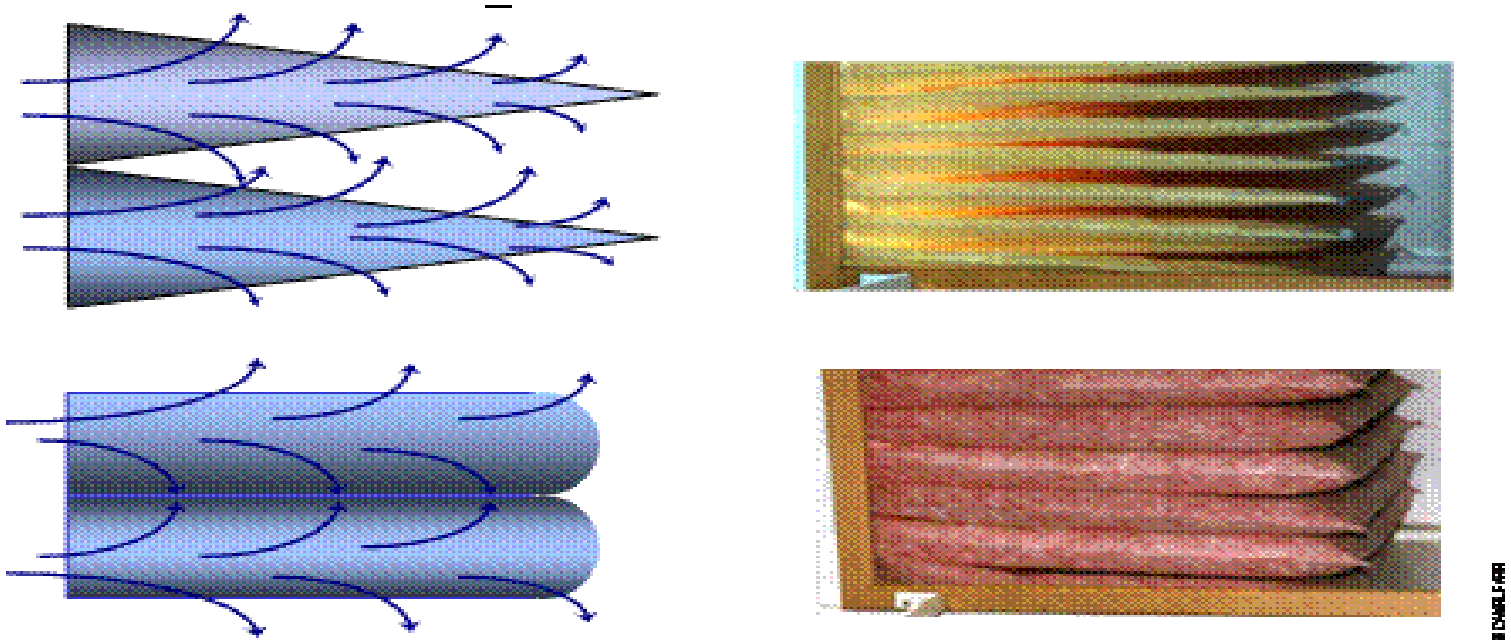
ASHRAE 52.2 "Appendix J"

- Incorporates a conditioning step using KCL.
- Eliminates static charges on media that typically dissipates quickly in service.
- Results in a MERV-A rating

Table 3 Cross-Reference and Application Guidelines (Table E-1, ASHRAE

Std. 52.2 Minimum Efficiency Reporting Value (MERV)	Approx. *Std.* 52.1 Results		Application Guide		
	Duct Spot Efficiency	Arrestance	Typical Controlled Contaminant	Typical Applications and Limitations	Typical Air Filter/Cleaner Type
20	n/a	n/a	**≤0.30 µm Particle Size**	Cleanrooms	**HEPA/ULPA Filters**
19	n/a	n/a	Virus (unattached)	Radioactive materials	≥99.999% efficiency on 0.1–0.2 µm particles, IEST Type F
18	n/a	n/a	Carbon dust	Pharmaceutical manufacturing	≥99.999% efficiency on 0.3 µm particles, IEST Type D
17	n/a	n/a	Sea salt	Carcinogenic materials	≥99.99% efficiency on 0.3 µm particles, IEST Type C
			All combustion smoke	Orthopedic surgery	≥99.97% efficiency on 0.3 µm particles, IEST Type A
			Radon progeny		
16	n/a	n/a	**0.3–1.0 µm Particle Size**	Hospital inpatient care	**Bag Filters** Nonsupported (flexible) microfine fiberglass or synthetic media. 12 to 36 in. deep, 6 to 12 pockets.
15	>95%	n/a	All bacteria	General surgery	
14	90–95%	>98%	Most tobacco smoke	Smoking lounges	
13	80–90%	>98%	Droplet nuclei (sneeze)	Superior commercial buildings	**Box Filters** Rigid style cartridge filters 6 to 12 in. deep may use lofted (air laid) or paper (wet laid) media.
			Cooking oil		
			Most smoke		
			Insecticide dust		
			Copier toner		
			Most face powder		
			Most paint pigments		
12	70–75%	>95%	**1.0–3.0 µm Particle Size**	Superior residential	**Bag Filters** Nonsupported (flexible) microfine fiberglass or synthetic media. 12 to 36 in. deep, 6 to 12 pockets.
11	60–65%	>95%	Legionella	Better commercial buildings	
10	50–55%	>95%	Humidifier dust	Hospital laboratories	**Box Filters** Rigid style cartridge filters 6 to 12 in. deep may use lofted (air laid) or paper (wet laid) media.
9	40–45%	>90%	Lead dust		
			Milled flour		
			Coal dust		
			Auto emissions		
			Nebulizer drops		
			Welding fumes		
8	30–35%	>90%	**3.0–10.0 µm Particle Size**	Commercial buildings	**Pleated Filters** Disposable, extended surface, 1 to 5 in. thick with cotton-polyester blend media, cardboard frame.
7	25–30%	>90%	Mold	Better residential	
6	<20%	85–90%	Spores	Industrial workplaces	**Cartridge Filters** Graded density viscous coated cube or pocket filters, synthetic media
5	<20%	80–85%	Hair spray	Paint booth inlet air	**Throwaway** Disposable synthetic media panel filters
			Fabric protector		
			Dusting aids		
			Cement dust		
			Pudding mix		
			Snuff		
			Powdered milk		
4	<20%	75–80%	**>10.0 µm Particle Size**	Minimum filtration	**Throwaway** Disposable fiberglass or synthetic panel filters
3	<20%	70–75%	Pollen	Residential	**Washable** Aluminum mesh, latex coated animal hair, or foam rubber panel filters
2	<20%	65–70%	Spanish moss	Window air conditioners	**Electrostatic** Self charging (passive)
			Dust mites		
			Sanding dust		
			Spray paint dust		

Filter design & construction makes a big difference

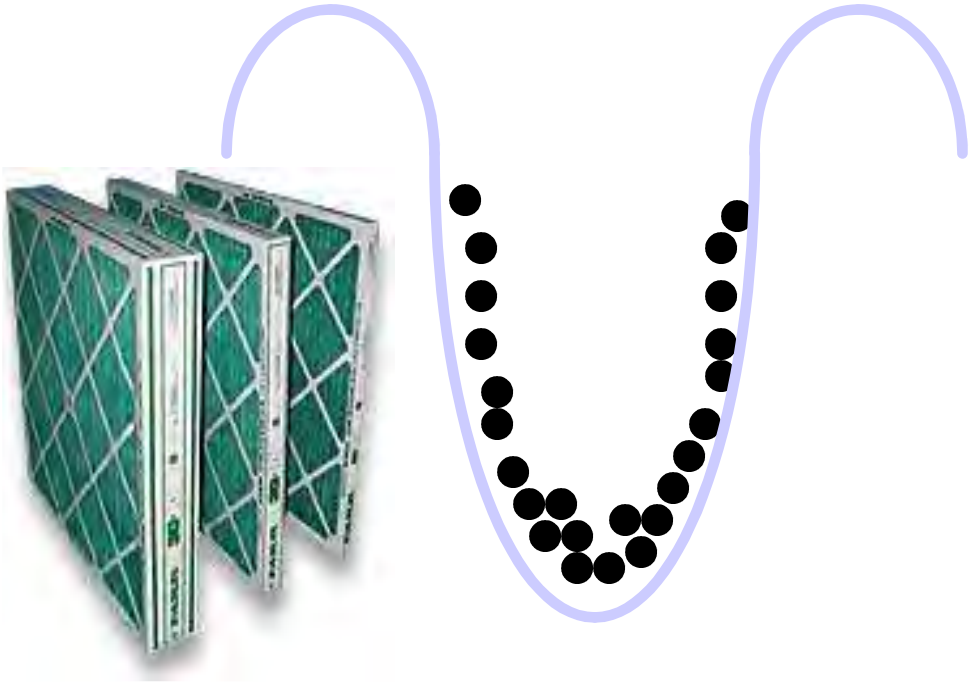


blocked surface area = high ∆p & shorter life

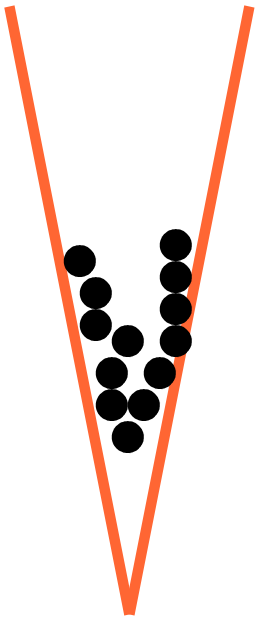
- Camfil Farr is clearly the highest quality provider of Air Filtration Products in the industry. Highly-engineered and carefully manufactured products assure maximum filter efficiency with minimum resistance to airflow.
- Quality of manufacturing and filter design can represent as much as a 75% difference in resistance to airflow between air filters of similar design and media.

Camfil Farr Design vs. “Copy me” Design

Uniform radial style pleat loads evenly resulting, in lower average pressure drop and long loading curve.

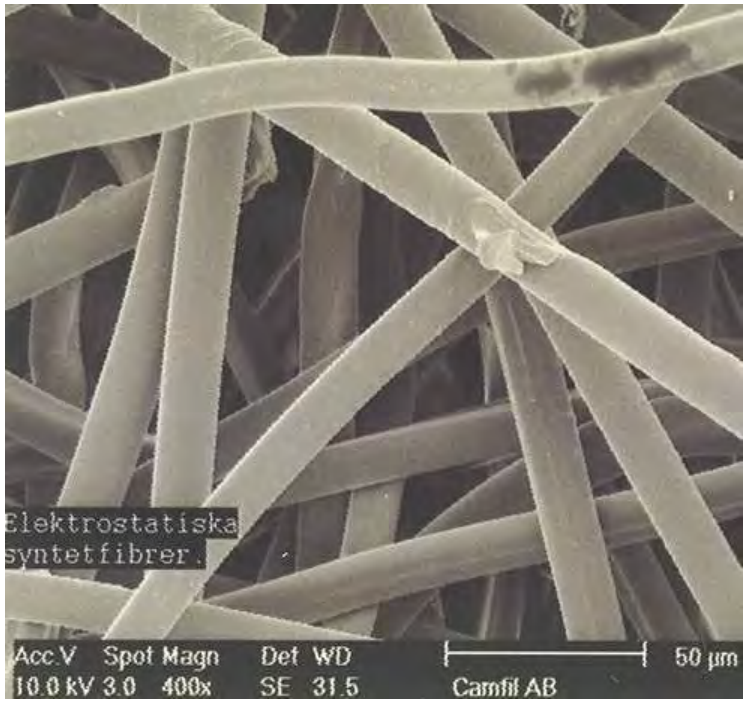


Chandler or ‘V” type pleat will blind causing rapid increase in pressure drop.



The media you use makes a big difference

- Glass Fibers (fine fibers)
  - many fibers/small diameter



- Synthetic Fibers (coarse fibers)
  - fewer fibers/large diameter

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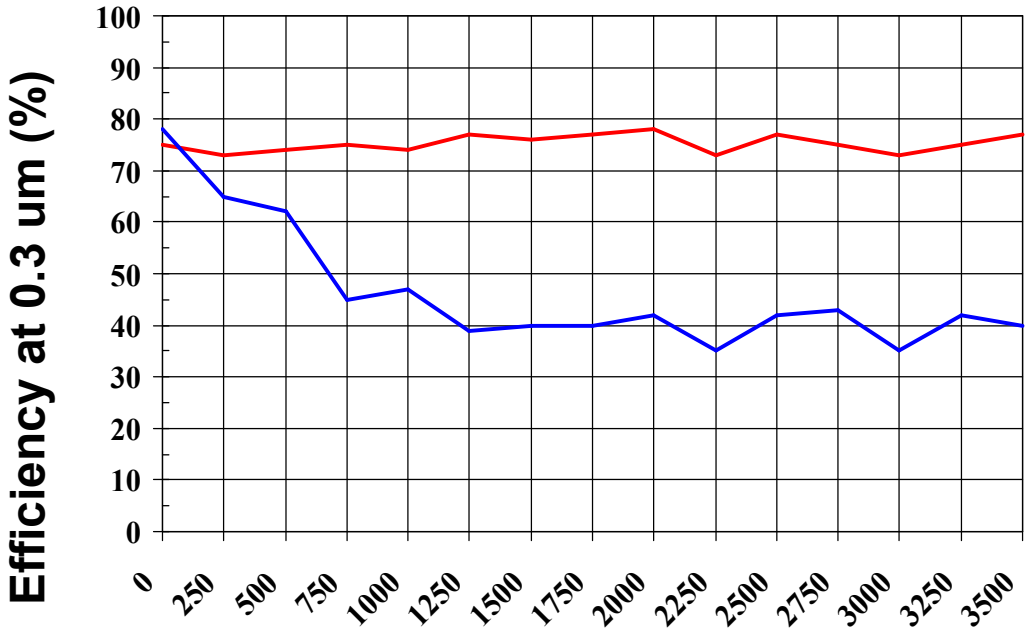
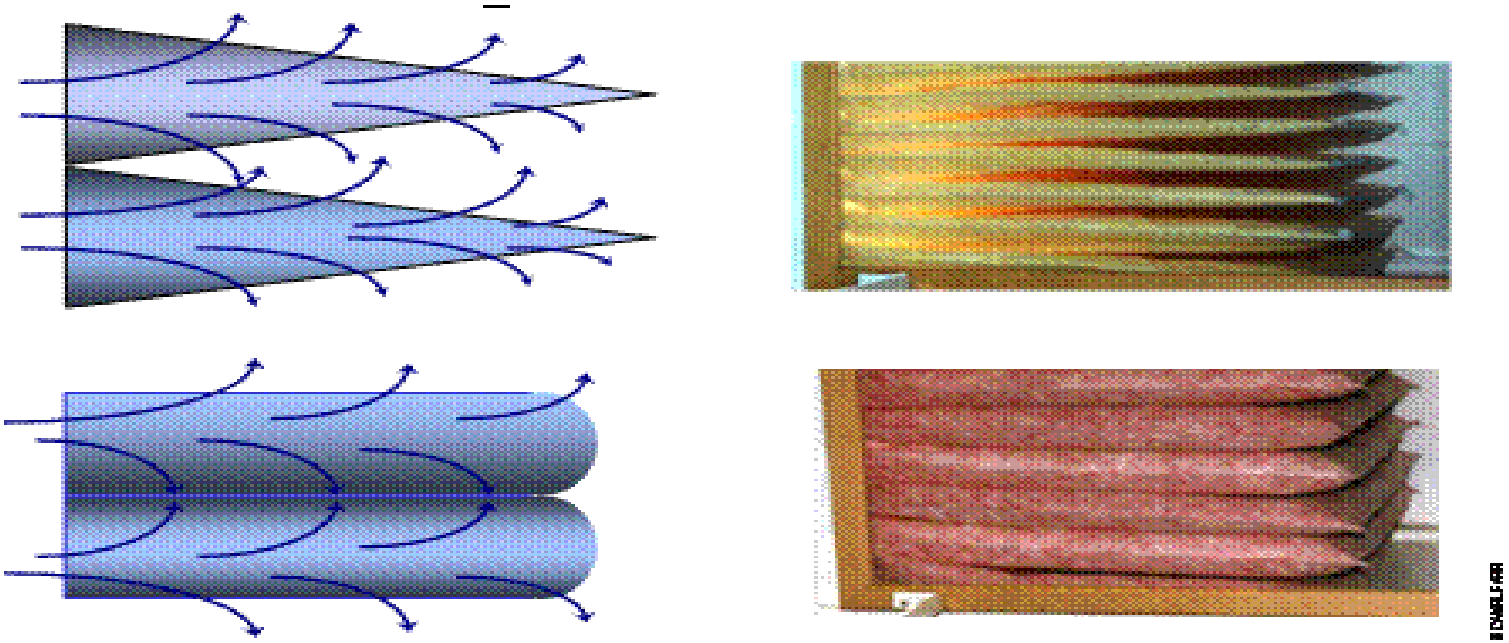
Glass media (fine fiber) significantly outperforms charged synthetic media in “real life” applications

Clean air with economic benefits



- **MERV 14 glass, fine fiber media (Univ. Minn.)**
- **MERV 14 synthetic, coarse fiber media (Univ. Minn.)**

Filter design & construction makes a big difference



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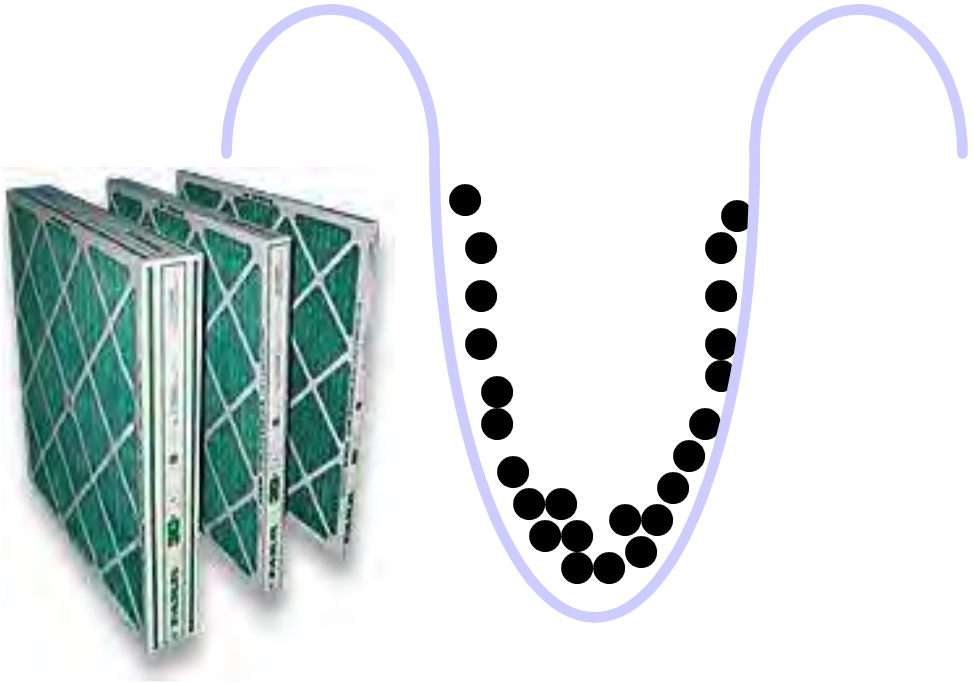

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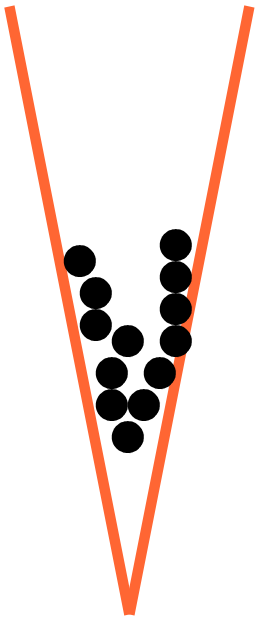

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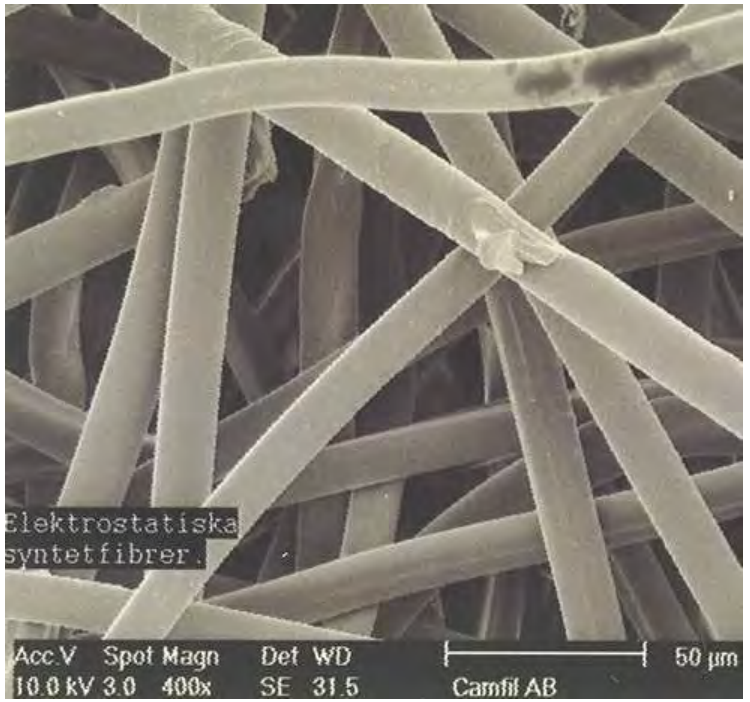

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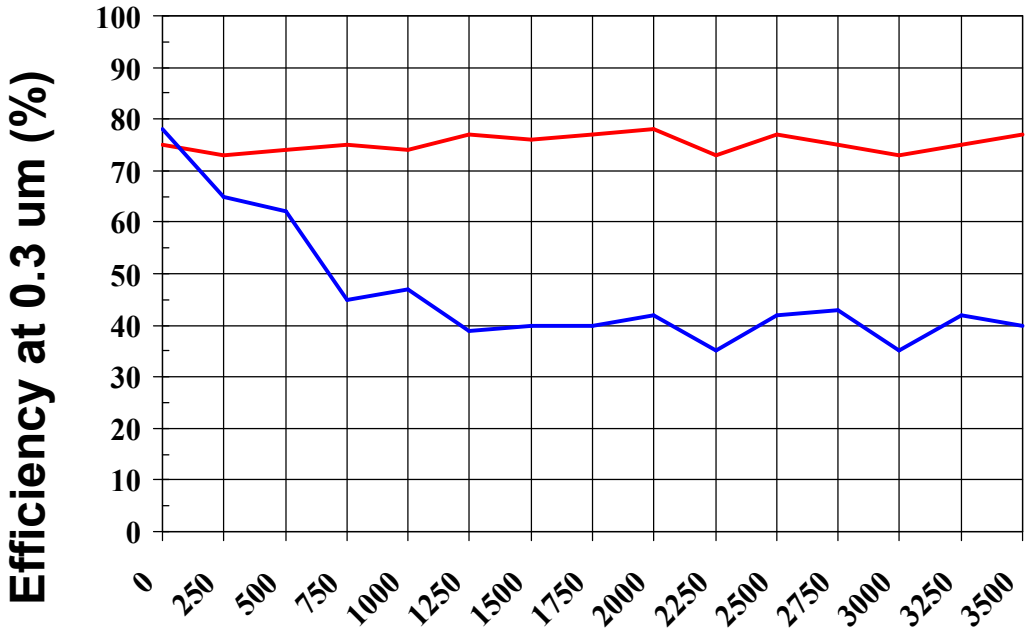
Clean air with economic benefits



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The two roads to savings

Total Cost Analysis

Low Price

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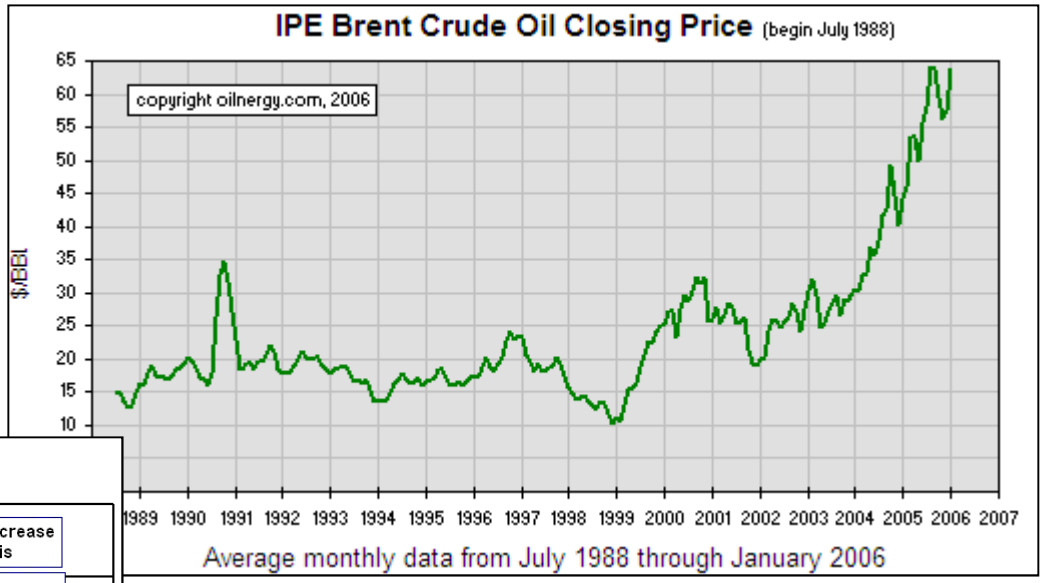
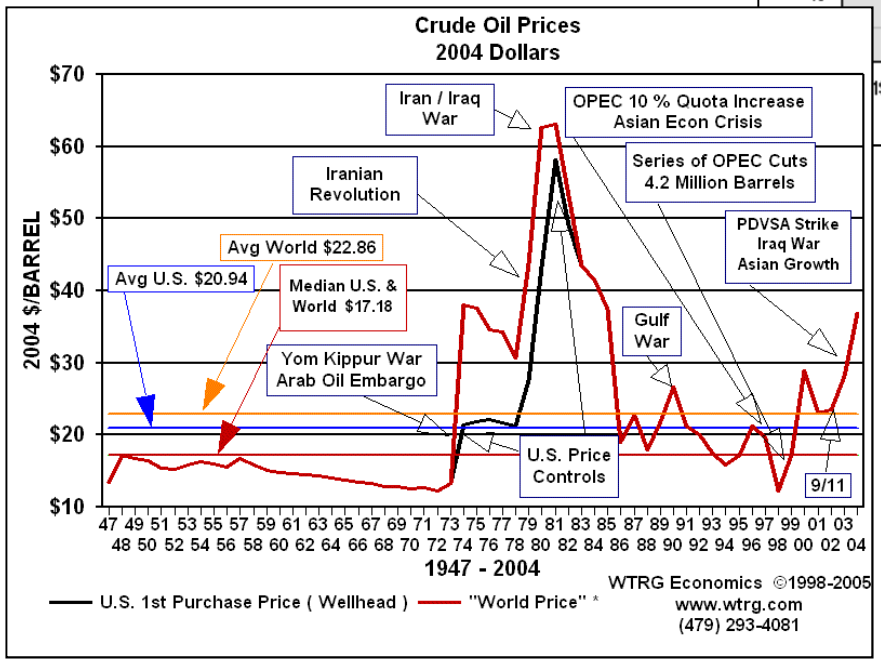
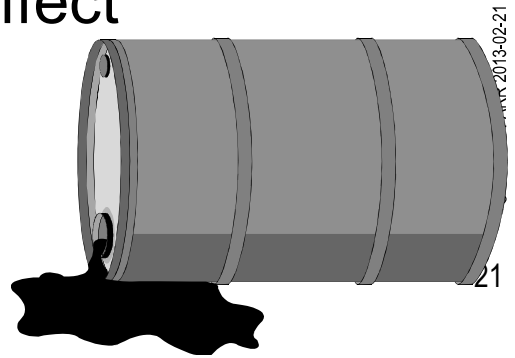
Why Energy, Why Now?

Energy is foremost in the concerns of economic advisors worldwide.





World events have a disturbing effect on oil pricing.



LCC and filtration

- What we know is .....
- the HVAC system is typically the largest energy consumer in a building
- optimizing filter selection at a given level of efficiency (maximize IAQ while minimizing total cost)

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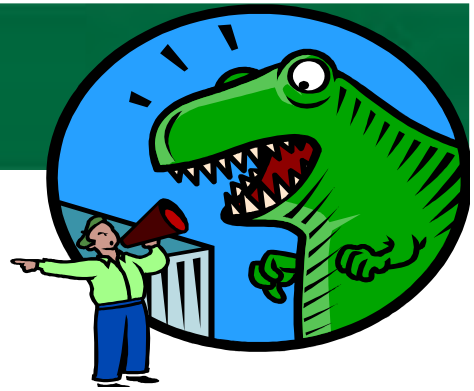
30% of the total electric bill your HVAC system* –

60- 80%

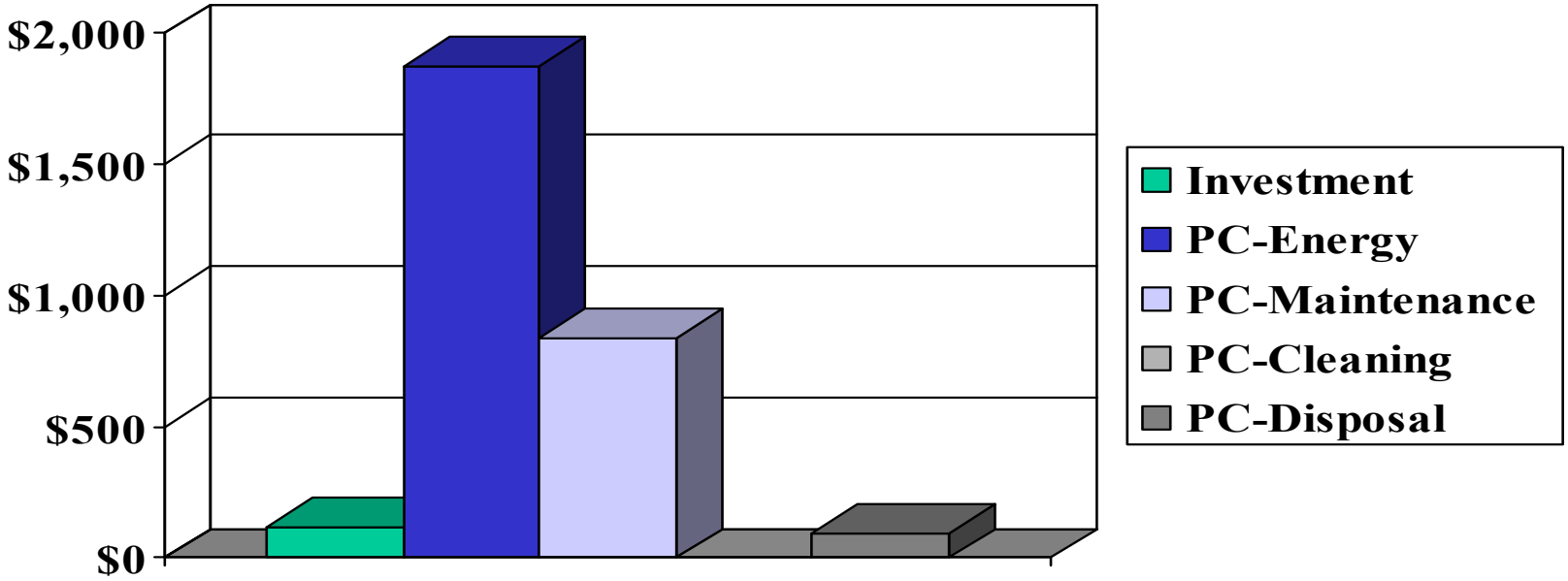
of the cost to operate air filters in a HVAC system is energy to move air through the filters

*EPA data@ WWW.epa.gov



energy is the ”monster”

energy costs typically represent anywhere from 50%-80% of life-cycle cost!!!!!!



Life Cycle Cost

why do we need LCC?

- at a given efficiency level, LCC allows the user to minimize total cost of ownership
- LCC allows the user to make knowledgeable choices (i.e., “first cost” shouldn’t be the only consideration)
- LCC helps us demonstrate that using “good” filters saves money

camfil FARR

components of Life-Cycle Cost

$$LCC = Investment + PC_{energy} + PC_{maint.} + PC_{cleaning} + PC_{disposal}$$

- Investment – capital cost of filters, frames, installation
- PC_{energy} – present total cost of power
- $PC_{maintenance}$ – present total cost of maintenance including filter replacement, etc.
- $PC_{cleaning}$ – present cost of duct cleaning
- $PC_{disposal}$ – present total cost for removal and disposal of the used filters

energy equation for life-cycle cost

- PC_{Energy} – the current cost of energy

$$\text{Energy } (E) = [(Q * \Delta P * T)/(\eta * Co)] * Pc$$

Q – Air flow, m^3/s (cfm)

ΔP – Average filter pressure loss, Pa (inWG)

T – Operation time, hr

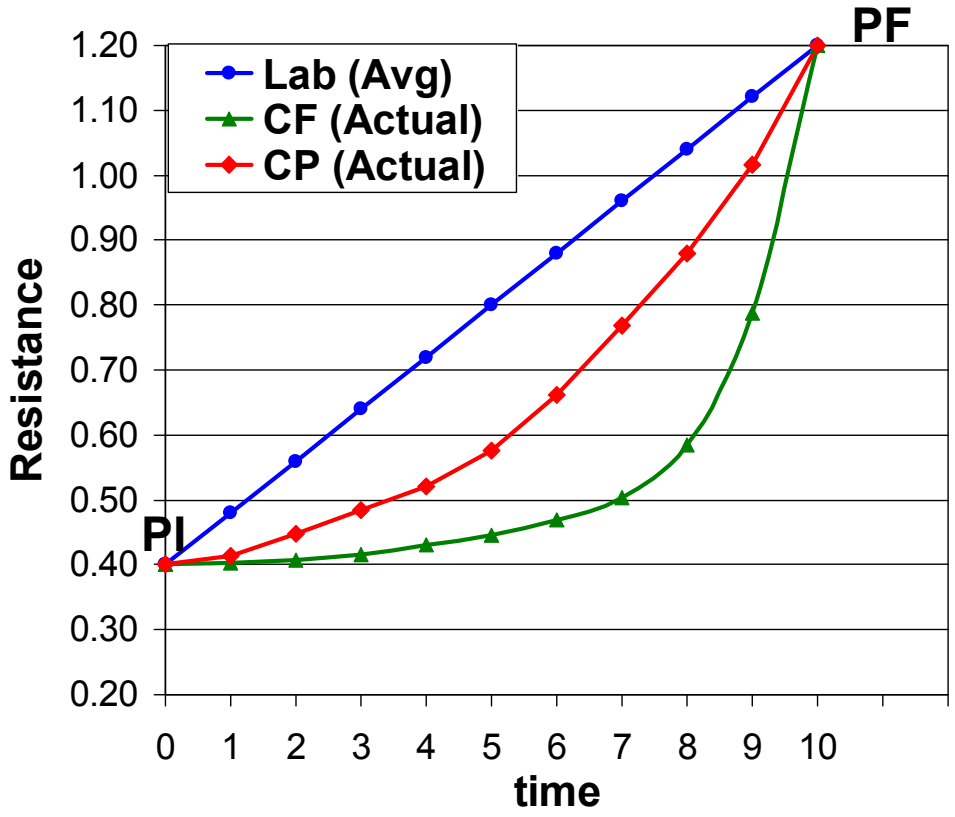
η – Fan efficiency, %

Co – Constant, 1000 in SI units, 8515 in IP units

Pc – Cost of Power, $/kWh

lab ΔP vs. real life ΔP

PI = 0.40” WG
PF = 1.20” WG



Simple averaging (Lab) ΔP

(PI+PF)/2 = 0.8” WG

Actual (Real Life) ΔP

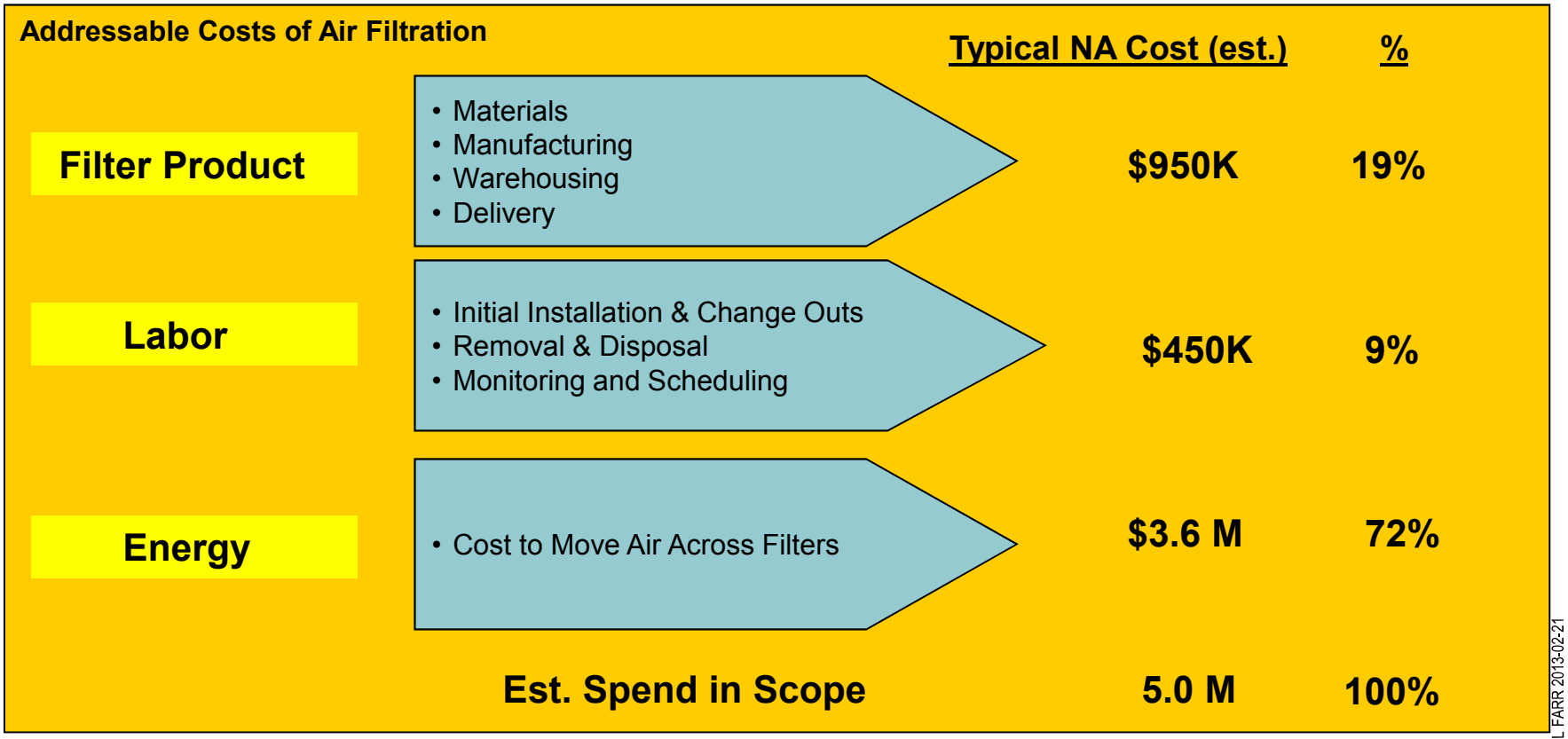
$$\int_{PI}^{PF} Dx$$

ΔP Camfil Farr (Act) = 0.6” WG
ΔP Competitor (Act) = 0.7” WG

Important points...

- Life Cycle Cost analysis
  - will give you several ways to evaluate the best filtration system for the money
- Selling price is not the best indicator of total cost
  - Typically, 60-80% of the filters LCC is ENERGY!
- A Total Cost of Ownership program is more comprehensive, but requires more resources
  - Leads to a complete answer

Reduce energy consumption and save money



- ***As a rule of thumb- "A reduction of .1" WG. saves $25-$40 per opening per year in energy."***

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Bottom line? Energy Savings

- At energy rate of $0.05 per kWh, for every 0.10” w.g. reduction in static pressure there is realized energy savings of

  $25 per year, per filter

- At energy rate of $0.08 per kWh, for every 0.10” w.g. reduction in static pressure there is realized energy savings of

  $40 per year, per filter

- **We’ll guarantee LCC projections/savings in writing. Accuracy of data provided for LCC calculations assures correct projections**

Running 24/7 at 400 FPM with moderate ambient air challenge

what is total cost of ownership (tco)?

- Filtration evaluation of multiple:
  - Sites
  - Buildings
  - Floors
  - AHUs
- Comprehensive LCC evaluation

BOSTON UNIVERSITY

Massachusetts Institute of Technology

Northeastern University — Higher Learning. Richer Experience.

Wyeth

AMGEN

VE RI TAS HARVARD

PARTNERS HEALTHCARE — FOUNDED BY BRIGHAM AND WOMEN'S HOSPITAL AND MASSACHUSETTS GENERAL HOSPITAL

Pfizer

IBM

NOVARTIS

MERCK

Abbott

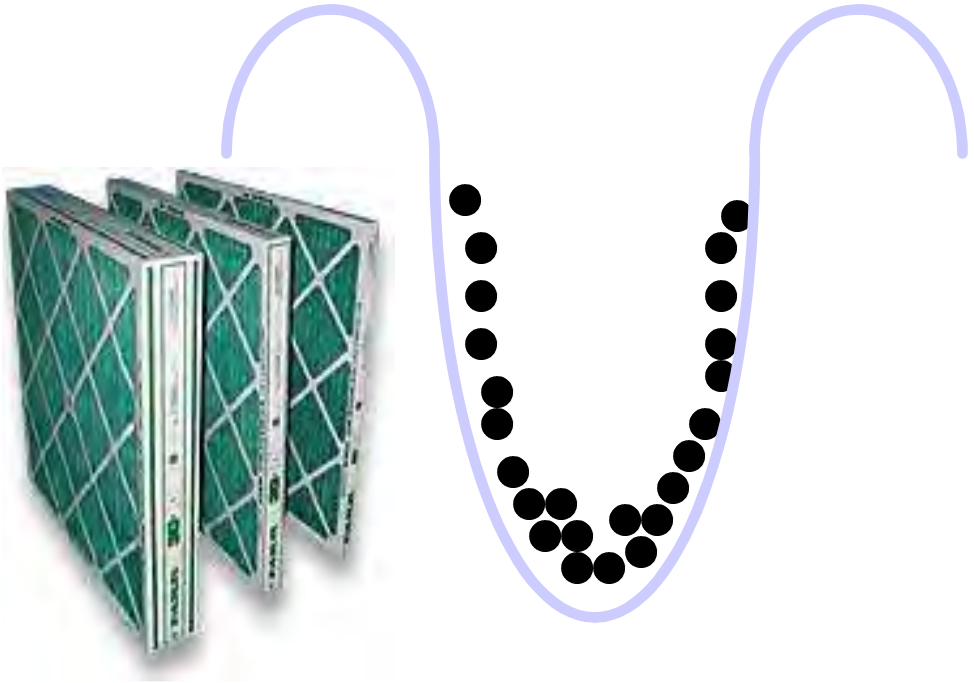
Lilly

Choosing the Proper Filtration

- MERV Rating
- Level of Effif

Camfil Farr Design vs. “Copy me” Design

Uniform radial style pleat loads evenly resulting, in lower average pressure drop and long loading curve.



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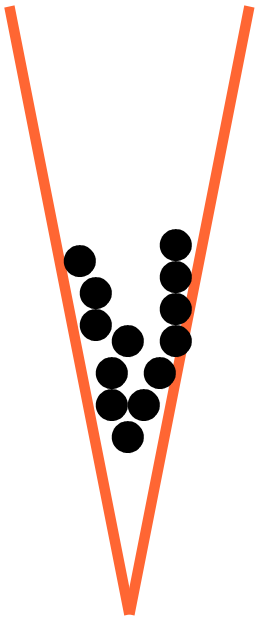

Reduce waste and save money

Filter Sales is so confident our high performance products are superior to any other filter in the industry that we guarantee our filters will outlast any competitive filter. If our filters don't last longer, then Camfil Farr promises to replace the filters for *FREE*.

We may have to change our logo to GREEN!

Our customers reduce waste by using fewer filters.

Our customers reduce their energy consumption by using lower resistance filters.

Even if the competitive filters were free and our filters weren't, the Our filters would still be less expensive overall to own and operate.

Let Us Prove It!!!!!!

CLEAN AIR SOLUTIONS

FILTER Sales & Service Inc.

case STUDY

HOSPITAL

Air Filtration - Lifetime Efficiency

Prestigious Hospital Achieves Optimized Air Quality by Choosing Fine Fiber Media Filters over Synthetic Media

Company Profile:

A prestigious healthcare clinic is rated among the top three hospitals in the country with 11 of its specialty areas ranking among the nation's top ten. The facility employs 1,500 full-time physicians and treats 54,000 hospital admissions per year.

The Situation:

With prestige, comes very high expectations from both patients and employees for excellence in all facility systems and conditions. Concerned that their indoor air quality was not optimized, they called in experts to help evaluate the situation. Camfil Farr determined that the bag filters used for final filtration in some of the air handling units were using coarse fiber synthetic media (highly electrostatically charged to get a high initial efficiency). These type of filters were allowing air quality to diminish early in the useful life of the filters. An In-Situ test (air filter testing in systems to capture true operating efficiency versus in a laboratory) would prove that the fine fiber glass media bag filters recommended by Camfil Farr would provide consistent indoor air quality.

The Action:

Two air handling units of equal airflow and close location (24 filters each) were selected to test the existing and incumbent products. The Flanders Precisionaire 95% efficiency 8-pocket final filter (24"x24"x30") with a charged synthetic media versus a Camfil Farr Hi-Flo® 8-pocket bag filter with fine fiber media at the identical 95% efficiency rating (24"x24"x30") were installed. The test was conducted following Eurovent Standards for in-place filter testing, and the competitor was invited to witness the test. Efficiency was tested at 0.4 microns – the average particle size in outside air. The air handling units used recirculated air which is why filter performance was extremely important.

The Result:

After eight weeks, a second In-Situ test was conducted. The Flanders bag filter was at 54% efficiency versus 86% efficiency for the Camfil Farr product.

In an adjacent air handling unit where the identical Flanders product had been in operation for two years, an In-Situ test revealed an efficiency of only 26%. Thus, the filter dropped its performance dramatically early after installation and never improved. This proves the right product means consistent air quality delivery the entire life of the product with the benefit of energy savings.

"The Hi-Flo filter is higher priced, but not more expensive when filter life and energy savings are added to the equation."

clean air solutions
www.camfilfarr.com

camfil by FARR

case STUDY

HOSPITAL

Air Filtration - 30/30® Panel Filter Lasts Longer

Saving Energy is a Bonus in Hospital that Reached Goal of Reducing Filter Changes & Meeting Efficiency Requirements

Company Profile:

A large district health center complex encompassing a 55-bed acute care hospital and community health center connected to a 70-bed personal care home.

The Situation:

The project is a two-story, 81,000-square-foot facility, including a surgical suite, emergency services, CSR, diagnostic services and laboratory and a large extended treatment/rehabilitation unit and associated therapy services. The building is designated as a Power-Smart building, utilizing northern construction standards, including high performance building envelope, energy efficient lighting and mechanical systems. The health center serves a regional catchment which includes several First Nations communities. The facility's pre-filters required changing on average every two months and the final filters needed changing every year. The center was operating with a reduced level of staff which meant minimal manpower and time to perform the required filter changeout tasks.

The Action:

Camfil Farr proposed using a 30/30 pleated pre-filter to replace existing fiberglass throwaway filters. They were presented with the "30/30 Lasts Longer Guarantee." It was also suggested that the existing AAF® VariCel® final filters be replaced with longer-lasting Durafil® filters. The combination would provide better filtration and reduce man hours currently dedicated to servicing filters. The bonus would be that they would also save energy costs.

The Result:

A life cycle cost analysis (LCC) was performed comparing the existing systems using the AAF PerfectPleat and the AAF VariCel 3V

against the Camfil Farr 30/30 and Durafil. The LCC projected a five-year savings of $4,590 for every ten filters, the average number of filters in an HVAC system in the facility. Changing the filters every two years as opposed to each year would save an additional $3,473.

The facility would also save on reduced purchasing costs and was able to free up filter inventory area for other uses. If the filter changes were optimized, scheduled based upon pressure drop as opposed to time, the savings would be even more. Although the number of filter changes would increase slightly, by two pre-filters and one final filter over five years, the savings would rise to $6,200. The facility now can claim adherence to medical facility requirements as the 30/30 provides a true MERV 8 efficiency.

"By converting to the 30/30 and Durafil, the facility now meets filter efficiency requirements."

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Things to Remember

- Original cost is only a small part of total cost
- Not all filters maintain their particle capture efficiency
- 60-80% of the cost to filter the air is energy.
- All filters are not the same – as much as 75% of pressure drop results from design & manufacturing
- Filter Sale and Service's "Green Message" for air filters
  - Energy savings – lower resistance product saves energy
  - Waste reduction – less filter changes
  - "Green" product features save our customers money.
- We can and will prove the claims we make!

E, kwh

q, volumetric flow rate (cfm)	2000
dp, resistance to airflow (in. w.g.)	0.31
t, time (hours)	8736
n, fan efficiency	0.65
8515, units conversion factor	8515
$/kwh, cost per kwh ($)	0.130

$$E = \frac{q \times dp \times t}{n \times 8515} = 978.60$$

$$\$ = E \times \$/kwh = \mathbf{\$127.22}$$

E, kwh	
q, volumetric flow rate (cfm)	2000
dp, resistance to airflow (in. w.g.)	0.5
t, time (hours)	8736
n, fan efficiency	0.65
8515, units conversion factor	8515
$/kwh, cost per kwh ($)	0.130

$$E = \frac{q \times dp \times t}{n \times 8515} = 1{,}578.39$$

$$\$ = E \times \$/kwh = \mathbf{\$205.19}$$