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PM1 – the new focus to protect human health

Ambient air quality has improved considerably in the last few decades by a range of measures to reduce harmful air emissions. However, there is convincing evidence that current levels of air pollution still pose a considerable risk to human health.

Among other specialized agencies, the World Health Organization (WHO) – in its role as the watchdog of international public health – has been particularly articulate about the dangers of particulate matter (PM) in reports and statements.

WHO's efforts have also been bolstered by frequently published newspaper reports, scientific studies, scholarly articles and government warnings about the negative health effects of poor quality air, and the diseases air pollution can cause or accelerate. Proof is online: try googling “air pollution and health effects” and you will get several million hits in half a second.

So the health impact of breathing bad air, especially in the most polluted cities of the world, is being well documented today. Air pollution is now estimated to be responsible for several million premature deaths each year. It is also considered to be one of the highest risk factors for death globally and a leading environmental risk factor for disease.

Cast of particles

The most typical particulates in the air are:

- PM1 – particles <1 µm in size. Examples: dust, combustion particles*, bacteria and viruses.

- PM2.5 – particles <2.5 µm in size. Examples: pollen, spores and other organic particles.
- PM10 – particles <10 µm in size. Examples: coarser fine dust and organic particles.
- Coarse – particles often 10 µm or bigger. Examples: visible coarse dust, sand, leaves, hairs and other large organic particles.

PM is a mixture with physical and chemical characteristics that vary by location. Its sources are man-made or natural. Air pollution therefore varies from place to place. Spending a day on the streets of Beijing, for example, will have the same negative effect on your respiratory tract as staying 30 days in Paris. It should be noted, however, that people will react differently to poor quality air, depending on their sensitivity.

When inhaled, PM10, PM2.5 and PM1 impact the body in different ways. Their ability to be trapped in the body, where they may form deposits, will depend on their size and whether they can pass through the walls of our airways.

Importance of good IAQ

How can we stop PM from invading our indoor spaces, where people spend around 90% of their lives? Unfortunately, we cannot fully escape outdoor air pollution by staying indoors because the function of ventilation systems is to mix outdoor air with indoor air.

If outdoor air is not effectively filtered and cleaned, there is a risk that the indoor air will contain a very large quantity of the harmful particulates that find their way into people's respiratory tracts and circulation systems. These particles and other substances can combine with those already present inside buildings and become

more aggressive and harmful, making indoor air pollution many more times as hazardous as the outdoor variety.

But with quality air filters in air handling units, a significant proportion of these harmful outdoor particles can be stopped before they are spread through the ventilation system. This means that in polluted cities like

London, Paris, Los Angeles, Beijing and New Delhi, it is possible to improve the quality of the poor indoor air until it reaches an acceptable level, using the ventilation system alone.

If a mobile air purifier is installed in rooms as an extra measure, a consistently high level of air quality can be achieved, even if the amount of particulates and other substances in the outdoor air varies significantly.

PM1 is most harmful

Today, WHO and the EU are monitoring PM2.5 and PM10 and reporting on the negative health effects of these particles and their ability to penetrate our lungs and cause respiratory and cardiovascular morbidity and disease.

But to provide a truly healthy and productive indoor air environment in areas with bad air pollution, ventilation systems need filters that are also capable of removing PM1 particles – the smallest fraction and the most harmful.

Our lungs are prey to PM1. When inhaled, PM1 particles travel to the deepest area of the lungs, where a significant part of them passes through the cell membranes of the alveoli (the millions of tiny sacs in our lungs where O2 and CO2 are exchanged), enter the bloodstream, damage the inner walls of arteries, penetrate tissue in the cardiovascular system and potentially spread to organs.

At worst, PM1 can contribute to deadly diseases like heart attacks, lung cancer, dementia, emphysema, edema and other serious disease, leading to premature death.

PM filtration today

Filters are like workhorses in ventilation systems and current F7 filters have varying efficiencies to capture PM1 (typically 50-75%).

With filters significantly influencing indoor air quality (IAQ), it will be increasingly important to choose the right filter and efficiency for the targeted particulate matter. This is not easy today because current regional standards apply different filter testing and classification methods, preventing proper product comparisons. Current standards are also known to have

limitations and generate results that are sometimes far from filter performance in service.

Filters are available today to meet the stricter demands for removing PM1, such as Camfil's Opakfil ES, Hi-Flo XLT7 and Hi-Flo M7.

In addition to selecting the right particle efficiency, there are other important product features to consider, such as long life, low pressure drop and low energy consumption. In addition to their high efficiency, Camfil filters are recognized "energy heroes" because they save many kilowatt hours of electricity, as documented in thousands of customer cases. When building owners purchase quality filters like Camfil's for high IAQ, they also benefit by getting the lowest total cost of ownership for their filtration solution.

For more information visit Camfil's website (www.camfil.com), where you can learn more about our filters and download the brochure "PM1 – Fine Dust Hazard to Health".

Your nearest Camfil company or representative will also be glad to advise you on the right filters for your building and location. For added indoor air filtration in polluted urban environments, Camfil also offers advanced room-air purifiers for both particle and molecular filtration. The latter are being increasingly used in offices and retail stores in large international cities with air pollution issues.

* Diesel engine emissions are considered the primary source and WHO classified them as carcinogenic in 2012.

Camfil is a global leader in the air filtration industry with more than half a century of experience in developing and manufacturing sustainable clean air solutions that protect people, processes and the environment against harmful airborne particles, gases and emissions. These solutions are used globally to benefit human health, increase performance and reduce energy consumption in a wide range of air filtration applications. Our 26 manufacturing plants, six R&D sites, local sales offices and 3,900 employees provide service and support to our customers around the world. Camfil is headquartered in Stockholm, Sweden. Group sales total more than SEK 6.8 billion per year.

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