Post-pandemic outlook:
The relevance of Indoor Air Quality for future standardization and regulation

DR. IYAD

Al-Attar

IAQ and Air Filtration Consultant

Visiting Fellow – Cranfield University, United Kingdom.

Editorial Member – Filtration Society, United Kingdom.

Instructor & Advisory Board Member at the Waterloo Filtration Institute

EUROVENT MIDDLE EAST- Associated Air Filtration Consultant.

Journal of Cleaner Production – Editorial Referee.

What has Filtration done for us?

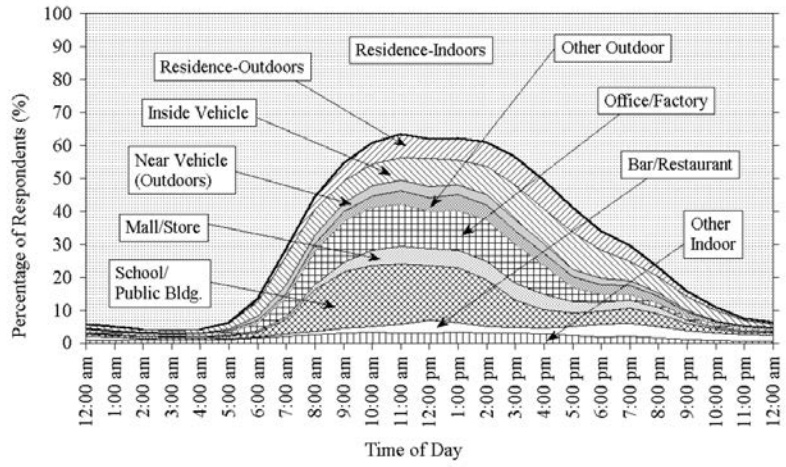


Figure 4: Stacked plot showing the weighted percentage of NHAPS respondents in each of ten different locations according to the time-of-day. The original minute-by-minute diary data have been smoothed for clarification.

***The Indoor Time:87-90%**

Importance and implementation

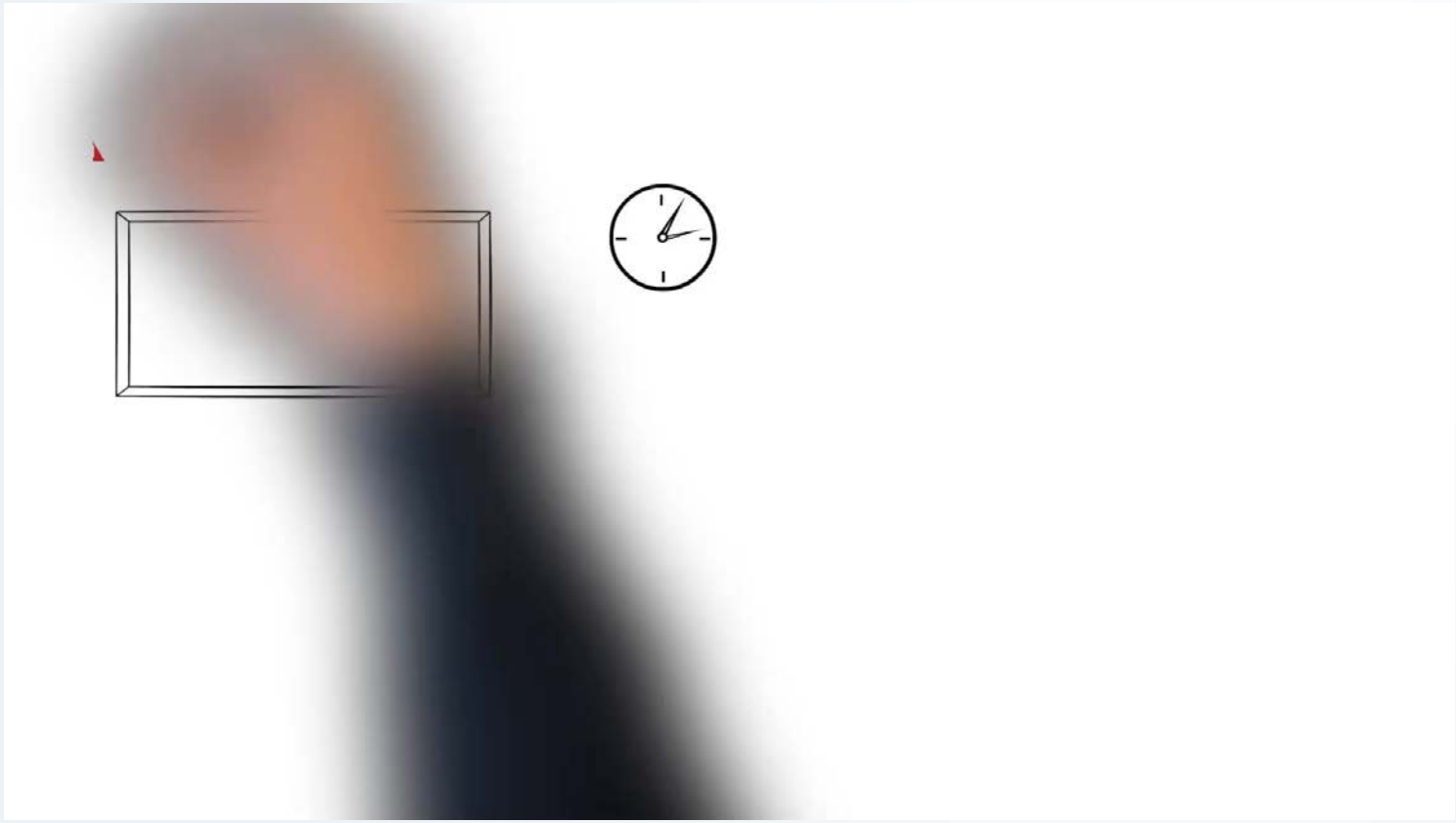
Overlooked, Ignored, Misunderstood

Filtration

The Common Denominator

*The National Human Activity Pattern Survey (NHAPS): https://indoor.lbl.gov/sites/all/files/lbnl-47713.pdf

Where is my seat?



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Global pollution kills 9m a year and threatens 'survival of human societies'

Landmark study finds toxic air, water, soils and workplaces kill at least 9m people and cost trillions of dollars every year

World Health Organization

عربى 中文 English Français

Media centre

Menu

7 million premature deaths annually linked to air pollution

News release

25 MARCH 2014 I GENEVA - In new estimates released today, WHO reports that in 2012 around 7 million people died - one in eight of total global deaths – as a result of air pollution exposure. This finding more than doubles previous estimates and confirms that air pollution is now the world's largest single environmental health risk. Reducing air pollution could save millions of lives.

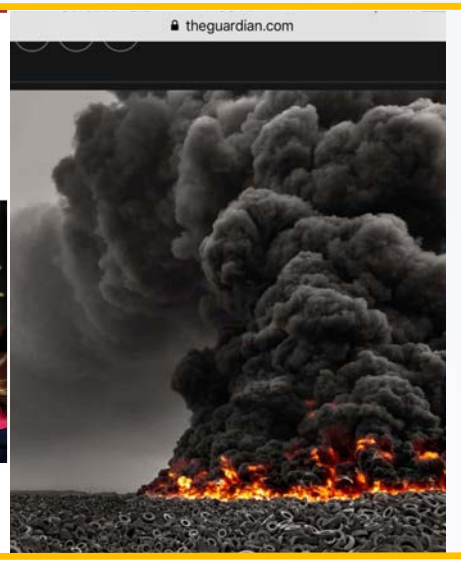
DAILY NEWS 12 October 2017

Air pollution blamed for 500,000 early deaths in Europe in 2014

Something bad in the air
Beata Zawrel/Pacific Press/LightRocket via Getty Images

By Andy Coghlan

theguardian.com



ENVIRONMENT TOXICOLOGY, GENETICS, CHEMISTRY

Air pollution can mess with our DNA

New evidence shows breathing diesel fumes inappropriately switches genes on and off

BY SHARON OOSTHOEK JAN 22, 2015 – 7:00 AM EST

Research now shows it also can affect our DNA.
CHIMIEL

UK has one of the worst pollution death rates in Europe, major study reveals

The Green Party co-founder warned it is 'one of the most urgent global crises of our times'.

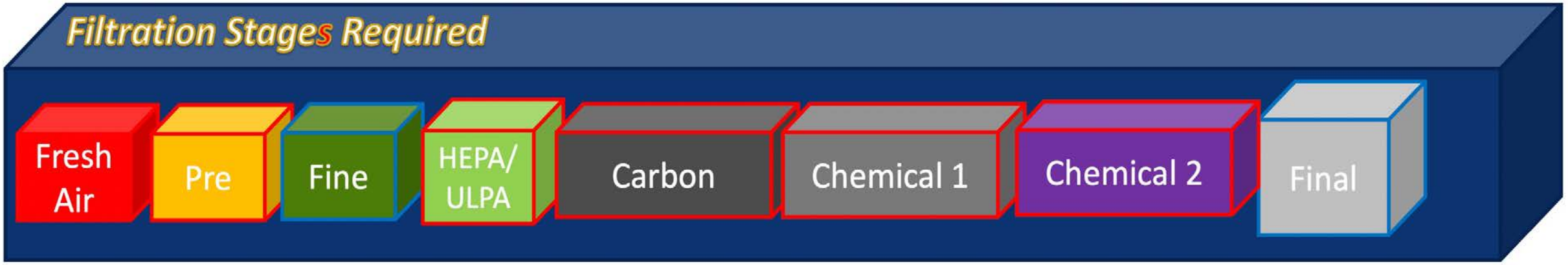
CHLOE CHAPLAIN | Friday 20 October 2017 08:55 | 22 comments

The UK has been shamed as being among the worst countries in Europe for pollution deaths Jeremy Selwyn

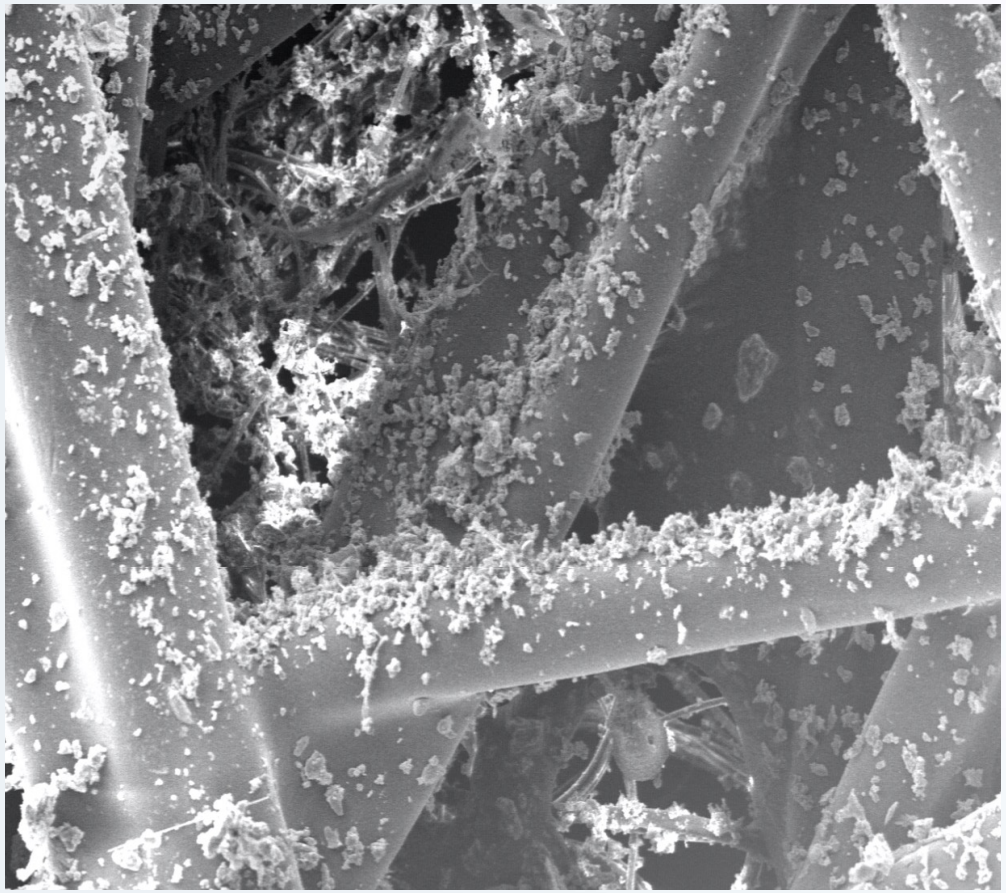
The UK has one of the worst records of pollution death of any country in Europe, a major study has found.

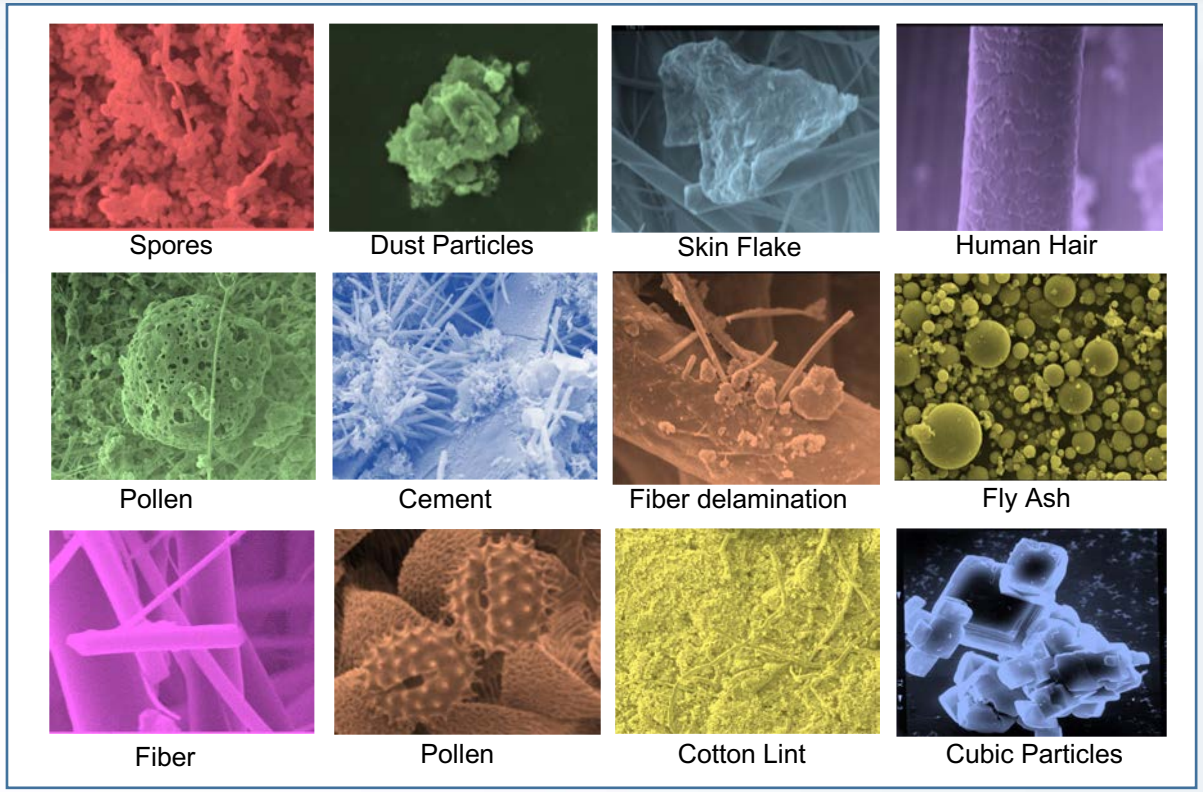
More Pollution ☞ More Filtration

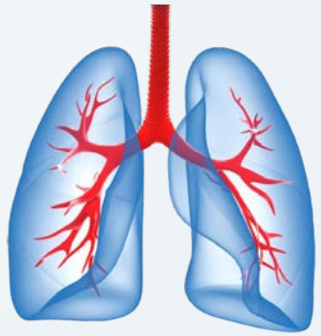
STOP Polluting!



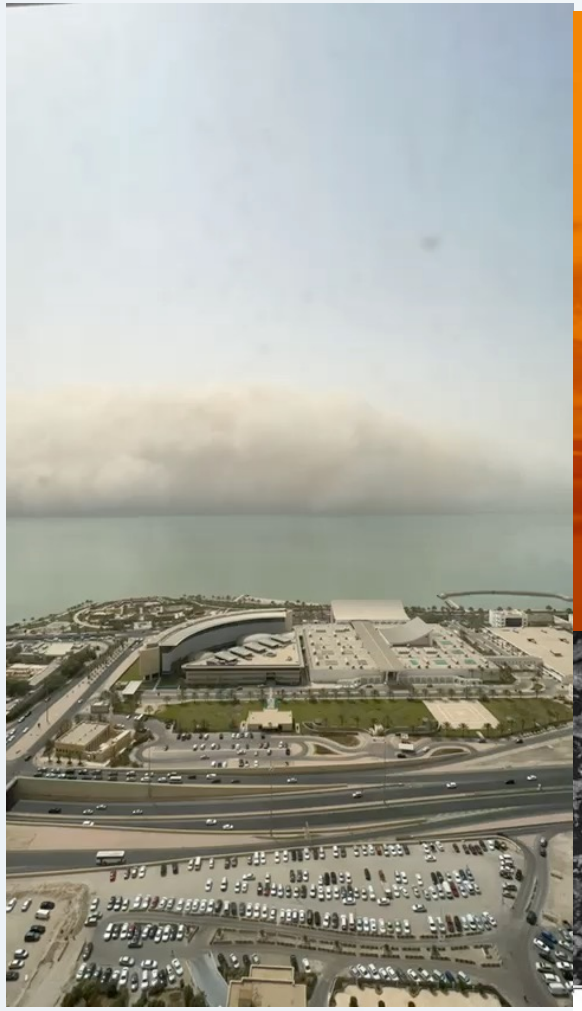
Contaminants Particle Types & Sizes

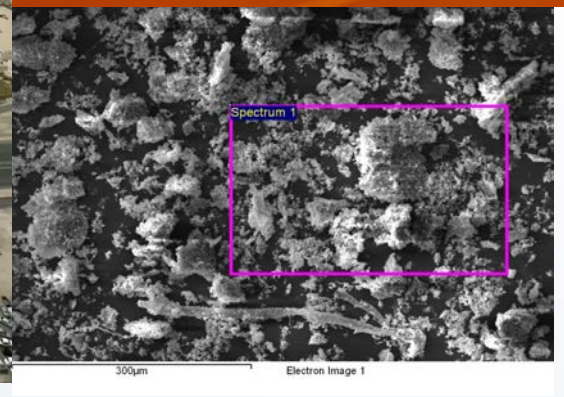


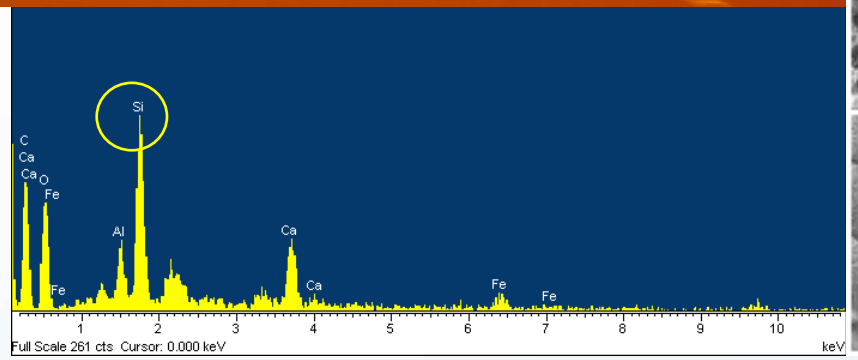


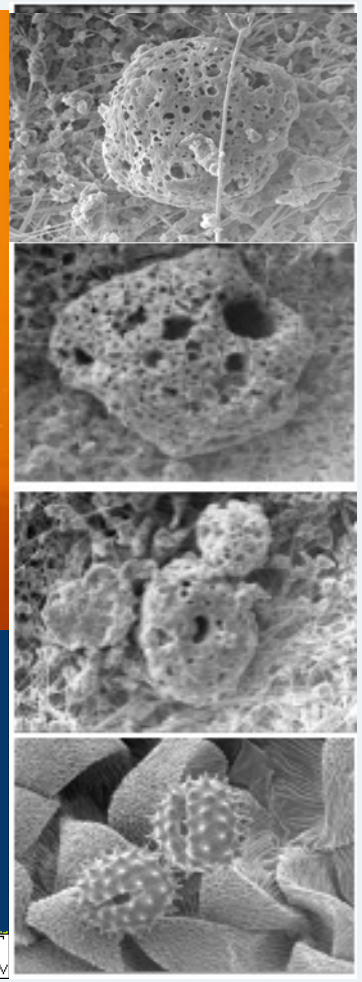


Climate Conditions - Challenges









From

Surviving to thriving…

- **Enhancing IAQ is not philanthropy**

- Air filtration solutions:

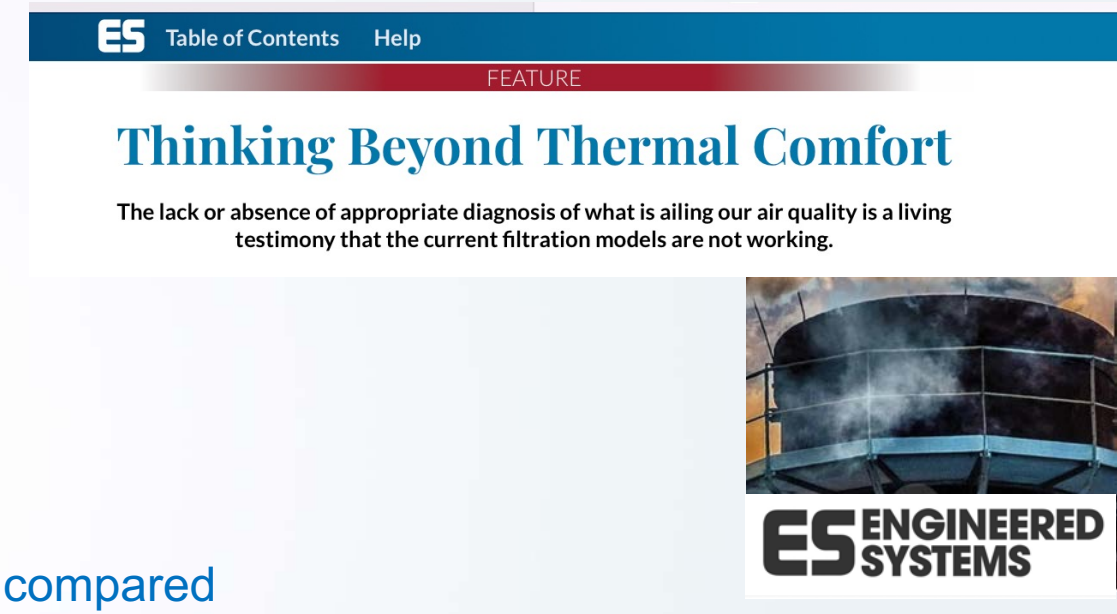
  Option? Consideration? Accessory to the HVAC systems?

- An international priority, pillar and a driving force…

1. **HVAC system:**
   are expected to respond to variations in IAQ
2. **Retrofits!**
3. Filtration upgrades

➡️ "infinitesimal" compared to the economic cost of lockdowns.

HVAC systems must step up

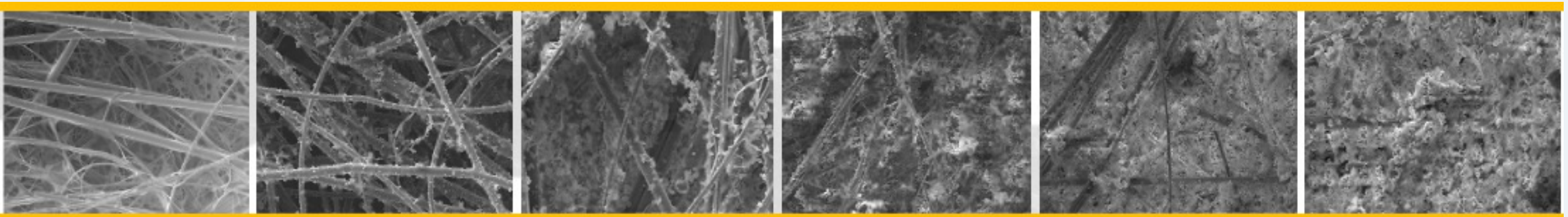

ES Table of Contents Help

FEATURE

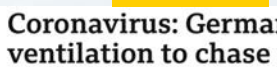
Thinking Beyond Thermal Comfort

The lack or absence of appropriate diagnosis of what is ailing our air quality is a living testimony that the current filtration models are not working.

ES ENGINEERED SYSTEMS



The Global Response



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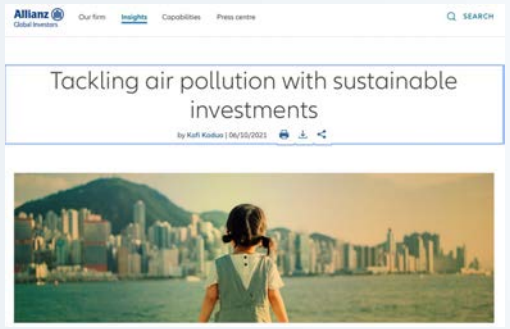
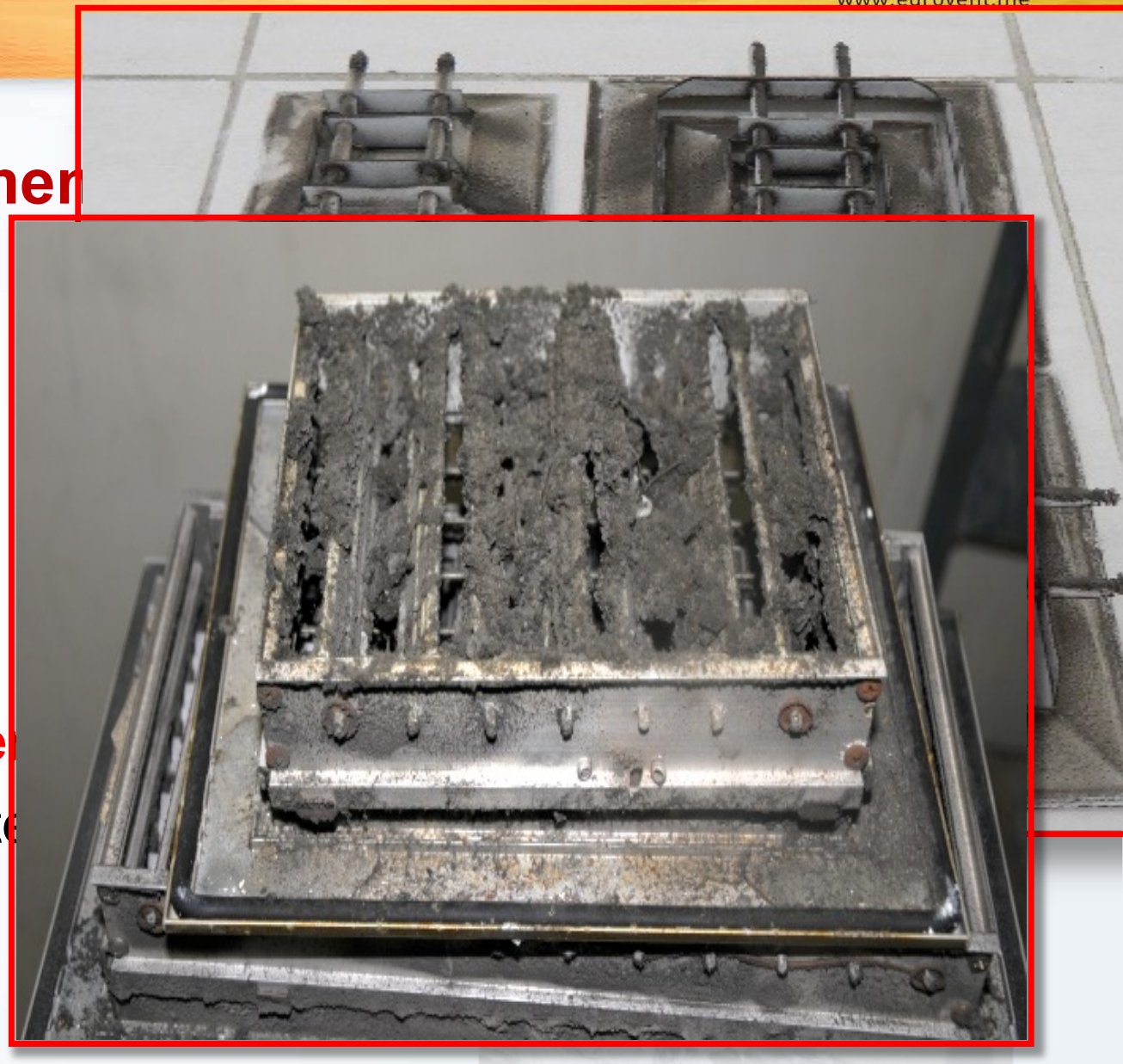


We've kept

The old school of facility managemen

1. Bailed out conventional filters
2. Overlooked maintenance ticks
3. Subsidized coil & ducting cleaning
4. Obstructed air quality enhancements
5. Thwarted air filter upgrades
6. Embraced the theology of washable filte
7. Underpinned the reuse of disposable filt



& As the pandemic seemed to regress:

Air quality and filtration don't get delisted from our priority list.

Can a smart building be ?

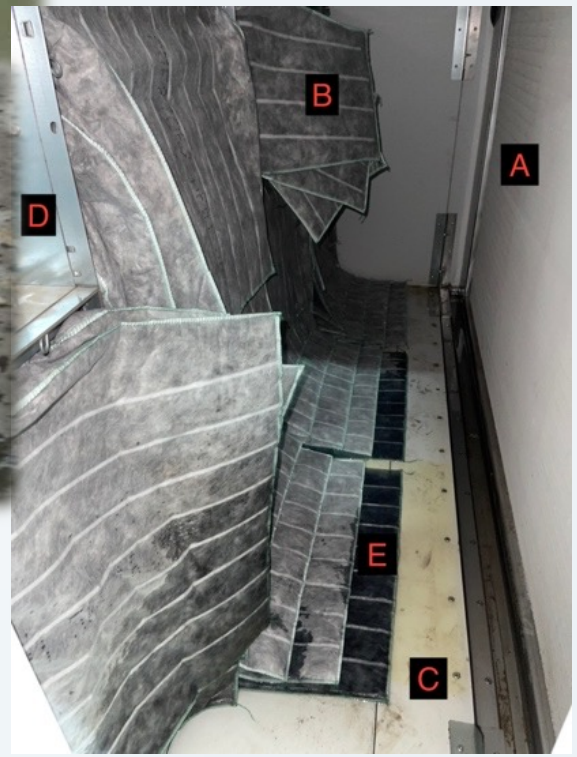
- Who could claim "**Filtration Homework**"?
- Who could argue?
- **1" Filter, with 2" gap!**

The prime time to revolt…

- **Limited (spaces) & filtration budgets**
- **Dedusting clogged filters**
- **Relying on coil & duct cleaning.**

Let's invite FM to visit their AHUs

- Water & dust accumulation
- A pressure gauge is not enough! (sometimes disconnected)

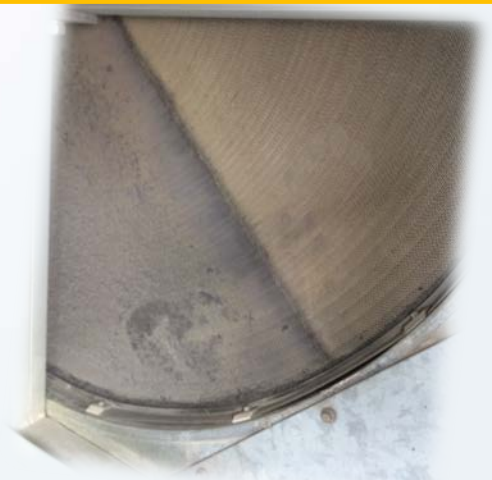


[A] Cooling Coil
[B] Pocket Filter
[C] Water Accumulation
[D] Filter holding frame
[E] Inappropriate filter installation

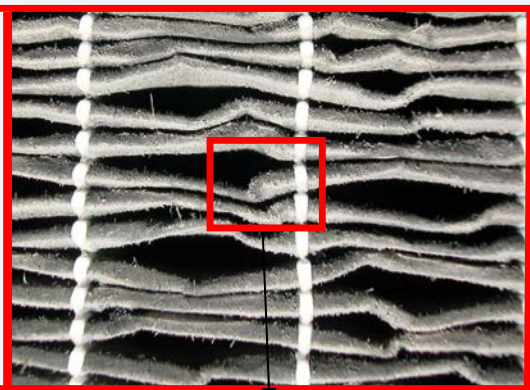
Prevent, the contamination event

Coil Cleaning

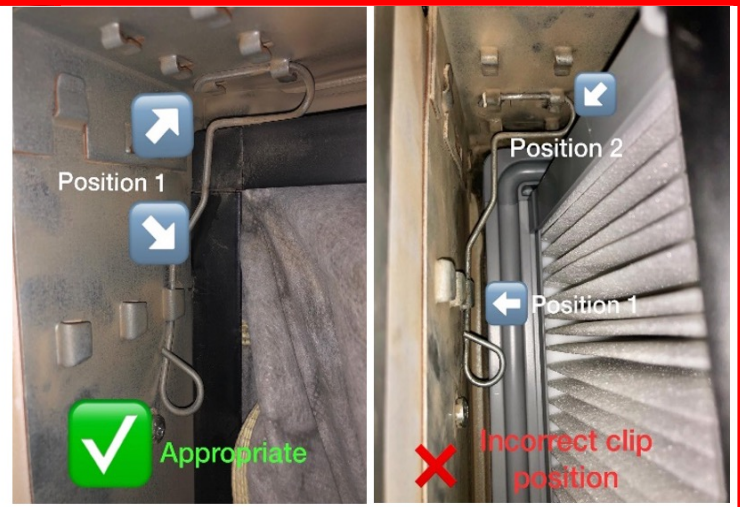
Coil Washing



Who wants to be an occupant of these indoor spaces?

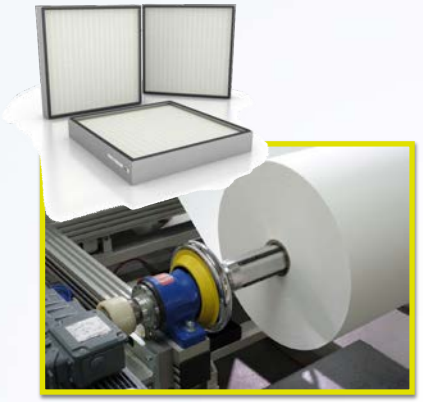


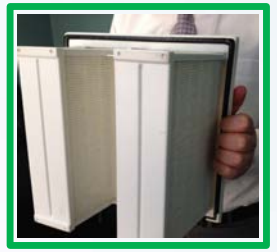
Appropriate Installation / Seal the gaps



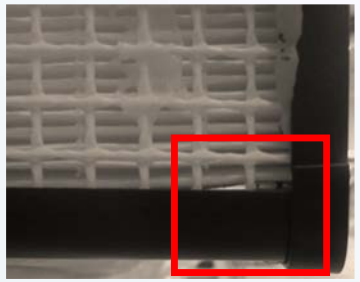
Correct and incorrect positions of the installation frame clip

The Birth and the Disposal of air filter acquistion



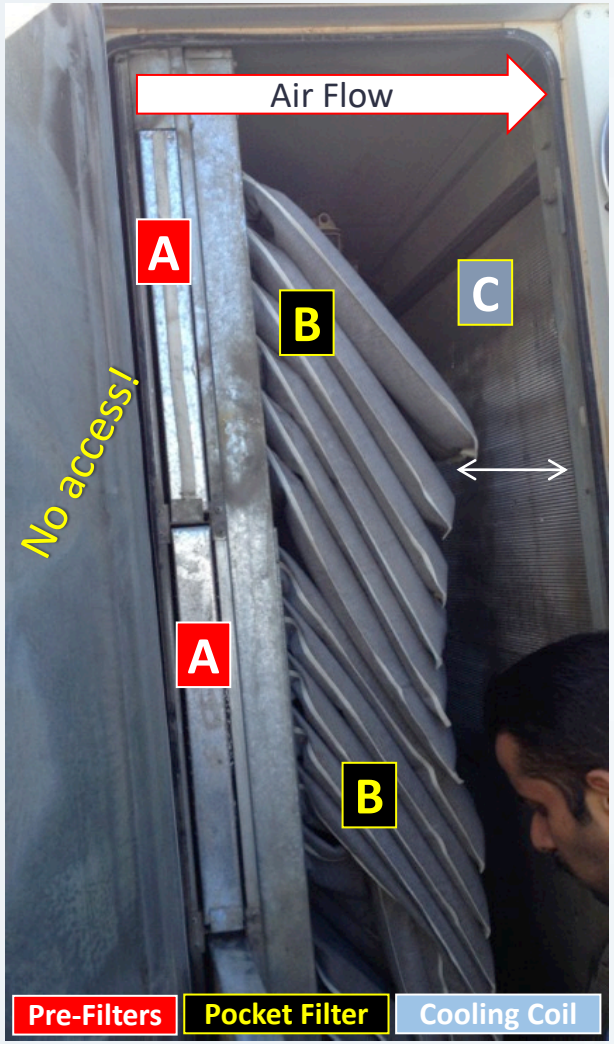


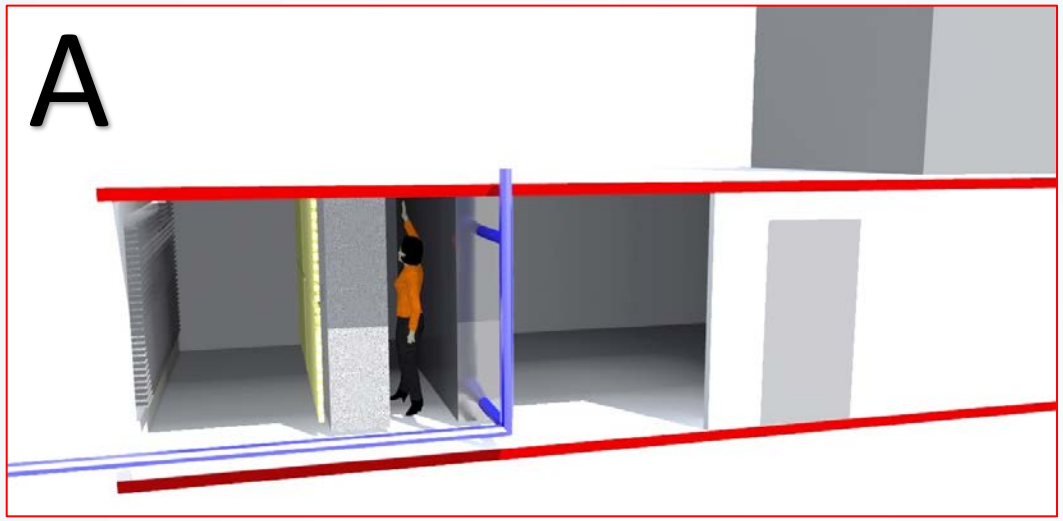
Selection → Purchase → Manufacturing & Testing → Transport → Installation, Handle, Storage → Maintain, Monitor, Replace → Disposal

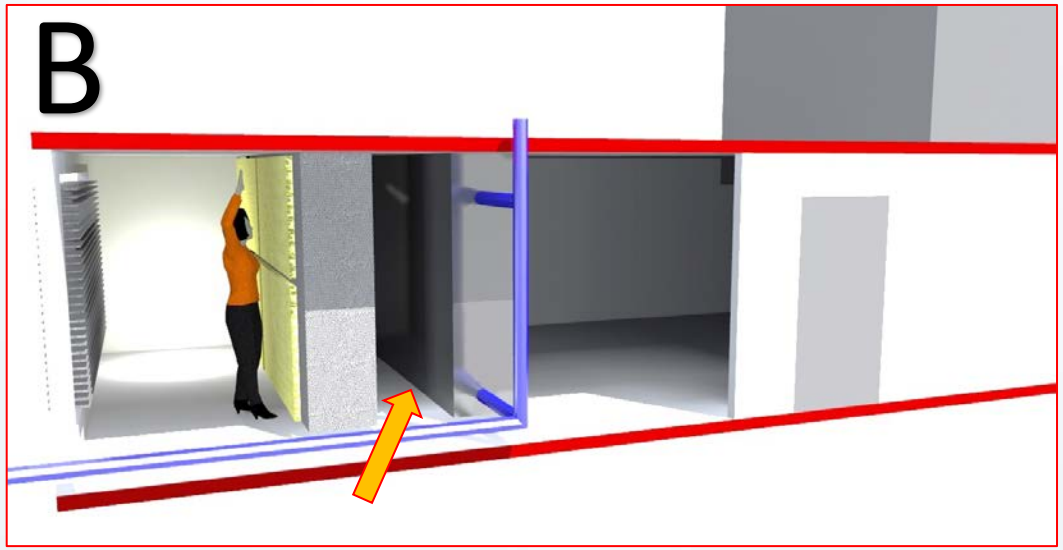


- **Leakage**
- **Fractional efficiency**

Maintenance Access / Position



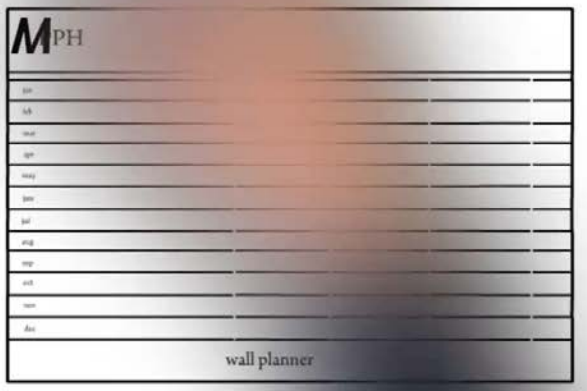




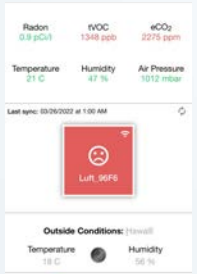
EUROVENT 5th ANNIVERSARY
MIDDLE EAST
Association of the region's leading HVACR manufactures

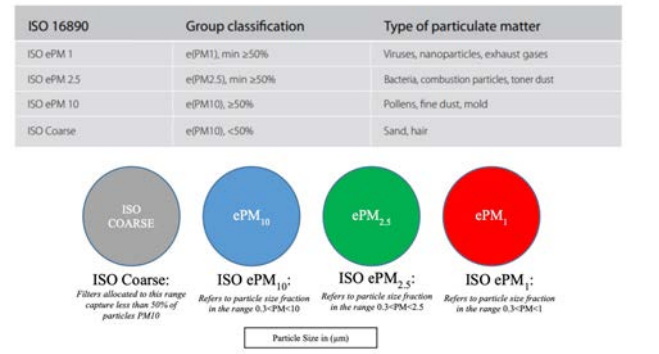
Sustainable Air Filter Performance

1. **Quantify Pollutants**
2. **Specify** Filters requirements
3. **Employ** appropriate filtration & ventilation technologies
4. **Understand** the **Filtration Standards**!
5. **Invest** in your team (Training & Re-training.)
6. **Avoid** filtration mistakes, they can be expensive.
7. **Seek professional advice** from filtration experts.



Designed & Produced by:
Dr. Iyad Al-Attar





Reimagining Air Quality!

Challenge & Change

Facilitate Challenge

Invest & Retrofit

Quantify & Report

Regulate & Reward

Aspire to Better Built Environment

We have what it takes

- **Filtration**, air quality monitoring and **HVAC technologies** to raise the bar of the indoor comfort of occupants.

- Not only confront the next pandemic, but to have ***no more pandemics***

Let's get it right this time through:

- Sustainable filtration solutions

- Second to none maintenance programs

LEAD rather than **LEAVE** the air quality initiative

- Embrace **preventive** rather than **reactive** maintenance

- During the pandemic, we had to **FLEE** rather than **FIGHT** as we neither had the **TOOLS** nor the **INFRASTRUCRE** to enhance IAQ.

Sustainable Filtration Solutions

EUROVENT ME NEWSLETTER

GUEST ARTICLE

Why the slow move back to normal should be an opportunity for the HVAC sector to step up

Dr Iyad Al Attar, Independent Air Filtration Expert and Associated Consultant for Eurovent Middle East, calls on the HVAC sector to challenge and change conventional philosophies, outlining what the industry should keep in mind to truly enhance IAQ and avoid the outdated thinking that prolonged Covid-19...

It is good to get back to "normal" slowly, but not back to the practices that have led to and delayed our exit from the Covid-19 pandemic. The importance of air filter performance in enhancing air quality has been belittled for decades and perceived as an acquired luxury. The pandemic finally brought the air quality narrative from the backburner to the news headlines. The scale and scope of losses in human lives and economic setbacks have forced us to scrutinize air quality and filter performance. Yet, despite all our technical know-how and collective experiences, we aimlessly wander in our HVAC systems, dedusting clogged filters, washing contaminated coils, and cleaning ducts, believing that we have satisfied our air quality obligations.

It is time to get it right; we ought to focus on what is effective, not what is in fashion. We must admit that our conventional philosophies trapped us in the pandemic and delayed our exit from it. If our literal adherence to filtration and HVAC standards has contributed to the deterioration of indoor air quality, we certainly need to check the metrics of these standards.

The pandemic is a prime time to revolt against outdated and conventional practices that have failed to protect our respiratory systems and instead participated in spreading the coronavirus. COVID-19 has now showcased compelling economic reasons for resolving air quality issues. The objective here is not just to avail the best Indoor Air Quality (IAQ) possible but to address all relevant matters influencing the built environment. HVAC systems must step up, and we should think beyond thermal comfort. That would include rewiring our buildings and cities to place IAQ at the forefront of national priorities by employing continuous aerosol monitoring and the corresponding filtration solutions.

Dr Iyad Al Attar

Conventional maintenance measures thwart any endeavour to attain better air quality.

Raising the bar of air quality is an engineering approach. Currently, predetermined ways of doing things and conventional practices continue to risk IAQ; the game is the same. The addiction to using washable and reusable filters has compromised IAQ and filtration upgrades. The villain in the story is the great emphasis on saving costs rather than lives by dedusting a clogged filter with compressed air, washing coils, and cleaning ducts.

These maintenance measures thwart any endeavour to attain better air quality. Therefore, it is time to bend the arc of conventional practices toward professional, thorough, and preventative maintenance programs to take air quality to the next level. The mindset of maintenance shortcuts will never position air quality as a pressing issue in the built environment. Underutilizing air filtration solutions and settling for maintenance tricks rather than technologies to the inheriting poor IAQ contributed further to the spread of microorganisms. It is time to realize the essence of air filter performance and regard it as an integral part of the built environment and not simply an accessory of the HVAC system.

To achieve leaps and bounds as far as IAQ is concerned, we must consider new ideas and adopt innovative approaches. We need to consider appropriate filter selection that can accommodate all types of pollutants once their physical and chemical characterization has been completed. To implement proper corrective measures, we ought to highlight the air quality issues and determine whether they are ventilation or filtration issues or a bit of both. For example, to lower the concentration of CO_2, ventilation techniques are necessary, but both filtration and ventilation solutions can reduce Particulate Matter (PM) and gaseous pollutants concentrations.

Recently, there has been a great deal of hype on moisture control, and several studies and scholars correlated humidity control and virus survivability in an indoor environment. Ironically, the sole reliance on a single stage of an inch thick washable filter in Fan Coil Units (FCU) and installing these filters before they are completely dry - not to mention their poor filter efficiency - may counterproductively affect the IAQ. Air handling units use a second filtration stage (usually pocket type) in addition to the primary filters to protect human occupants and the installed HVAC system. However, the agony is that these secondary filters occupy tremendous space in the air handling units compared to their modest performance (efficiency and pressure drop). Unfortunately, although these filters are disposable, maintenance teams often reinstall them after attempting to regenerate them by water-washing or compressed air.

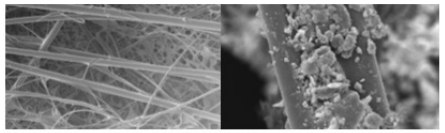


Figure A & B: Scanning electron microscopic images of filter media used in air filters.

It is impossible to embark on air quality enhancements if these practices exist. There is a lot to tweak in IAQ, not just to hike the filter efficiency and install High-Efficiency Particulate Arrestance (HEPA) filters, but to consider the entire HVAC systems and built-in environments holistically. Satisfaction is gained through increased productivity and improving dull buildings through the Internet of Things. Therefore, enticing HVAC engineers to design systems responding to indoor air quality variations will prove invaluable in confronting a wide array of pollutants, not just Particulate Matter (PM).

Air filter media, design, and performance have advanced substantially. Addressing only the associated rise in pressure drop when selecting air filters with higher efficiency is yesterday's argument. The optimized performance of modern aerodynamic filter design can spark a new beginning to attain cleaner air at a much lower pressure drop.

Figure C: Typical installation of secondary stage filter "pocket type" in an air handling unit

Reimaging Air Quality

Existing and new buildings are under immense pressure to provide healthier indoor environments. However, any cost of filtration upgrades is infinitesimal given the cost of the lockdown. Although COVID-19 has brought enormous suffering, it has highlighted the primary deficiencies in terms of the tools and conditions of our indoor environment. Globally, the pandemic pushed air quality to the center and forced everyone to reimagine air quality given the incredible growth in industrialization; however, at the same time, it also shed light on the lack of adequate regulations. Today, technology has provided us with the tools and the resources to attain the best air quality, and the pandemic has given us the business case to act swiftly.

We must unweave every strand of conventional practice that led to the spread of the virus. We ought to admit that maintenance programs in place are, at best, modest, if they exist at all. It is time to certify HVAC systems, air filter performance, and maintenance programs and teams to take air quality to the next level.

It is now time for the global government to legislate rules and regulations that match the importance of outdoor and indoor air quality and allocate budgets and plans to improve IAQ. The bill that can come due is horrendous if we do not make air quality a global priority.

Thank you