**Preparing Homes for Future Pandemics and Dangerous Everyday Airborne Particulates**

 **By Nick Agopian**

 **What people can’t see in their homes might just be slowly killing them. However, new technological advancements in HVAC filtration technology might be the answer to saving lives and promoting a healthier well-being for homeowners.**

 **Everyone knows the dangers SARS CoV-2, the invisible virus that causes COVID-19, which killed more than one million Americans in 2020 and 2021.**

**Now research has uncovered newly-discovered dangers of an invisible age-old threat. Airborne particles, known scientifically as** [**Particulate Matter (PM2.5 micron (µm))**](https://www.health.ny.gov/environmental/indoors/air/pmq_a.htm)**, float almost perpetually in residences. PM2.5 can be biological or just simple sub-micron dust. Direct sunlight can some time highlight them, but otherwise PM2.5 is invisible. These potentially lethal floaters are eventually inhaled by occupants. They’re small enough to flow through the lungs and into the bloodstream where they can eventually join triglycerides, cholesterol and other accumulations of particles that eventually result in heart disease, or worse yet, a fatal heart attack.**

**This relatively new information is revealed in the University of Nottingham (U.K.) study** [**“Harm from Indoor Air Contaminants.”**](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4409736) **The study examined the detrimental harm of 45 common indoor airborne contaminants, such as formaldehyde, nitrous oxide and PM2.5. PM-2.5 was found as the most damaging contaminant based on the Disability-Adjusted Life-Year (DALY), which is a criteria used to establish indoor air quality (IAQ) standards that New Jersey bases building codes on, such as** [**ASHRAE Standard 62.2**](https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2) **“Ventilation and Acceptable Indoor Air Quality in Residential Buildings.”**

**PM2.5 is part of everyday life, but now recent annual upsurges in wildfire smoke, both from Canada and more recently in New Jersey, pose an even greater threat of inhaled particulates. Wildfire combustion consists of small particles, gases, and water vapor. Smoke is mainly water vapor. The remaining components include carbon monoxide, carbon dioxide (CO2), nitrogen dioxide (NO2), irritant volatile organic compounds (VOCs), air toxins, and very small particles. Eventually the gases dissipate. Consequently, the remnants are predominately respiratory system-damaging particles in the PM2.5 range.**

 **Filters That Collect Particulates**

**Ideally, an HVAC system filter, should entrap both PM2.5 and smaller particulate contaminants and remove them from the airstream. Unfortunately, many sub-micron particulates flow through the sparse weaves of the most common residential filters, MERV 8 through MERV 13 (**[**Minimum Efficiency Reporting Value**](https://www.lakeair.com/iaq-education/merv-rating-explanation/)**). Instead of entrapping particulates, the HVAC system redistributes them around the home after they pass through the media filter.**

**High Efficiency Particulate Arrester (HEPA) filters, rated at MERV 16 and above, can entrap sub-micron particulates. However, their dense media weave filters also restrict airflow. More fan power is required to offset this resistance, which results in significantly more HVAC energy consumption. HEPA filters also entrap pathogenic contaminants, unfortunately they can remain alive within the media and still replicate.**

 **Filters That Disinfect *and* Collect Particulates**

**Recently, technological advancements have combined disinfection of biological contaminants with particle collection. One technology recently featured in the** [**December issue of the *ASHRAE Journal***](https://www.nxtbook.com/nxtbooks/ashrae/ashraejournal_XDEFVG/index.php#/p/38) **is** [**non-thermal plasma-based filtration**](https://reviveaire.com/how-plasmic-fields-work/)**. This technology is the size of a one-inch-thick media filter that’s available in various widths and lengths to fit most HVAC filter rack sizes. It creates a high voltage plasmic electric field in the HVAC airflow that kills or alters biological contaminants’ ability to replicate.**

**Besides electrical disinfection, non-thermal plasma-based filters electrostatically charge airstream contaminants with negative and positive charges. The polarity electrically attaches the ions to each other and contaminants. Therefore, contaminants that were too small for media filter entrapment are now enlarged by the agglomeration of negatively and positively-charged ion attraction. Consequently, the enlargement prevents their free-flow through MERV 8 and MERV 13 media filters. When combined with a non-thermal plasma filter, MERV 8 and MERV 13 filters now perform like MERV 13 and MERV 16 filters because more particles are entrapped due to their agglomerated size.**

**The cost savings are multifaceted. MERV 8 filters are 66% less expensive to replace than MERV 13 filters. Maintenance costs are reduced because evaporator coils will need less or possibly no cleaning of biological slime that commonly adheres to dark, moist HVAC interiors. Clean coils result in better thermal transfer and HVAC energy efficiency.**

**HVAC contractors and builders that market and provide IAQ safeguards that prolong lifespans and prevent disease spread will undoubtedly benefit their customers and be in demand.**

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**About the Author:** [**Nick Agopian**](https://www.linkedin.com/in/nick-agopian-3454864/) **is president at** [**Reviveaire**](https://reviveaire.com/how-plasmic-fields-work/) **LLC, Kenilworth, NJ, which specializes in enhancing indoor air quality (IAQ) in residential spaces and commercial airport, educational and healthcare facilities of all sizes. Agopian is a 40-year veteran of the HVAC industry, holds a building systems engineering degree from Vanier College and an MBA from Duke University. He is a member of multiple ASHRAE committees. He can be reached at nick@reviveaire.com.**