



AIR DISINFECTION

WITH FILTRATION & ULTRAVIOLET LIGHT

By Annette Uda and
Wladyslaw J. Kowalski, P.E., Ph.D

What are the advantages of cleaning the air with filters and ultraviolet germicidal irradiation (UVGI) in a typical pet boarding facility or animal house? The major benefits are pet health and the suppression of infectious disease outbreaks while the secondary benefits include reduced likelihood of human infections and general facility cleanliness.

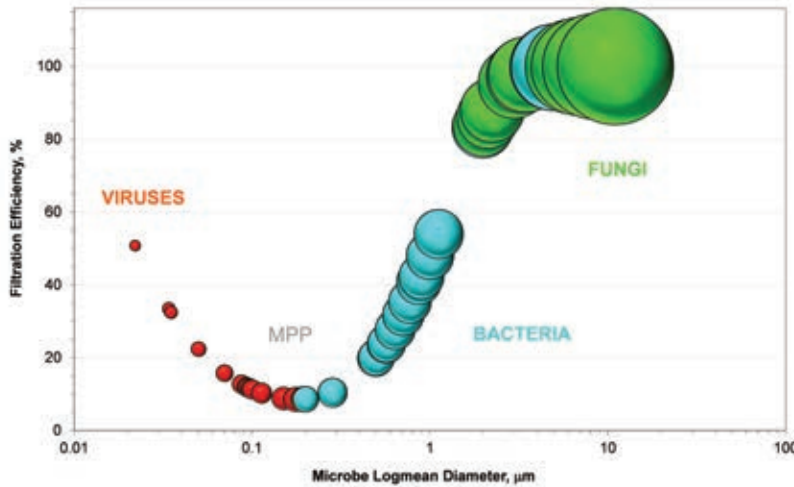
Certainly, these benefits can reduce the cost of operation and prevent catastrophic losses if infectious disease outbreaks are prevented. For any given facility, the actual payback or savings of installing an air disinfection system will depend on many factors but even a single outbreak of a contagious disease like Canine Cough (aka Kennel cough), Influenza or Parvovirus can wreak havoc on operating costs and the benefits should be weighed in this regard.

Air filtration is an effective approach for cleaning the air, provided the right filter and the appropriate airflow are used. The filter need not be a HEPA filter, which can be expensive to operate, since a HEPA filter may provide no significant advantage over normal high efficiency filters such as MERV rated filters. Typical filters used for air cleaning range from MERV 6 to MERV 16 where the higher MERV ratings mean higher removal rates.

Figure 1 shows a typical performance curve for a MERV 10 filter overlain with an array of canine pathogens including viruses, bacteria and fungal spores shown in relative size. Fungal spores, which are large, are removed at relatively high rates, often approaching 100%, while the bacteria and viruses are removed at rates determined by their physical size.

The net effect of air filtration is to lower the airborne concentrations of pathogens, which limits the inhalation

Figure 1



Performance curve of a MERV 10 filter against canine pathogens. The Most Penetrating Particle (MPP) size range is indicated between about 0.1 - 0.4 microns.

of pathogens as well as the settling of pathogens on floors and surfaces.

Typical ventilation systems will also introduce about 15-25% outside air (fresh air for breathing) and the purging effect of outside air can also diminish the indoor airborne concentrations of microbes. However, the outside air is not sterile and contains a wide variety of ambient environmental microbes that can induce disease.

There are no viruses in the outdoor air but there are many environmental bacteria like Staphylococcus, Streptococcus and Pseudomonas and many fungi like Aspergillus and Fusarium. Air filters will generally remove these microbes provided the outside air passes through the filter. Environmental microbes which enter the indoor environment by other routes, like doors and human traffic, will tend to be removed by the recirculation of the air through the filters of ventilation system.

Air filters should be changed out at least once a month or as specified by your individual needs. The operating efficiency is reduced when they are fouled and they will consume more energy if they are not maintained. Air filters that

are not changed out on time will suffer reduced ability to remove particulates, but when they become loaded with dust

and debris, they will increase the energy consumption of the fans or blowers and this is a good reason alone to change the

Dog Kennel Floors

Solving Your Concrete Kennel Floor Problems

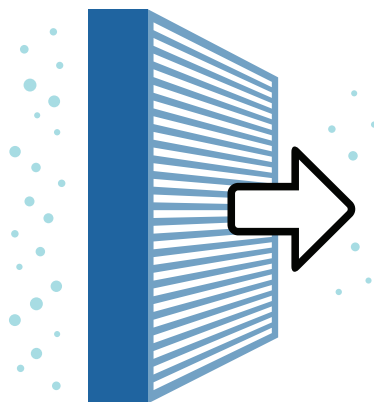


EXPERT HELP FOR *EVERYTHING* TO DO WITH KENNEL FLOORS

Planning • Problem Solving • Installation • Products
Get Help to Do It Yourself

www.DogKennelFloors.com
Your One-Stop Resource for Kennel Floors
Grant@DogKennelFloors.com • (417) 733-4950 – Ask for Grant

CS002



It just so happens that the microbes that can penetrate MERV filters (i.e. in the MPP range) are very often microbes that are highly susceptible to UV rays and this leads to the combination of UV and MERV filters being the most effective and economical means of disinfecting air.

filters regularly. One additional factor that deserves attention is the fit of the filters; the filters must fit tightly in place, especially if they are high efficiency filters, because a small amount of leakage past the filter can result in greatly diminished filtration efficiency.

The removal of microbes from an airstream can be greatly enhanced by the addition of ultraviolet (UV) lights in or near the air handling unit in any building. Referring back to **Figure 1**, one can see

that the smallest microbes, viruses, and bacteria can penetrate a filter at high rates (for a single pass). It just so happens that the microbes that can penetrate MERV filters (i.e. in the MPP range) are very often microbes that are highly susceptible to UV rays and this leads to the combination of UV and MERV filters being the most effective and economical means of disinfecting air.

Fungal spores are the most UV-resistant microbes but they tend to be

easily removed by even low efficiency MERV filters. UVGI systems attached to air filtration systems will tend to balance out the removal rates such that high microbial removal rates can be achieved across-the-board by the appropriate pairing of UV lamps and MERV filters. In effect, UVGI perfectly complements air filtration and has the effect of removing the MPP (most penetrating particle) size range from the filter performance curve. The combined performance curve (see

“I Love Love LOVE my panel system you all made/installed for my pet resort. That’s one of the BEST investments I have made in this little venture.”
Joan K, Texas

Whether you clip, bathe or board Direct Animal has a full line of equipment built to fit your every need. Check out our entire product line up at WWW.DIRECTANIMAL.COM
Grooming | Boarding | Animal Sheltering

DIRECT
ANIMAL PRODUCTS
A Division of Tractor Brands, Inc.

Figure 1) is largely 'flattened' with the result being high single-pass removal rates for virtually all pathogens of consequence, provided the filters and UV lamps are appropriately selected.

UV rays can destroy organic matter over time and will tend to clean cooling coils, and may even restore the coils to their original design operating conditions. The payback period (or return on investment) due to the cooling coil cleaning effect alone is typically on the order of 1-2 years or less and can often be used to economically justify the installation of air cleaning systems in animal facilities.

There is not a "one size fits all" solution when choosing a UV air and surface disinfection system. Furthermore, the array of zoonotic pathogens is considerably different from pathogens that infect and they must be addressed individually to ensure high levels of removal by any given air treatment system. As always, it is best to consult an experienced firm who specialize within the animal care industry to get the equipment properly sized and located to fit your facility's needs. ■



BRING THE BEST OUT OF YOUR PEOPLE

"EVERYTHING is much more efficient! Employees have clear direction to follow, know what is expected of them at any given time, and are anxious to meet, if not exceed, established goals. We no longer have an environment where there is friction between staff and management. Everyone is moving forward in a collective manner. Even our customers have noticed the positive changes! We actually have employees thank us routinely for allowing them to work at our facility!"
Al Bowman: Owner
Cinder Hills Kennels



Find and Retain Loyal Staff Reward Accomplishment Motivate Gen X, Y and Millennials Enjoy a Self Managing Facility Create an Achievement Culture Staff Accountability & Education

See it in action TODAY!

Use our online calculator to see much you can save with performance based pay.

www.TryMasterPlan.com