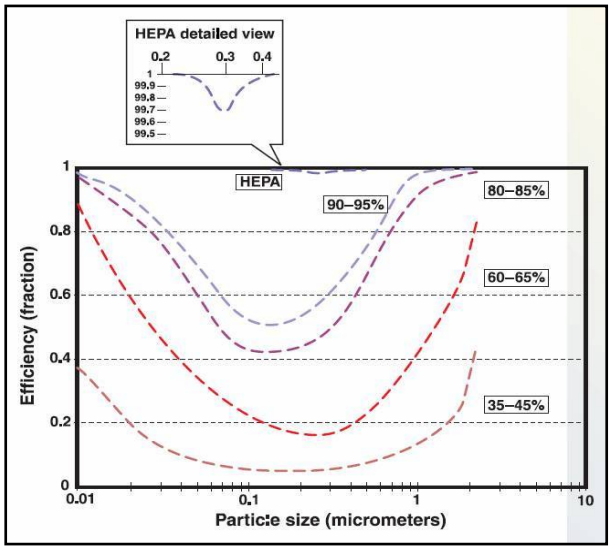
Donaldson.
FILTRATION SOLUTIONS

HIGH EFFICIENCY PARTICULATE AIR

HEPA Filtration Facts

What is a HEPA Filter?

HEPA is an acronym which stands for High Efficiency Particulate Air. HEPA filters provide a high level of filtration efficiency for the smallest as well as the largest particulate contaminants. As defined by the Institute of Environmental Sciences and Technology, IEST-RP-CC001.3 and MIL-STD-282 Method 102.9.1, a HEPA filter must capture a minimum of 99.97% of contaminants at 0.3 microns in size.



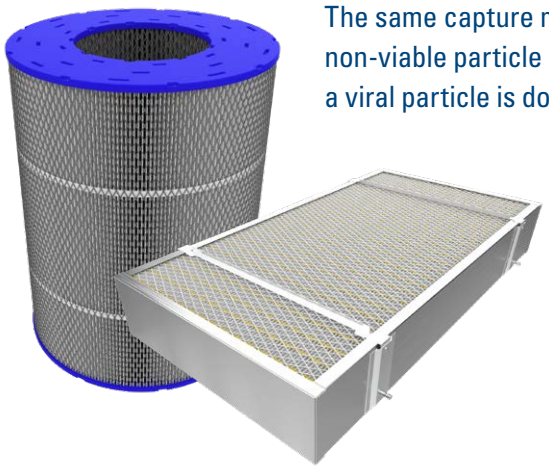
Detail of HEPA Filter Efficiency vs. Particle Size
Chart above illustrates how a HEPA filter, as defined by MIL- STD-282 Method 102.9.1, performs compared to lower efficiency filters.

Virus-Related Independent Test Results with HEPA Filtration

An independent research study conducted by Nelson Laboratories reported that Donaldson standard HEPA filter media achieved a viral removal efficiency of greater than 99.99909% when challenged with bacteriophage ϕX174 virus organism.

What does "Microbially Tested" mean?

Microbially tested simply means that a filter was tested against a particular bacterial, fungal, or viral particle challenge. Many industry and university studies have shown that a HEPA filter provides the same removal efficiency against a viable or a non-viable particulate challenge of the same size. The physical laws at work governing the removal efficiency of a filter media do not discern between a viable and a non-viable particle.



The same capture mechanisms apply. Thus, the removal efficiencies for a viable and a non-viable particle are equivalent. The removal efficiency of the HEPA media against a viral particle is dominated by the diffusion filtration mechanism. This mechanism provides a very effective means of removing very small particles, such as viruses. In fact, the smaller the particle, the higher the removal efficiency due to the diffusion filtration mechanism.

Disposal of Filters

All maintenance personnel should be equipped with and wear personal protective equipment and follow safe work practices specified by their employer. During periods of concern about international epidemics, we suggest monitoring the Centers for Disease Control and Prevention website (cdc.gov) and other public health resources to stay abreast of what may be required in this regard. To determine how you should dispose of the filter, please consult with your local waste disposal provider.

Filtration Mechanisms

The 0.3 micron benchmark is used in efficiency ratings, because it approximates the most difficult particle size for a filter to capture. HEPA filters are even more efficient in removing particles that are smaller than 0.3 microns. The fact that a HEPA filter's removal efficiency increases as particle size decreases below 0.3 microns is counter-intuitive. However, the filtration mechanisms described below explain how a HEPA filter does this.

There are four basic ways media captures particles:

Inertial Impaction

Inertia works on large, heavy particles suspended in the flow stream. These particles are heavier than the fluid surrounding them. As the fluid changes direction to enter the fiber space, the particle continues in a straight line and collides with the media fibers where it is trapped and held.

Diffusion

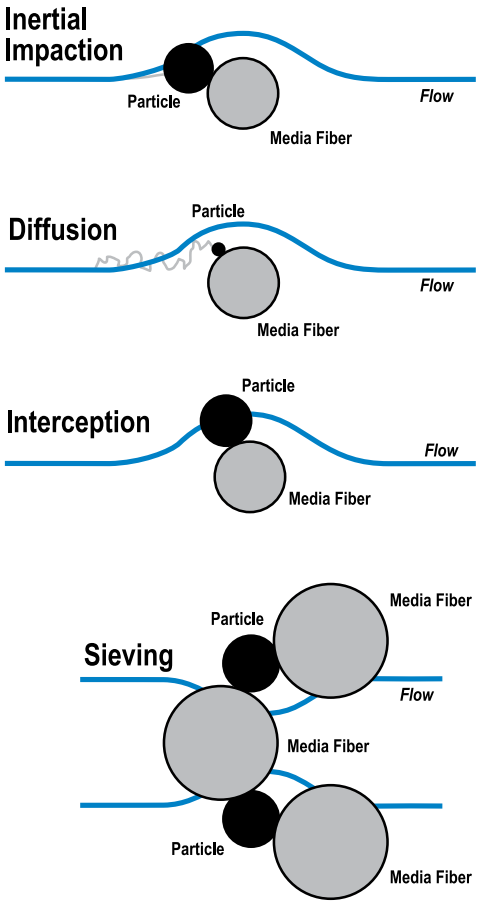
Diffusion works on the smallest particles. Small particles are not held in place by the viscous fluid and diffuse within the flow stream. As the particles traverse the flow stream, they collide with the fiber and are collected.

Interception

Direct interception works on particles in the mid-range size that are not quite large enough to have inertia and not small enough to diffuse within the flow stream. These mid-sized particles follow the flow stream as it bends through the fiber spaces. Particles are intercepted or captured when they touch a fiber.

Sieving

Sieving, the most common mechanism in filtration, occurs when the particle is too large to fit between the fiber spaces.



References:

Virus Filtration Efficiency Test (VFE) to determine the efficiency of various Donaldson materials and filtration devices using a challenge of organism of the bacteriophage ΦX174. Challenge level >1 x 108 PFU (plaque forming units) / test sample, Mean Particle Size (MPS): 3.3 µm. Nelson Laboratories, Inc. (2005), pp1-2

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Donaldson Company, Inc.

www.donaldson.com

1400 W 94th St
Minneapolis, MN 55431

North America +1-877-314-9640
aerospace.americas@donaldson.com

Europe +33 1 30866698
aerospace.emea@donaldson.com

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