

Filter material used in the Airlaw IVC

Our filter material is P50, which is nominally 50 micron inter fibre spacing but the thickness of the filter provides no direct air path of this size.

This media has been shown to be effective in arresting pathogens that are most usually attached to particles of dust or micro droplets of water that are in turn much smaller than 50u. (See data below regarding HEPA filters)

The interesting thing to note is the effect of the thickness of the media in that by simply using two filter papers in the inlet the filtration, efficiency increases by a significant factor. Note that we have designed with a very low velocity across the filter consistent with 3 below.

Data regarding HEPA filters

HEPA filters can remove at least 99.97% of airborne particles 0.3 micrometres (μm) in diameter. Particles of this size are the most difficult to filter and are thus considered the most penetrating particle size (MPPS). Particles that are larger or smaller are filtered with even higher efficiency. HEPA filters are composed of a mat of randomly arranged fibres. **Key metrics affecting function are fibre density and diameter, and filter thickness.** The air space between HEPA filter fibres is much greater than 0.3 μm . **The common assumption that a HEPA filter acts like a sieve where particles smaller than the largest opening can pass through is incorrect.** Just as for membrane filters, particles so large that they are as wide as the largest opening or distance between fibres can not pass in between them at all. But HEPA filters are designed to target much smaller pollutants and particles are mainly trapped (they stick to a fibre) by one of the following three mechanisms:

1. **Interception, where particles following a line of flow in the airstream come within one radius of a fibre and adhere to it.**
2. **Impaction, where larger particles are unable to avoid fibres by following the curving contours of the airstream and are forced to embed in one of them directly; this increases with diminishing fibre separation and higher air flow velocity.**
3. **Diffusion, an enhancing mechanism is a result of the collision with gas molecules by the smallest particles, especially those below 0.1 μm in diameter, which are thereby impeded and delayed in their path through the filter; this behaviour is similar to Brownian motion and raises the probability that a particle will be stopped by either of the two mechanisms above; it becomes dominant at lower air flow velocities.**

Diffusion predominates below the 0.1 μm diameter particle size. Impaction and interception predominate above 0.4 μm . In between, near the 0.3 μm MPPS, diffusion and interception predominate.

The initial filter airflow resistance and final filter airflow resistance are typically measured as pressure drop across the filters.

It can be shown that the standard P50 filter material is capable of arresting more than 99% of particle material > 10 micron