



**Duke Wiser**  
**President and**  
**Chief Technology**  
**Officer**



**WELCOME**

**Webinar**

**August 12, 2020**

**11:00 am - 12:00 pm**

# DYNAMIC AIR QUALITY SOLUTIONS

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PRODUCTS AND CAPABILITIES

Duke Wiser



# DYNAMIC AIR QUALITY SOLUTIONS

Since 1982, Dynamic has been manufacturing award-winning air cleaning systems that improve IAQ, save energy, and reduce maintenance around the world.

From anthrax clean-up, to the world's most valuable art collection, mission critical government facilities, and ASHRAE headquarters...

Dynamic can design the right system for the job.

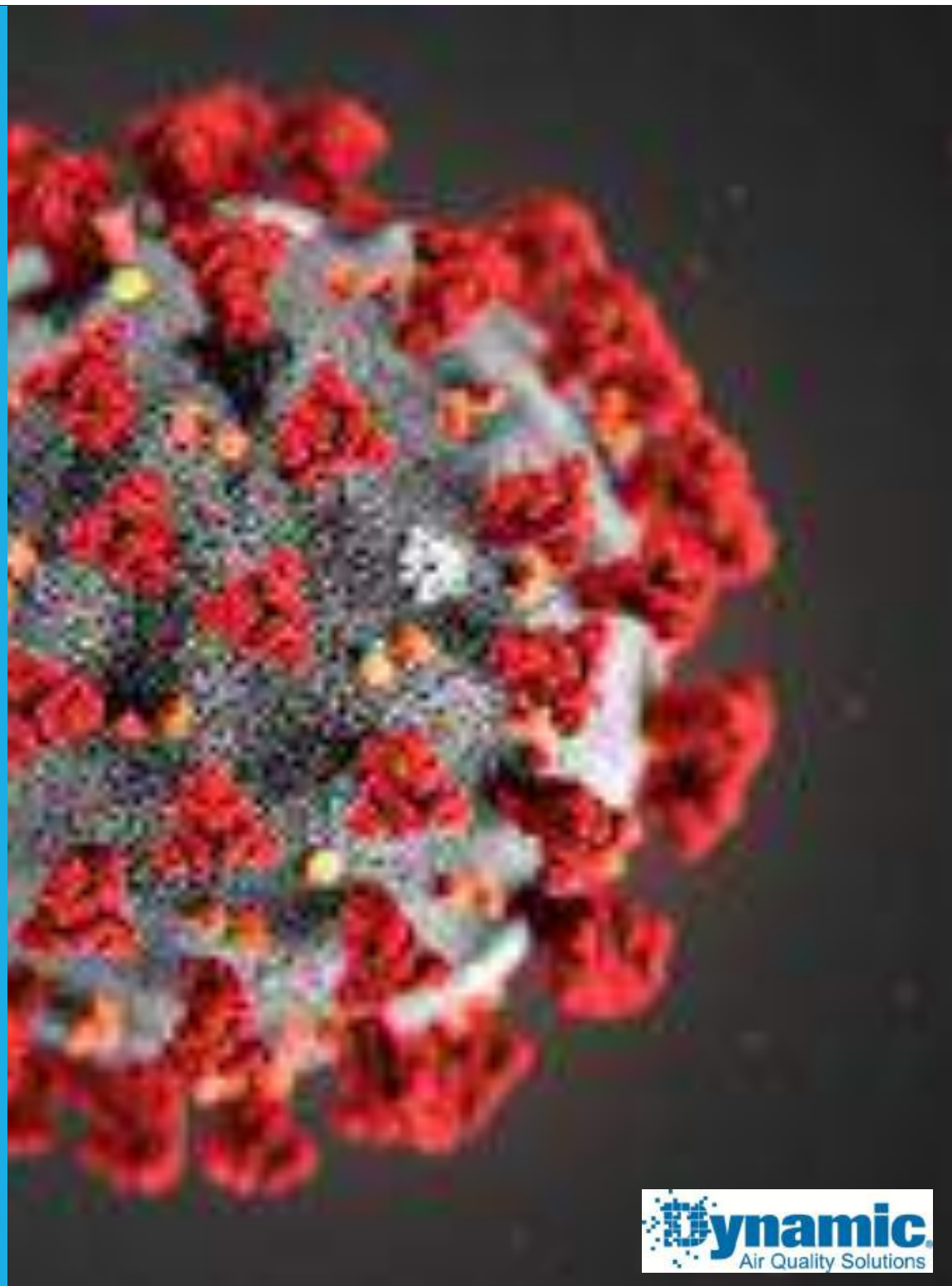


# COVID-19 WHAT WE KNOW

SARS-CoV-2 is **dangerous** because it spreads readily, and humans have no **immunity to it**. That is what makes it unique and unprecedented: its interaction with people.

But in terms of its interaction with other things, just like all other viruses:

**It can be caught on a filter; be inactivated by UVC and disinfectants; and will die by itself on a dry surface.**



# COVID-19 WHAT WE KNOW

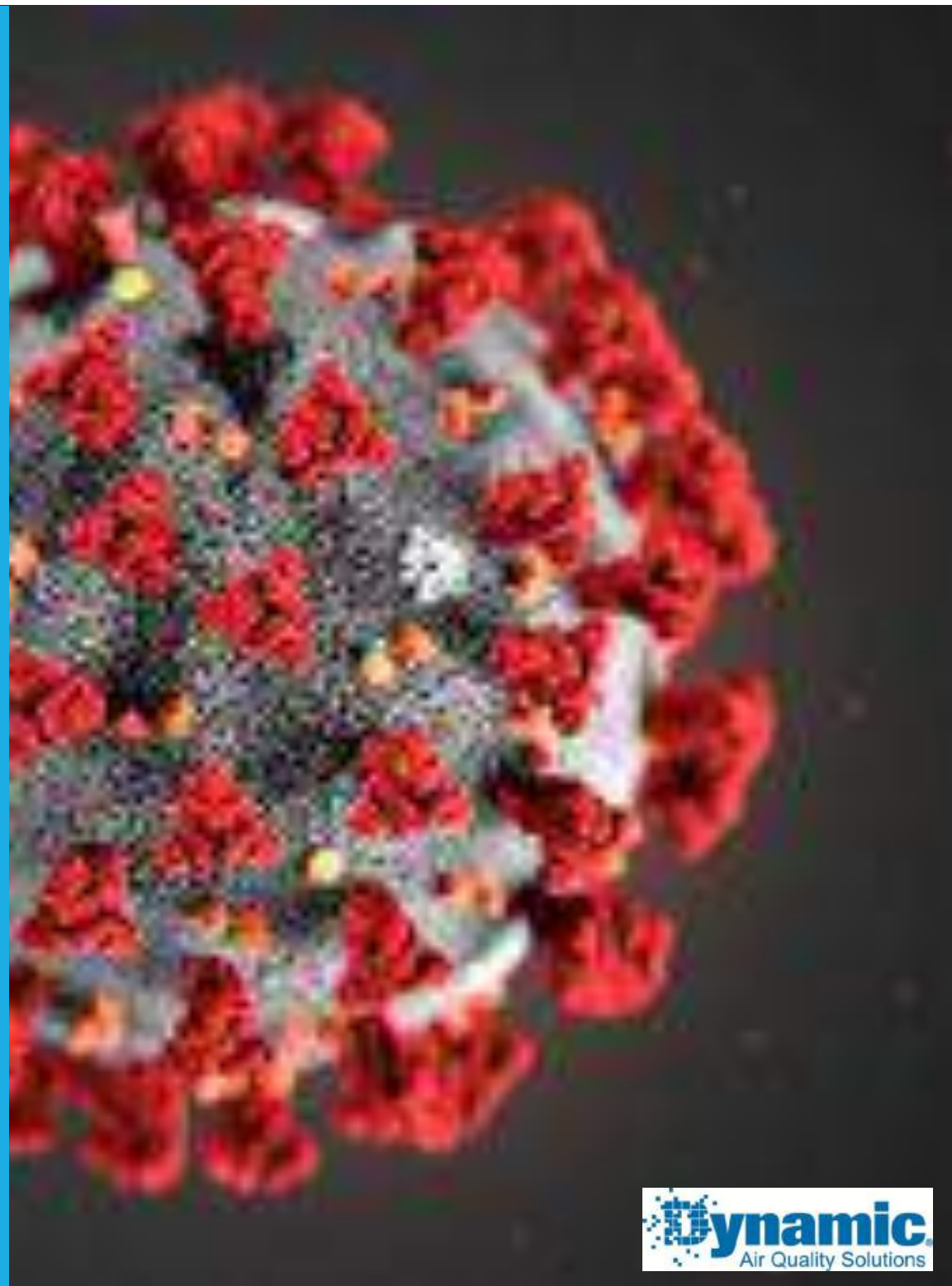
## **Airborne Transmission:**

SARS-CoV-2 travels through the air in droplet nuclei (>5 micron) and aerosols (.5 to 5 micron) from sneezes, coughs, talking, breathing, etc. The virus itself is approximately 0.15 micron. But the majority of airborne aerosol is 1-3 micron.

The bigger the droplet nuclei, the less time it will remain in the air before settling on a surface. Only some nuclei will make it into the HVAC system before settling.

Droplet nuclei become smaller quickly as contained moisture evaporates.

SARS-CoV-2 can live on a surface



# COVID-19 WHAT WE KNOW

## **Airborne Transmission...**

At the University of Florida, live virus was found in aerosols in a hospital 7-16 feet from patients.

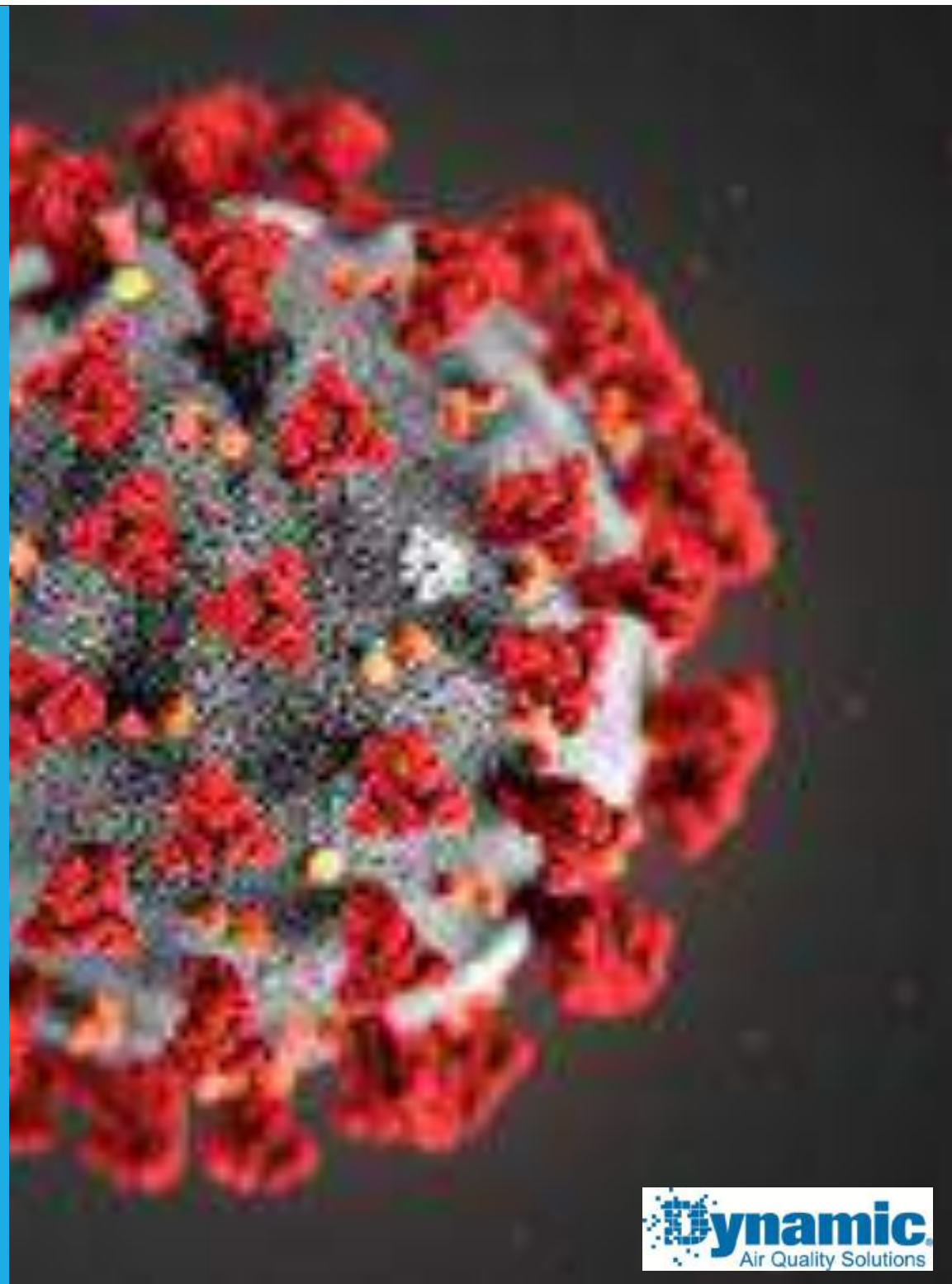
Out of 1,200 Super Spreader events, 97% occurred indoors.

In a Korean office building, 94 out of 216 people on the same floor contracted the virus while only 3 in the rest of the building did.

SARS-Co-V-2 RNA has been found on filters and supply dampers in an Oregon Hospital as well as under beds.

In Wuhan, they have found the virus in re-suspended particles from floors, surfaces, and clothing.

Beyond personal protection, handwashing, surface cleaning, and social distancing....



# ASHRAE POSITION DOCUMENT ON INFECTIOUS AEROSOLS, APRIL 2020

## COVID-19 Statements

**Airborne Transmission of SARS-CoV-2:** Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne transmission to the virus should be controlled. Changes to the building operations, including the operation of the HVAC systems, can reduce airborne exposures.

**Operation of HVAC Systems to Reduce Transmission:** Ventilation and *filtration provided by the HVAC systems can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air.* Unconditioned space can cause thermal stress to people that may be directly life-threatening and that may also lower resistance to infection. In general, disabling of the HVAC systems is not a recommended measure to reduce the transmission of the virus.

# ASHRAE POSITION DOCUMENT ON INFECTIOUS AEROSOLS, APRIL 2020, CONTINUED....

## INFECTIOUS AEROSOLS



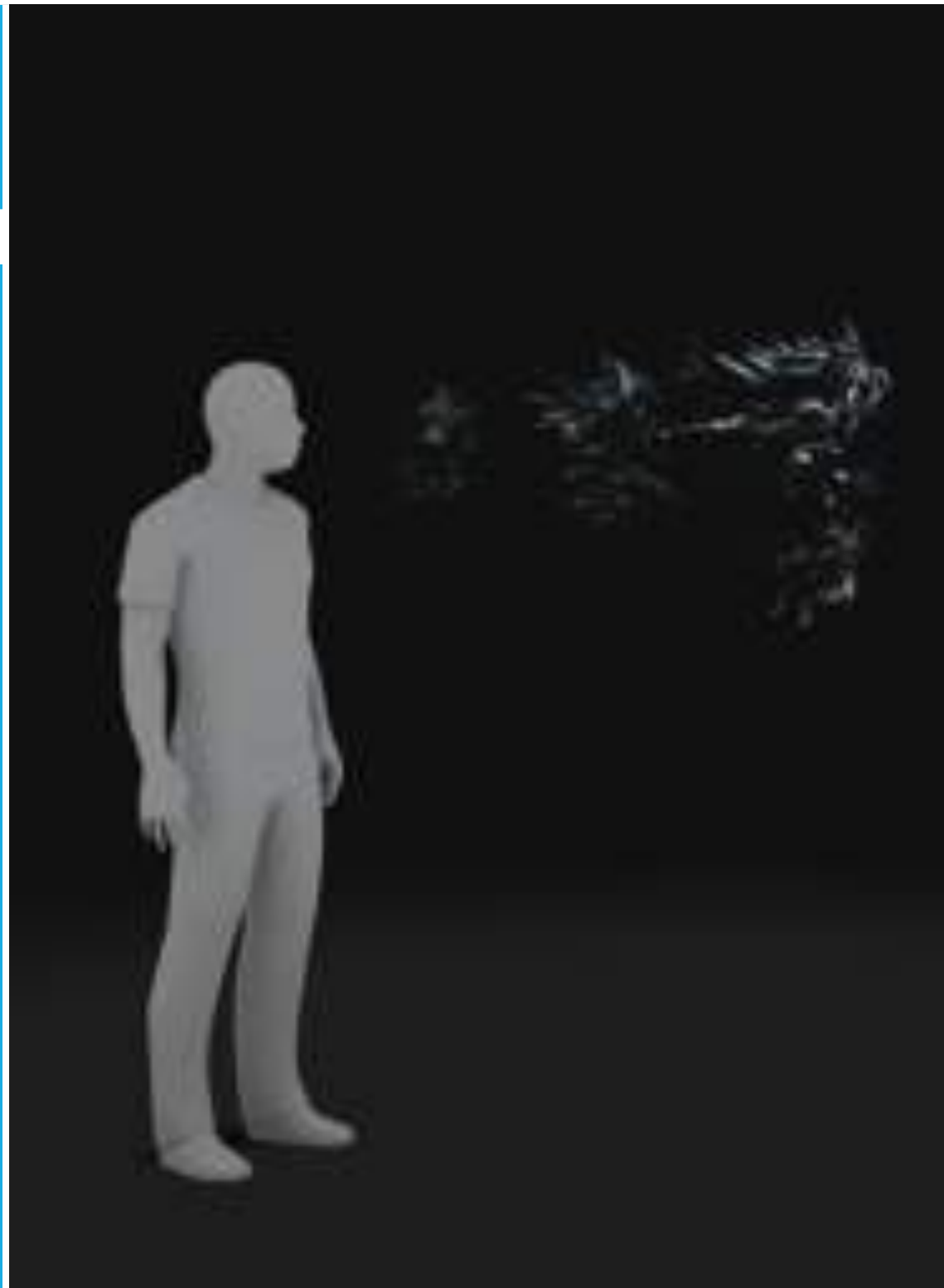
Figure 1 (a) Comparative settling times by particle diameter for particles settling in still air (Baron n.d.) and (b) theoretical aerobiology of transmission of droplets and small airborne particles produced by an infected patient with an acute infection (courtesy Yuguo Li).

**Asymptomatic people generate more smaller infectious aerosols.**



# ASHRAE RECOMENDATI

- High-efficiency filtration (MERV 13 or better) in central systems
- Use of UVC Germicidal systems
- Localized supplemental air cleaning systems
- Proper ventilation rates—maximum outdoor air
- Optimized/directional airflow patterns
- Building/room pressurization
- Proper Humidity Levels



# PASSIVE FILTRATION

Felts, Bags, and Cartridge Today

- Rated per ASHRAE 52.2 MERV
- Essentially a sieve
- Trade increased efficiency for increased pressure drop and energy
- 90% of the cost of filtration is energy
- Upstream, face loading
- Efficiency can increase as they load



# PASSIVE FILTER RATINGS

- Pursuant to ASHRAE 52.2
- Three Size Ranges (E1-3)
- Single Pass Efficiency
- Range of Allowable Ef

TABLE 3: MERV PARAMETERS

Standard 52.2 Minimum Efficiency Reporting Value (MERV)	High-Efficiency Filtered Particle Size Ranges, $\mu\text{m}$ (ASHRAE 52.2)			Average Arithmetic, %
	Range 1 0.3-1.0	Range 2 1.0-3.0	Range 3 3.0-10.0	
1	n/a	n/a	E1 < 20	$E_{\text{avg}} < 80$
2	n/a	n/a	E2 < 20	$80 \leq E_{\text{avg}} < 70$
3	n/a	n/a	E3 < 20	$70 \leq E_{\text{avg}} < 75$
4	n/a	n/a	E3 < 20	$75 \leq E_{\text{avg}}$
5	n/a	n/a	$20 \leq E_1 < 80$	n/a
6	n/a	n/a	$30 \leq E_1 < 90$	n/a
7	n/a	n/a	$30 \leq E_1 < 70$	n/a
8	n/a	$20 \leq E_2$	$70 \leq E_2$	n/a
9	n/a	$30 \leq E_2$	$70 \leq E_2$	n/a
10	n/a	$30 \leq E_2 < 80$	$80 \leq E_2$	n/a
11	$20 \leq E_1$	$30 \leq E_2 < 80$	$80 \leq E_2$	n/a
12	$30 \leq E_1$	$40 \leq E_2$	$90 \leq E_2$	n/a
13	$30 \leq E_1$	$40 \leq E_2$	$90 \leq E_2$	n/a
14	$45 \leq E_1 < 80$	$80 \leq E_2$	$95 \leq E_2$	n/a
15	$80 \leq E_1 < 90$	$80 \leq E_2$	$95 \leq E_2$	n/a
16	$80 \leq E_1$	$80 \leq E_2$	$95 \leq E_2$	n/a

## Dynamic V8 in Operation

E1 (%) Composite Minimum Avg. Efficiency 0.30 - 1.0  $\mu\text{m}$

94

E2 (%) Composite Minimum Avg. Efficiency 1.0 - 3.0  $\mu\text{m}$

99

E3 (%) Composite Minimum Avg. Efficiency 3.0 - 10.0  $\mu\text{m}$

100

Minimum Efficiency Reporting Value (MERV)

MERV 15 @ 1968 CFM



DYNAMIC  
ENGINEERED  
SOLUTION

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GREEN

# V8 AIR CLEANING SYSTEM

ASHRAE 52.2 MERV 13 & 14 Rating

- ASHRAE 52.2-NC MERV15+
- 92-99% reduction of Ultrafine Particles
- Zero Bypass Seal
- 45-65% TVOC removal
- Highest Dust Holding Capacity on market
- **Typical 3-5 year Maintenance Cycle**
- Saves energy and reduces maintenance



MAINTAIN  
IAQ



REMOVE  
ODORS



52.2  
COMPLIANT



NO  
OZONE

# V-BANK & STERILE SWEEP

- Catch, Hold, Kill UVC Systems: coupling sparse glass media with hi-output 254nm UVC
- Up to 90% Bacteria kill after 5 minutes
- Often a Pre-filter for V8 or other High Efficiency Filtration
- Up to MERV 14 Performance in a Re-circ system
- 20-35% First Pass TVOC Removal
- Increased Dust Holding Capacity
- Easy to Use, Maintain, and Replace



**MAINTAIN  
IAQ**



**STERILIZE  
PATHOGENS**



**REMOVE  
ODORS**



**NO  
OZONE**

# PANEL AIR CLEANERS (PAC)

- Replace Low-Efficiency Passive Filters
- Fits in Standard 1" and 2" Filter Racks
- Capture, Hold, Kill UVC Options
- Up to MERV 13 Performance in Re-circ System
- TVOC and Ultrafine Particulate Removal
- Easy to Use, Maintain, and Replace



**MAINTAIN  
IAQ**



**REMOVE  
ODORS**



**NO  
OZONE**



DYNAMIC  
TECHNOLOGY



 **Dynamic.**  
Polarized-Media Technology

ACTIVELY  
POLARIZED  
MEDIA

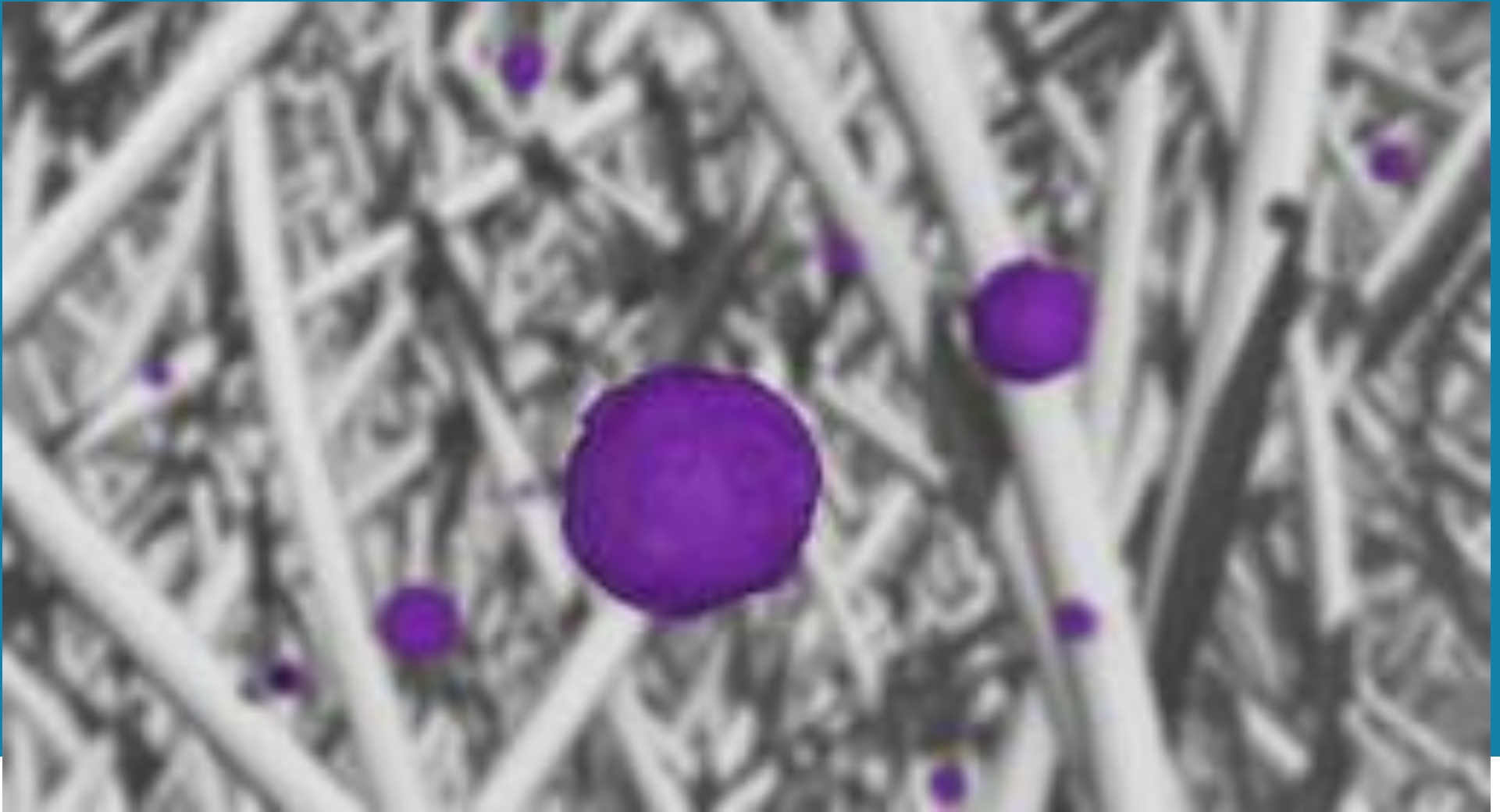


 **Dynamic.**  
Air Quality Solutions



# PASSIVE FILTER MECHANISMS

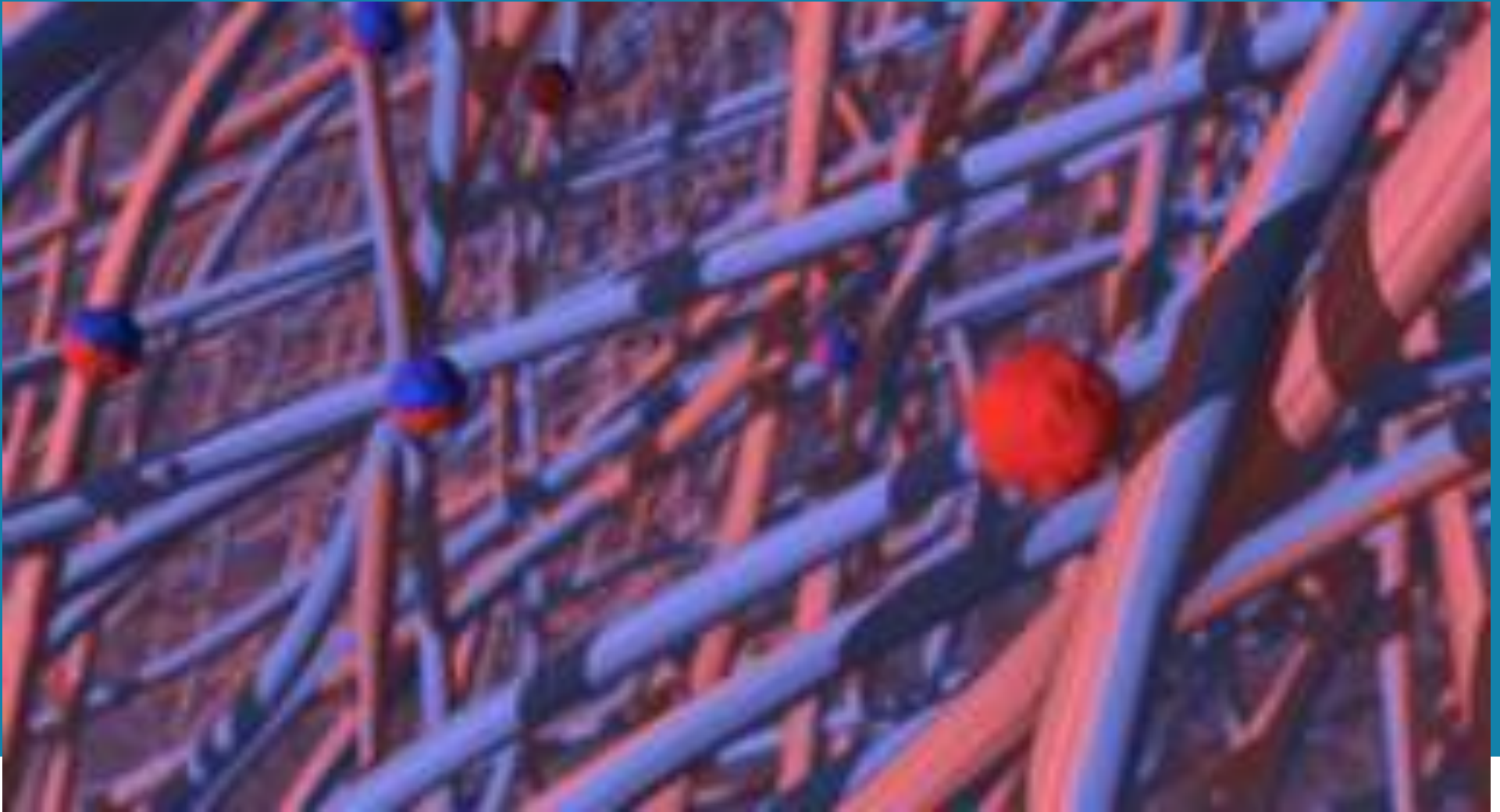




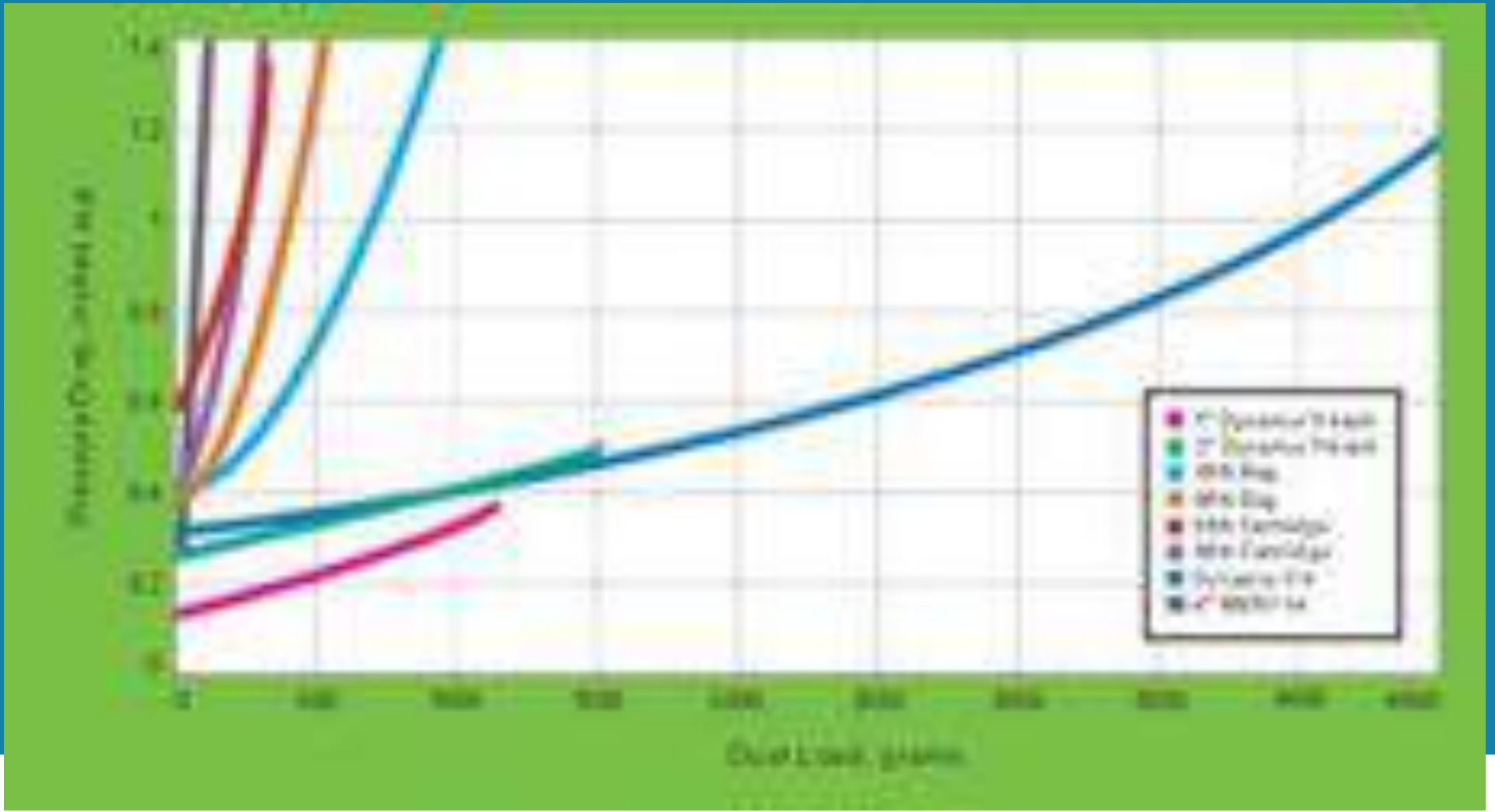
# POLARIZATION & ELECTROSTATIC ATTRACTION



**Dynamic**  
Air Quality Solutions

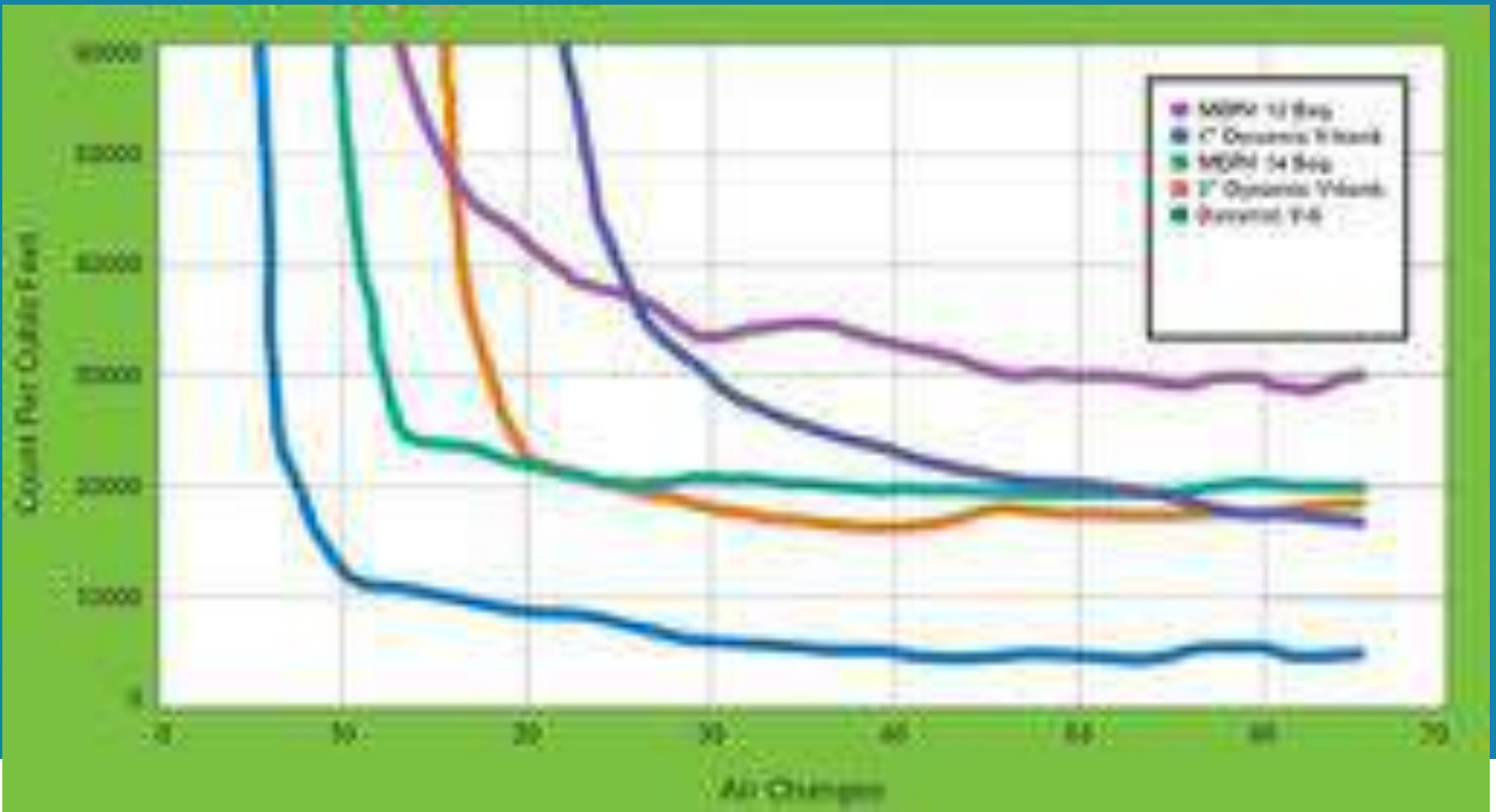


# PARTICLE EXCITEMENT & AGGLOMERATION



# MAXIMUM DUST LOADING





MAXIMUM  
CLEANING



# TVOC AND FORMALDEHYDE REMOVAL

Figure 1: Pre and Post Filter TVOC Levels

from 1/2007 to June 21, 2007

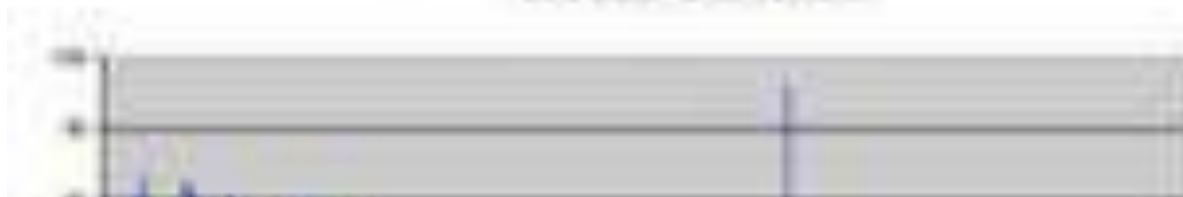


Table 1: Pre and Post Filter Average TVOC Levels and Estimated Removal Efficiencies

Date Range	Pre Filter Average		Post Filter Average		TVOC Removal Efficiency
	ppb	mg/m <sup>3</sup>	ppb	mg/m <sup>3</sup>	
March – April	24.1	0.01	8.5	0.004	77 %
June 1 – 21	41.1	0.02	3.2	0.001	91%

Notes:

ppb – parts per billion by volume, instrument calibrated with isobutylene  
 mg/m<sup>3</sup> – milligrams per cubic meter of air, converted and adjusted to TVOC methane equivalents



# V8 PERFORMANCE AND IMPACTS

- MERV 13-15+
- 1/3 the operating cost of passive filters
- Reduced maintenance
- Removes Ultrafine Particle (UFPs)
- Significant reduction of VOCs and odors
- No need for pre-filters
- Typical design midlife of ~0.5" w.g. and .7-.8" Dirty
- 30-50% Less cost of ownership over 15 years
- ROIs of 15-30%



**OFFICE BUILDING REMOVAL  
ASHRAE HEADQUARTERS  
ATLANTA, GEORGIA**



ASHRAE's new office building is a large building with typical operating hours.

Indoor air quality was a major part of the emphasis. The indoor air is continuously monitored. A number of outdoor air quality monitors (PM 2.5 and PM10) and gas-phase and particle-phase (TSP) of monitoring in the building (rather than quality monitors).

The building's energy data building, especially has been so high that the system has not a continuous monitor. The data processor and the other data have not required several improvements in the future.

**TEAM**

- Owner - American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- Architect - HOK (HOK/Ch2M Hill)
- Engineer - Johnson, Spelman & Associates, Inc.
- Mechanical Contractor - Sherman & Kinney
- General Contractor - Oak-Crest Builders
- Project Manager - Ed Perkins
- Commissioning - C&S
- LEED Consultant - HOK

**TECHNICAL SERVICES**

- HVAC - HOK/Ch2M Hill/Trane
- Electrical - Trane
- Building Controls - HOK/Ch2M Hill
- Energy Monitoring - Trane
- Mechanical - HOK
- Commissioning - C&S

**IAQ  
&  
MAINTENANCE**

**7-YEAR MEDICAL  
REPLACEMENT**

**ASHRAE  
HEADQUARTERS**



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CLASS-A OFFICE BUILDING  
2121 K STREET NW  
WASHINGTON D.C.

KEY PARAMETERS

# EXCEEDING STANDARDS

92-99% UFP  
REDUCTION  
VS OUTSIDE  
AIR

2121  
K. STREET,  
D.C.

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Delivery of the building's interior systems, including ductwork, was completed to meet all the current requirements in (pending) state



Deliver 100% UFP reduction (UFPs fully sealed structure, which was sealed structure) (pending) for being brought in compliance the various ASHRAE Standard 154, Standard 155, Standard 156. The tests showed minor levels of mass concentrations with 10% to 20% over the three (three) tests on demonstrating the need for effective filtration in indoor environments. Design and test data fully and thoroughly is available online at

[www.DynamicAQES.com](http://www.DynamicAQES.com)  
[www.DynamicAQES.com](http://www.DynamicAQES.com)

## TEAM

- Owner - Hill Country Partners
- Architects - WDC worked on
- Engineers - Jacobs Engineering Associates, Inc.
- Mechanical Contractor - M.E. Brown
- General Contractor - Jettison Construction Corporation

## MECHANICAL SYSTEMS

- HVAC - Three Custom 100000 and 150000 CFM units (one 100000 CFM and one 150000 CFM)
- Heating System - Three Radiant Heating

[www.DynamicAQES.com](http://www.DynamicAQES.com)

ENERGY & REDUCED BHP

# ENERGY & REDUCED BHP

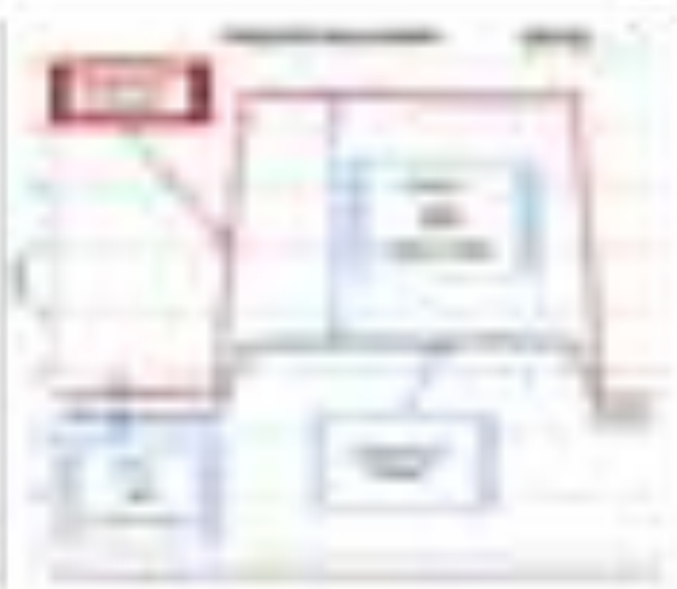
## 55% REDUCTION AT PEAK HOURS

# HOSPITAL VIAMED



Dynamic Air Quality Solutions provided the design, installation, and commissioning of the VIAMED hospital's air conditioning system. The system is designed to provide a high level of indoor air quality and energy efficiency. The system includes a variety of air conditioning units and controls that are designed to meet the hospital's needs. The system is also designed to be easy to maintain and operate.

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- Key features include:
- Energy-efficient design
  - High indoor air quality
  - Easy to maintain and operate
  - Flexible and scalable system
- For more information, visit [www.dynamic-air.com](http://www.dynamic-air.com)

# WHERE TO?

Wider application of MERV 13 filtration (Changes to Leed/Well?)

Changes in systems design to optimize contaminant control

- Airflow direction and pattern
- Higher ventilation rates
- More effective contaminant capture (eg bathrooms)
- Space and building pressurization

Expanded use of localized air cleaning and ventilation

- Supply grille filtration
- Supplemental air cleaning systems and air change rates

Expanded use of UVGI optimized for airborne inactivation

And.....

THANK YOU

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QUESTIONS?



