Energy-Efficient HVAC Filtration: An Easy Way to Achieve Greener Labs

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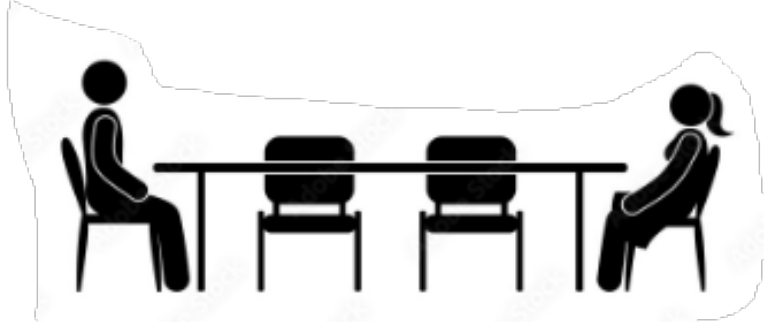
camfil

Learning Objectives -



1. Gilead La Verne's lab area HVAC supply fan energy usage was reduced 49,000 kWh/year (9%) by changing filters

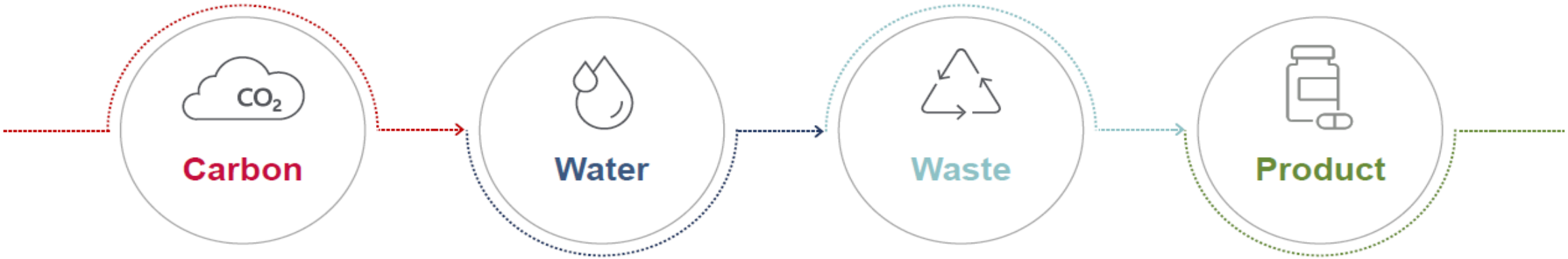
2. The change was completed as part of routine maintenance
   - Filter sizes are standardized
   - VFD motors automatically adjust to use less energy
   - Filter lifetime increased, reducing waste to landfill 2-3X

3. Not all AHU filters are the same ….
   - Some create less resistance to air flow
   - Some are specified to MERV-A (not just MERV)

Pharma Facility

Air Handler Units (AHU)

Gilead's Corporate Sustainability Goals



Carbon

- Reduce Scope 1 and 2 greenhouse gas emissions by 46% by 2030[1]
- Reduce Scope 3 greenhouse gas emissions by 15% by 2030[1]
- Transition 100% of fleet vehicles to electric or low emissions vehicles, and increase charging infrastructure by 2030 (EV100)
- 100% renewable electricity in operations by 2025 (RE100)
- Achieve Carbon NetZero Operations GHG emissions by 2030

Water

- Achieve water neutrality in water stressed regions by 2030
- Reduce potable water use at owned facilities by 30% by 2030[1]

Waste

- Reduce total waste generated by 20% by 2030[1] (non-hazardous only, excludes construction and demolition waste)
- Achieve Zero Waste to Landfill status at owned facilities by 2030, Foster City to achieve by 2025 (may exclude leased facilities)
- Eliminate single use plastics by 2025 (excludes R&D operations)

Product

- 100% product packaging widely recyclable or reusable, including elimination of all unnecessary plastics, where quality and safety permit by 2025[2]
- Use 30% post–consumer recycled content in all plastic packaging by 2025[2]
- Use 70% recycled content paper from sustainably managed (FSC certified) forests by 2025[2]

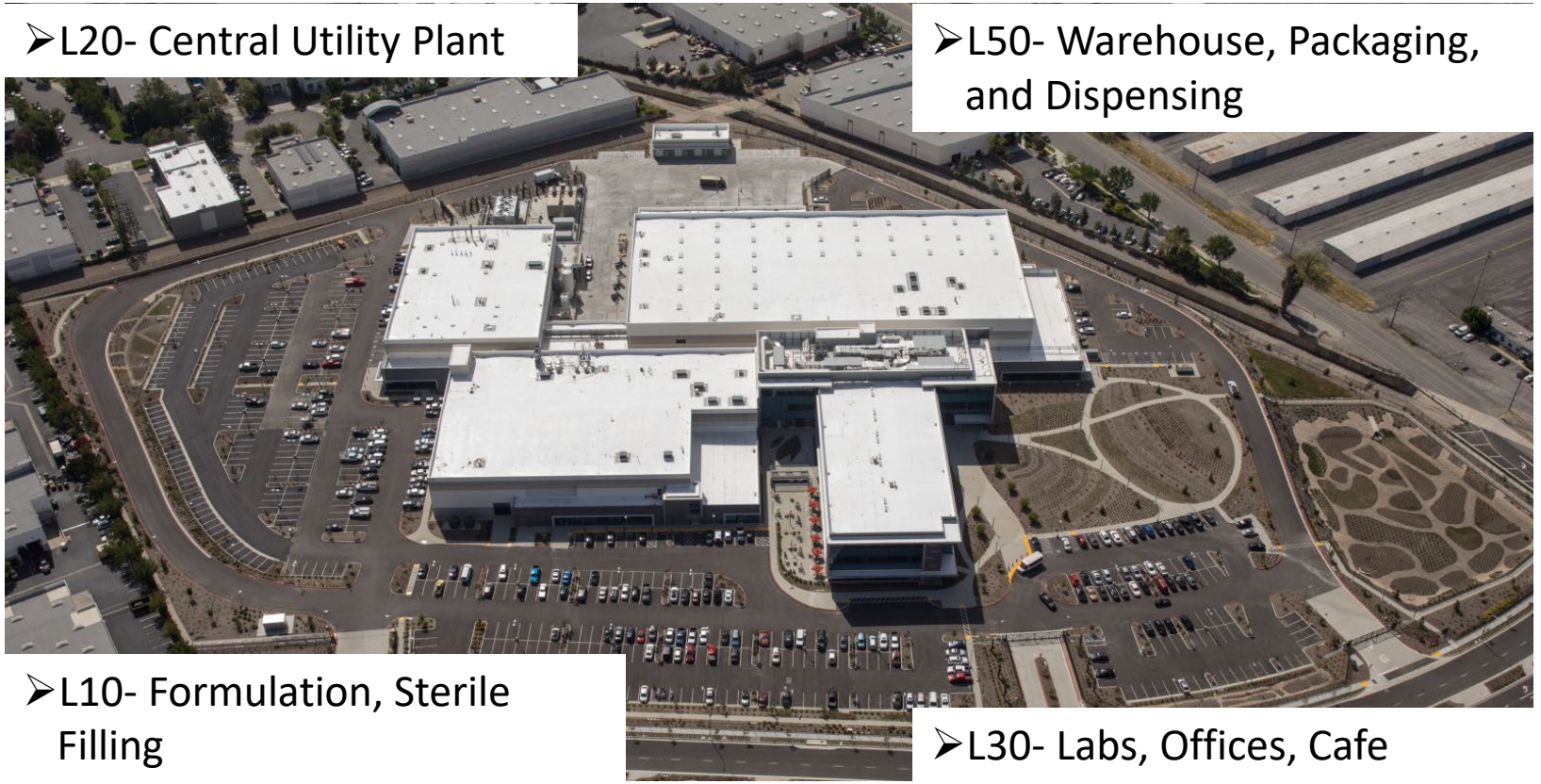
Notes

1. Compared to 2019 baseline (SBT)/level
2. Excludes primary packaging

Gilead La Verne Site Case Study

- Los Angeles, CA
- Commissioned 2017

- 23 Acre site
- 387,000 SQFT building space in 2017



➢L20- Central Utility Plant

➢L50- Warehouse, Packaging, and Dispensing

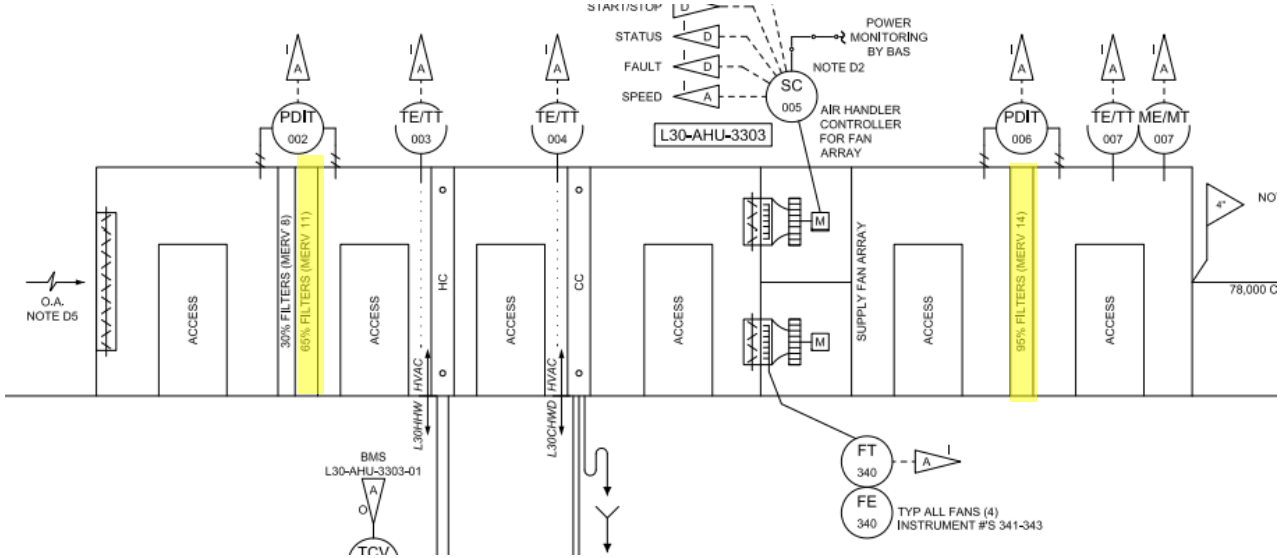
➢L10- Formulation, Sterile Filling

➢L30- Labs, Offices, Cafe

Upgrade to More Efficient Filters

Scope: Changed AHU Intermediate (MERV 11 or 13) and Final Filters (MERV 14) to more energy efficient filters

- Performed in 2018 on 17 units after initial start-up in 2017



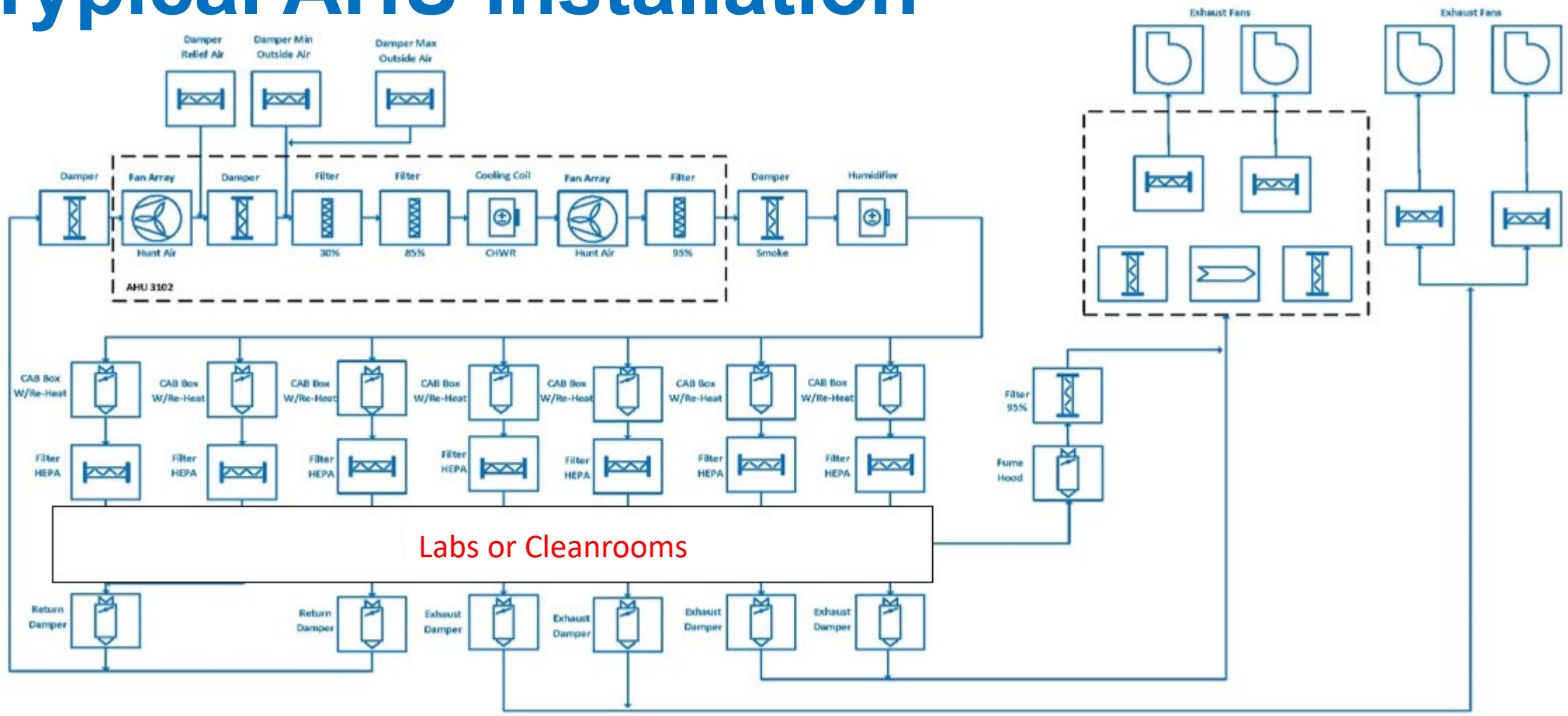
Considerations:

- Requires no Mechanical Upgrades
- Need to Verify Clearance in Unit for New Filters

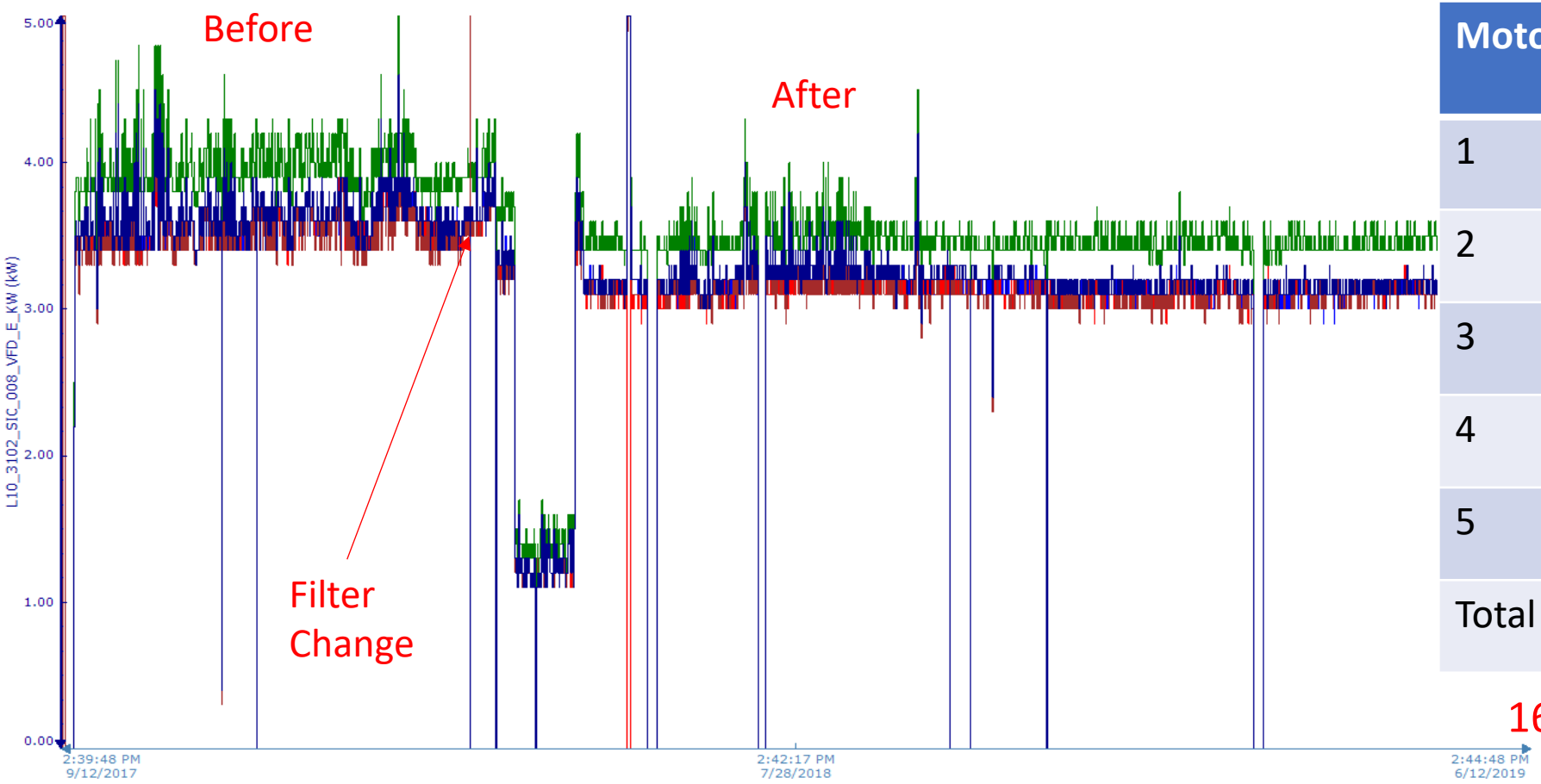
Original

New

Typical AHU Installation



Energy Usage on one AHU, Before vs After



Motor	Average kW Before	Average kW After
1	3.62	3.25
2	3.62	3.21
3	3.94	3.55
4	3.54	3.18
5	3.65	3.30
Total	18.37	16.49

16,500 kWh Saving Per Year

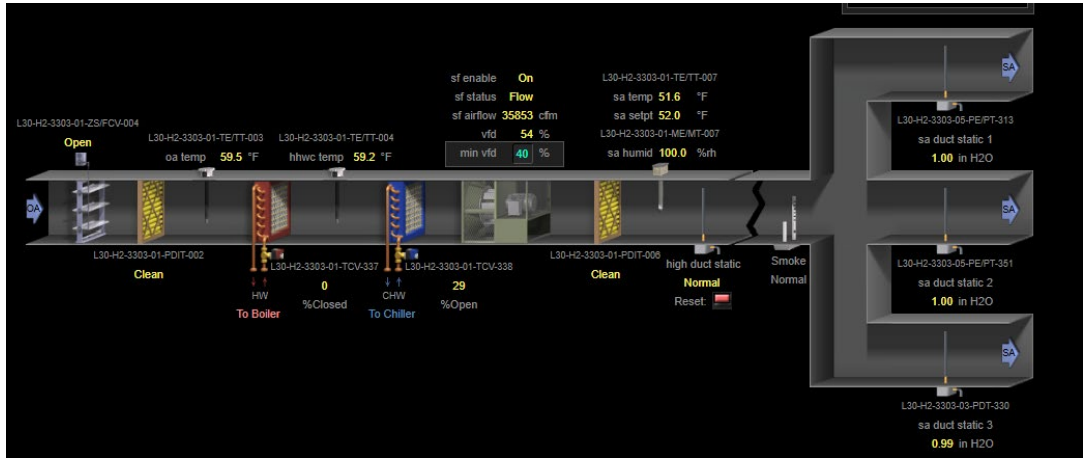
Results Across Multiple Units

Unit Size (CFM)	Area Served	Control Design	Filters Changed	kWh/yr Before	kWh/yr After	kWh/yr Savings
40,000	Cleanrooms (EU Grade A/B)	Fixed Duct Static Pressure and Damper	Intermediate (MERV 13)	487,500	472,500	15,000
27,000	Cleanrooms (EU Grade C)	Fixed Duct Static Pressure and Damper	Intermediate (MERV 13) And Final (MERV 14)	161,000	144,500	16,500
20,000	Cleanrooms (EU Grade C/D)	Fixed Duct Static Pressure and Damper	Intermediate (MERV 13) And Final (MERV 14)	83,000	71,000	12,000
24,000-40,000	GMP Warehouse and Common Areas	Variable Duct Static Pressure and Variable Volume	Intermediate (MERV 13) And Final (MERV 14)	470,500	450,500	20,000
3,000-7,000	Packaging	Variable Duct Static Pressure and Variable Volume	Intermediate (MERV 13)	56,500	52,000	4,500
6,000-8,000	Packaging	Variable Duct Static Pressure and Variable Volume	Intermediate (MERV 13)	51,000	49,000	2,000
32,000-40,000	QC Lab Areas	Variable Duct Static Pressure and Variable Volume	Intermediate (MERV 11) And Final (MERV 14)	533,000	484,000	49,000
10,000-18,000	Office Space	Variable Duct Static Pressure and Variable Volume	Final (MERV 13)	46,500	44,000	2,500

Lab Areas saving 49,000 kWh per year (9% of fan motor usage)

Benefits and Future Considerations

- Benefits
  - 121,500 kWh/yr Energy Savings (~1% of facility energy usage)
  - $20,000/yr reduction in energy bills
  - 30 MTCO2e per year reduction
  - Reduced Filter Changeout Frequencies
    - 3 years for intermediate
    - 6 years for final
- Future Considerations
  - Removal of Intermediate Filters
  - Installation of PTFE HEPAs
  - Extension of changeout intervals
  - Installation of 4 Inch Pre-Filters

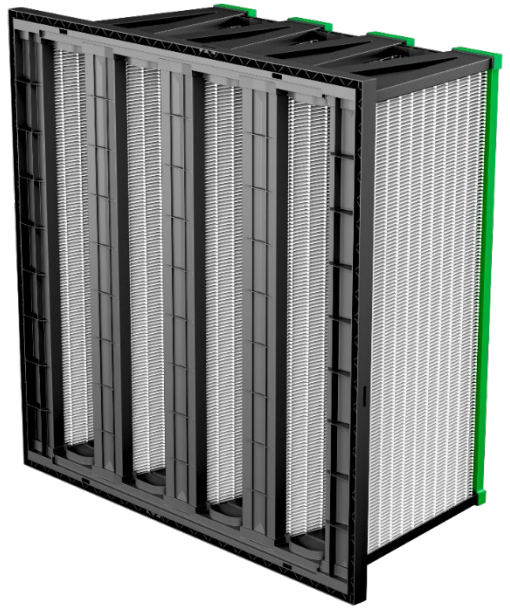


49,000 kWh/year saved in Lab: how much is that?

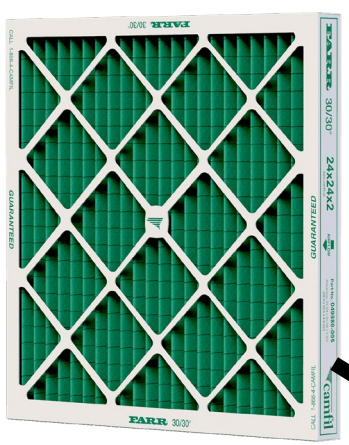
USA Average
10,000 kWh/yr

5 USA homes = 50,000 kWh/yr

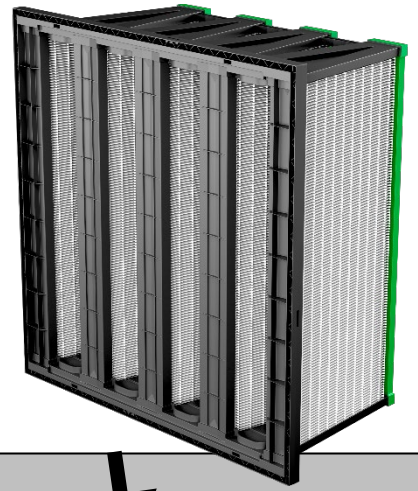
What is different about energy efficient air filters?



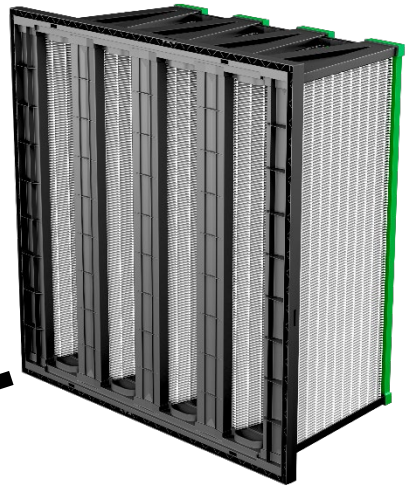
Look Inside the AHU
Low Air Flow Resistance = Low Energy Usage



Pre-filter



Intermediate Filter



Final filter

Air Flow

FAN

MOTOR

FLOW (SP)

MEASURED

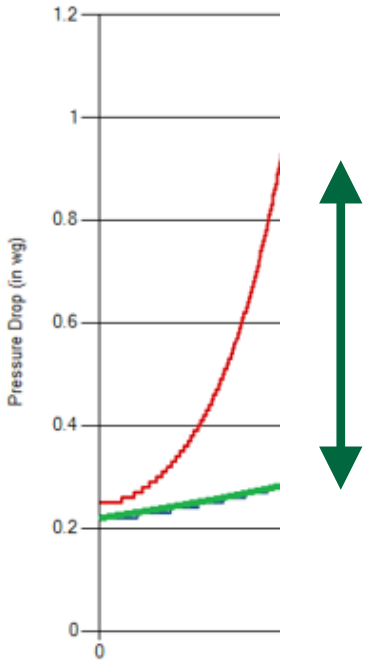
VFD Drive

OUTSIDE AIR

INSIDE AIR

ENERGY USAGE increases with DUST LOAD and FLOW RESISTANCE

Flow Resistance (dP)

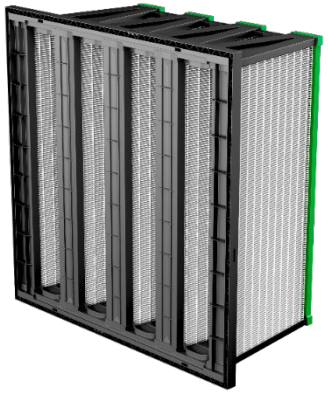


Time (or Dust Load)

Other filters

Versus

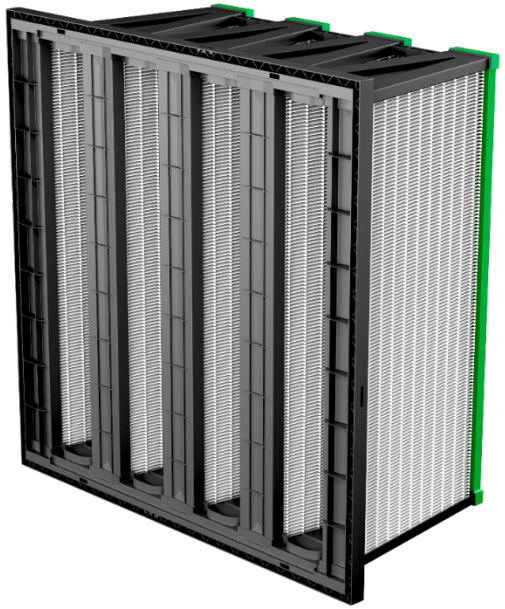
Energy Efficient Filters



Maximum filter SURFACE AREA in latest Intermediate and Final filters

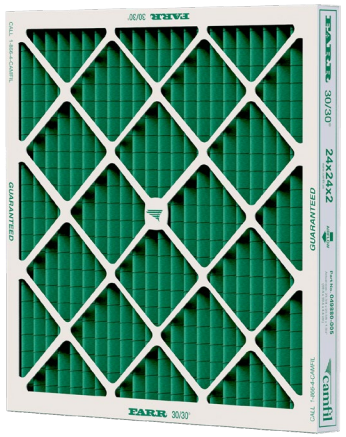
53 ft^2

Earlier design



200 ft^2

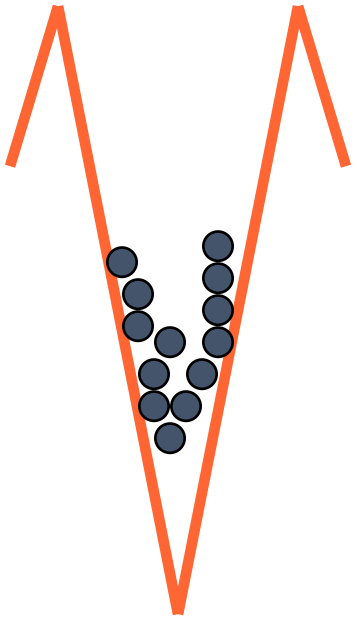
Energy efficient



Pre- Filter pleat shape

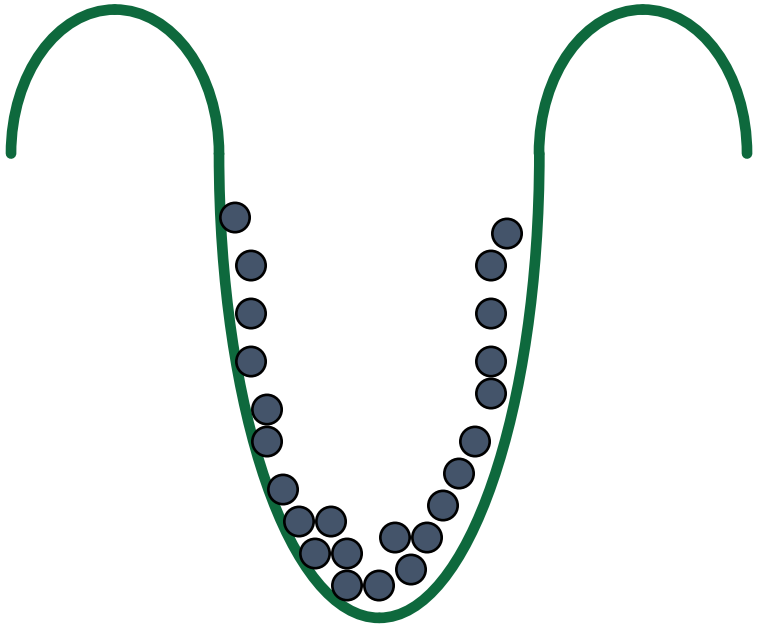
"V" shape

rapid increase in flow resistance



Uniform radial shape

slower increase in flow resistance



Multiple layers in one prefilter

White Colored
Upstream Layer

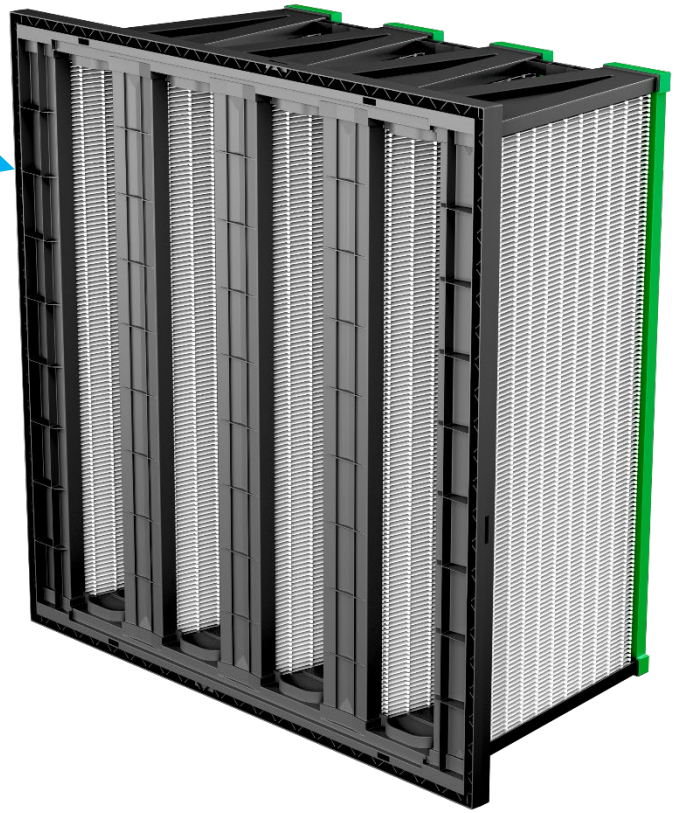
(3-10 Microns)

Green Colored
Downstream Layer

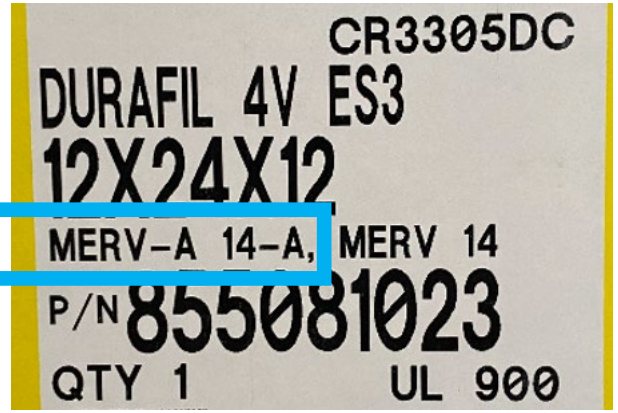
(1-3 Microns)

What is MERV-A ?

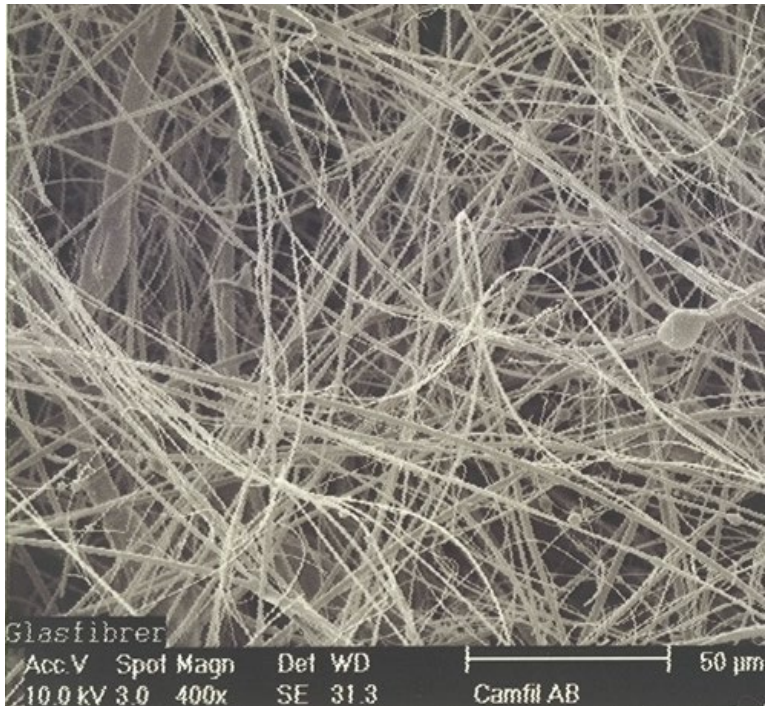
on product

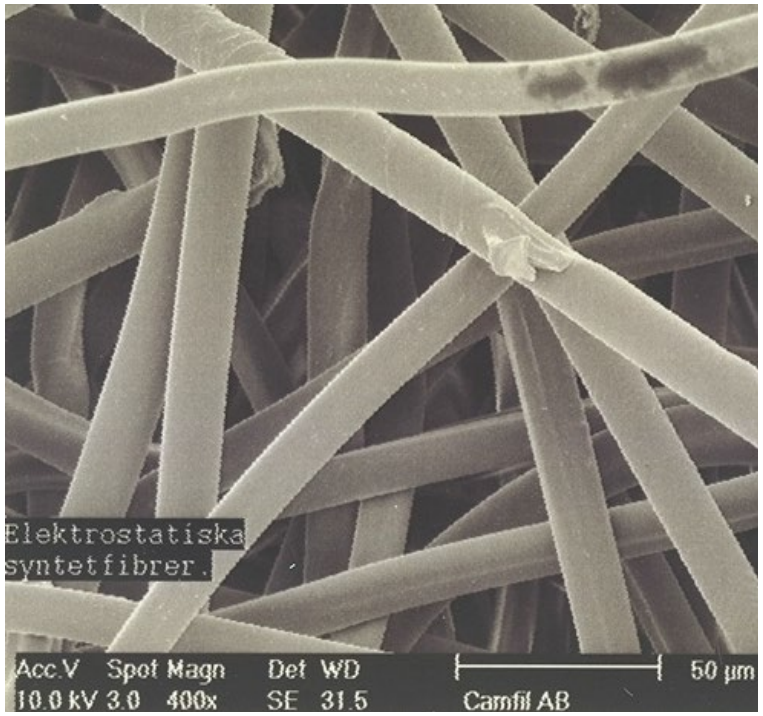


on box



What is different about these two MERV 14 final filters?

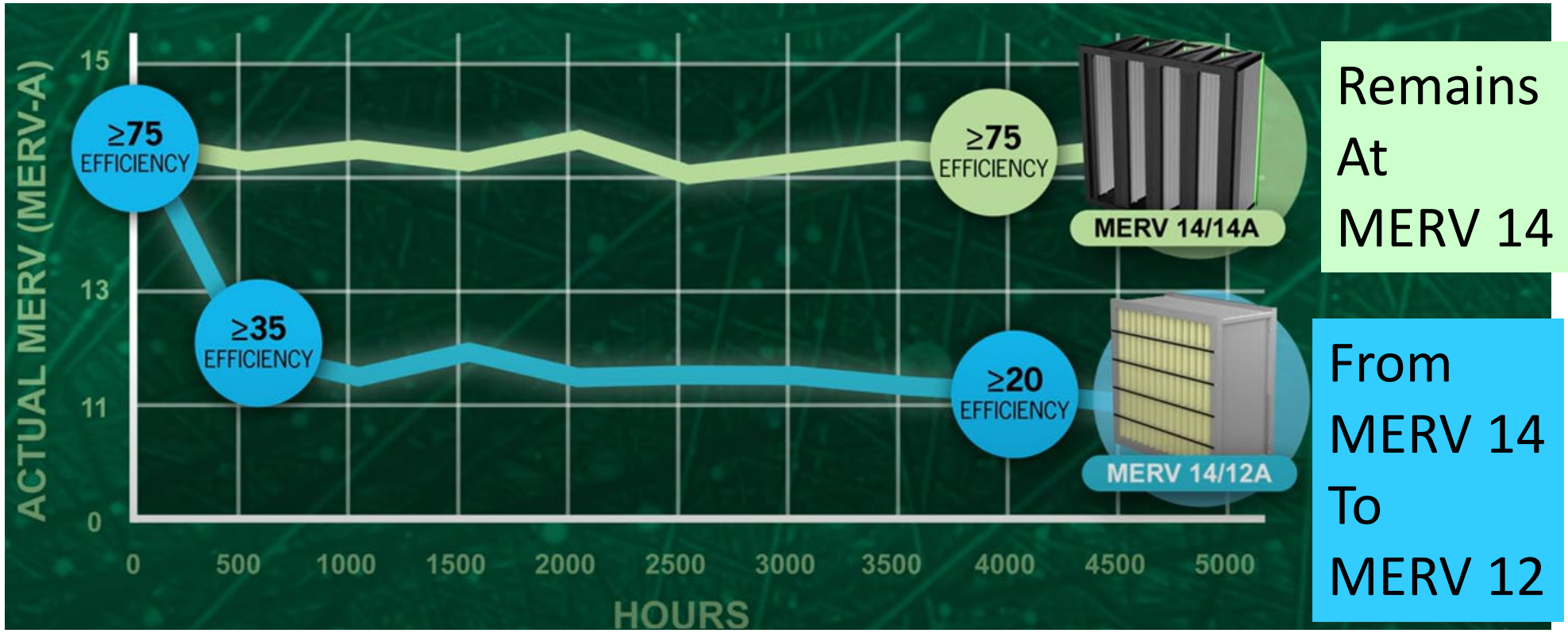




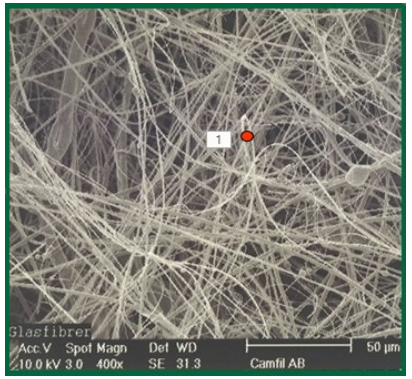
electrostatic charge

Use filters which do NOT rely on static charge

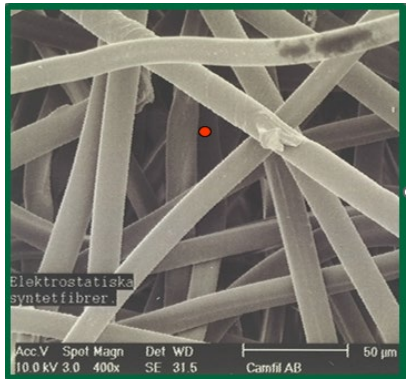
ASHRAE 52.2-2017, range 1



Remains At MERV 14

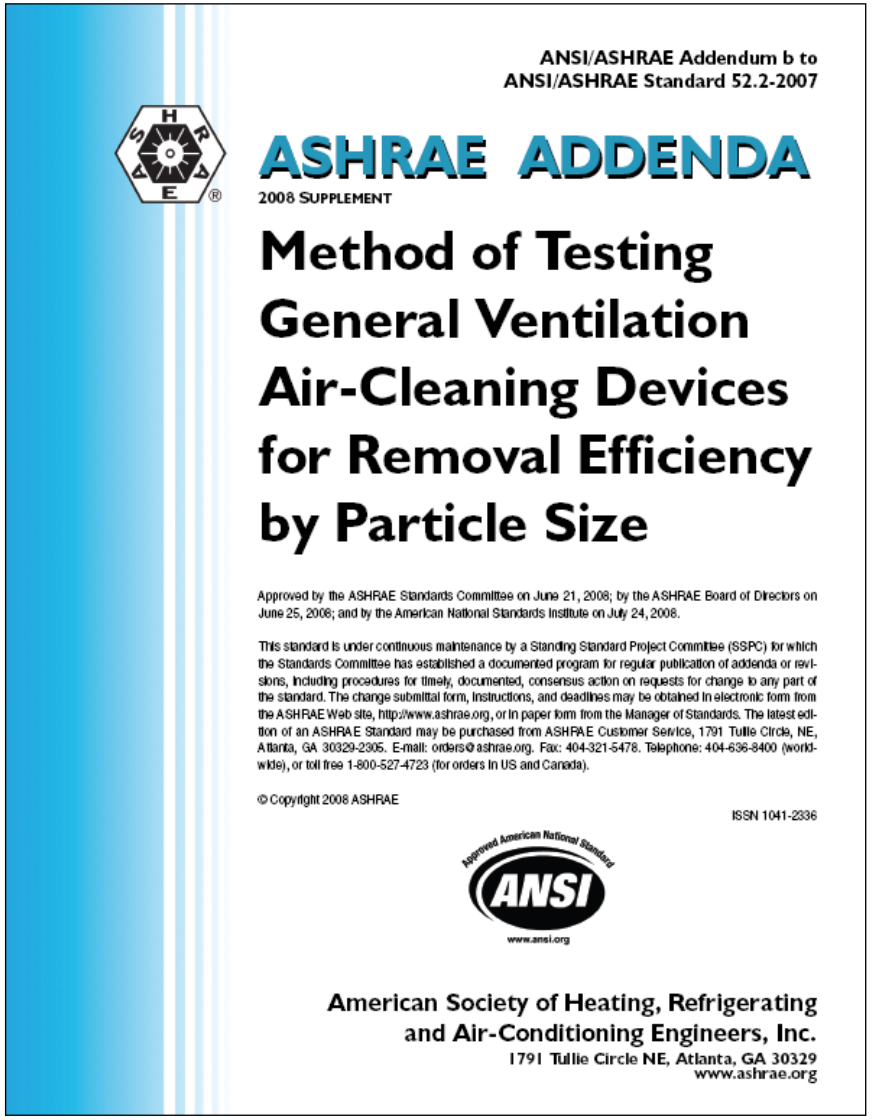


From MERV 14 To MERV 12



Specify the MERV-A TEST

- Non-Mandatory Test
- Additional conditioning step which **removes electrostatic charge prior to efficiency test**



ANSI/ASHRAE Addendum b to
ANSI/ASHRAE Standard 52.2-2007

ASHRAE ADDENDA

2008 SUPPLEMENT

Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

Approved by the ASHRAE Standards Committee on June 21, 2008; by the ASHRAE Board of Directors on June 25, 2008; and by the American National Standards Institute on July 24, 2008.

This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site, http://www.ashrae.org, or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada).

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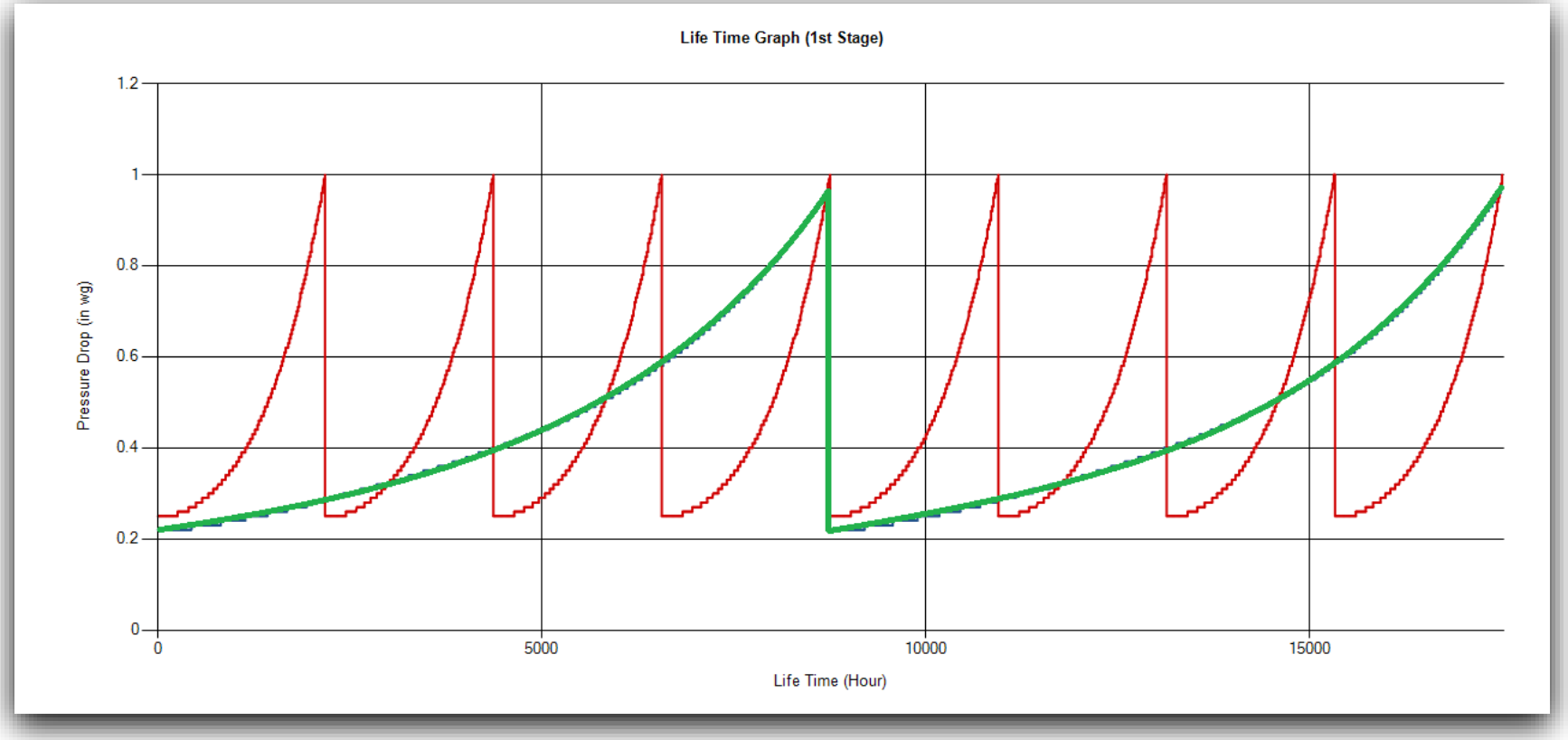
Longer Filter Lifetime means LANDFILL WASTE reduction

dP



Time (or Dust Load)

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And cost savings

Thank you. Questions?

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