Decontamination of Air

Decontamination of air, especially in environments where air quality is critical for health, involves various strategies and technologies designed to remove, dilute or neutralise airborne contaminants, including particulates, gases, VOCs, bacteria, and viruses. One of the significant concerns in air quality management is the presence of particulates smaller than 8 microns. These tiny particles can bypass the body's natural defences, such as the nose, throat, and upper respiratory tract, which typically filter out larger particles. Once these small particulates are inhaled, they can penetrate deep into the lungs and potentially enter the bloodstream, causing various health issues ranging from respiratory problems to systemic effects.

The World Health Organization (WHO) has highlighted that inhalation exposure can significantly increase the dose of contaminants a person receives compared to other exposure routes, such as dermal contact or ingestion, this is emphasised where toxigenic or harmful contaminates fragment, such as in the case of hyphal fragments. This increased dose, potentially up to 40-fold higher, underscores the importance of effectively controlling airborne contaminants to protect human health.

HEPA Negative Air Machines

High-Efficiency Particulate Air (HEPA) filters are a standard solution for filtering particulates from the air. HEPA filters can capture 99.97% of particles that are 0.3 microns in diameter or larger. Negative air machines equipped with HEPA filters have been used for years but studies by HSE have shown failures in operation due to limitations of particle stratification. There use in creating negative pressure within critical barriers can assist in environmental controls , capturing airborne particles, and preventing their spread.

Shortfalls of HEPA Negative Air Machines

While HEPA filters are highly effective at capturing a broad range of particulate sizes, they have limitations:

- **Stratification**: In environments with poor air circulation, particulate matter can stratify, or layer, based on particle size. This stratification can lead to uneven cleaning of the air, with some areas having higher concentrations of contaminants than others. HEPA-based systems rely on air being pulled through the filter, which may not adequately address areas with stagnant air.

Advantages of Agglomeration Technologies

Products like those offered by AirScrub.co.uk utilize agglomeration technology to enhance the removal of airborne particles. This technology works by clustering smaller particles into larger aggregates, which then fall out of the air due to increased weight. This process effectively removes particles from the breathing zone and surfaces without relying solely on filtration.

Benefits of Agglomeration

- **Increased Efficiency for Smaller Particles**: By transforming smaller particles into larger aggregates, agglomeration technology can overcome the limitations of traditional filtration methods in capturing ultrafine particles.
- **Rapid Decontamination**: Agglomeration accelerates the removal of airborne contaminants, resulting in quicker decontamination of the air. This speed is particularly beneficial in settings where rapid air quality improvement is necessary.
- **Economic Advantages**: Agglomeration technology can be more cost-effective over time, reducing the need for frequent filter changes and maintenance associated with traditional HEPA filtration systems. The physical removal of particles also decreases the potential for recirculation of contaminants.

Conclusion

While HEPA negative air machines play a crucial role in managing air quality, their effectiveness can be complemented and, in some cases, surpassed by innovative technologies like agglomeration as used by Building Forensics. These technologies address some of the inherent limitations of traditional filtration, offering a more comprehensive solution to air decontamination. By physically removing particulates from the air, agglomeration technology ensures a rapid and economically viable method to improve indoor air quality, catering to the heightened need for clean air in sensitive environments and for individuals with particular health vulnerabilities.