

HEPA Filter vs. Ultraviolet Light

Feature Note

Comparative Analysis



MCO-230AIC / MCO-230AICL



MCO-170AIC / MCO-170AICL



*1 Standard for Model No. Including UV

*2 Standard for Model No. Including UHV

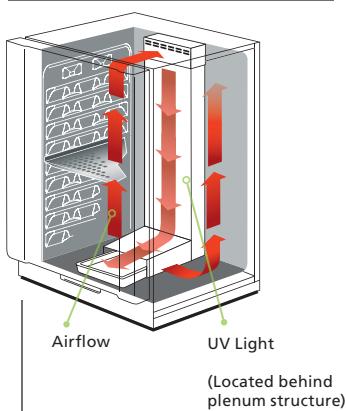
HEPA Filters

Commonly used in many CO₂ incubators, HEPA filters serve to filter the internal airflow. Particles of 0.3 microns or larger are trapped by the filter and prevented from re-entering into the interior chamber. The filter can then be carefully removed, discarded, and replaced with a new one.

HEPA Filter



SafeCell



SafeCell UV

Alternatively, ultraviolet light can be built into CO₂ incubators to decontaminate airflow. Typically, a UV light is located behind a plenum in the back of the incubator. The plenum will shield UV light from the cell cultures. Behind the plenum, the UV lamp decontaminates the moving air within the incubator, ridding any foreign contaminants it may contain in the air or on the humidity pan water surface.

Contamination is a common problem for researchers when cultivating cells in a CO₂ incubator. During door openings, microbial contaminants may enter the incubator's chamber and negatively affect samples. An easy way to minimize contamination is by having a filter or decontamination method for the internal airflow. If foreign contaminants are introduced into the incubator, the filter or decontamination system will remove them from the air without interrupting cell cultures. Two common technologies, used for this purpose, are HEPA filters and ultraviolet light.



Calculating Total Cost of Ownership

Cost of Maintaining a HEPA Filter vs. UV Light

Another way to look at these two technologies and to figure out what works best for your incubator is to look at the total cost of ownership over several years.



UV Bulb

UV Light Usage Calculation:

- Hours used from Decontamination Cycle per Year: 288 hours
- Hours used from Daily Usage per Year: 365 hours
- Total Hours: 653 hours
- Number of Years before UV Bulb Replacement: $5000/653 = 7.7$ years, ~every 7 years

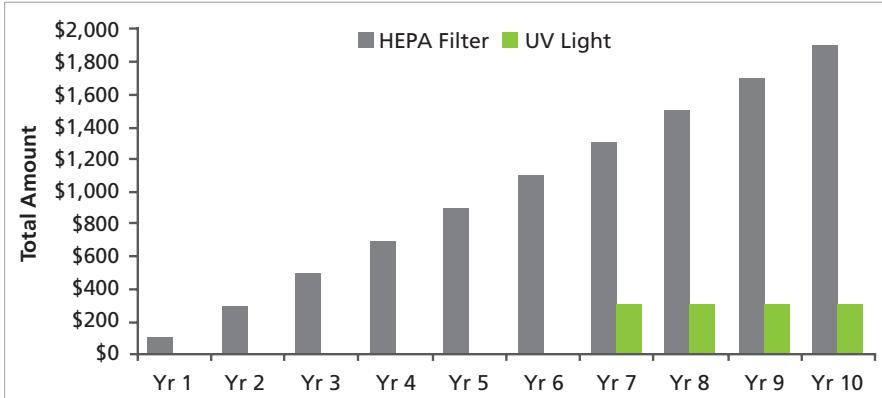


Table reflects cost of ownership per year (as an example). Year 1 takes into account the fact that most incubators come with a HEPA filter or UV light pre-installed.

	HEPA Filter	UV Light
Cost Per Part	~\$100 for a replacement filter	~\$300* for a replacement UV bulb
Part Lifecycle	Replaced every 6 months at least	Replaced after 5000 hours or 7 years of usage
Laboratory Usage	Assume 12 door openings per day	Assume 12 door openings per day and 5 minutes of UV light exposure after every door closing; also assume 12 hour overnight decontamination every 2 weeks

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
HEPA Filters	\$100	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$1700
UV Light	N/A	\$300*								

*The price of UV bulb is the average price level sold in United States. Please contact local distributor or sales company for the price in detail.

Conclusion

In the long run, having to replace and maintain a HEPA filter every year becomes much more expensive than replacing a UV bulb that can last for at least 7 years assuming normal incubator usage. If you have more than one incubator that uses a HEPA filter this cost becomes even greater.

In conclusion, ultraviolet technology is a very favorable alternative to conventional HEPA filters. Not only are they more cost effective, they also provide actual decontamination of the airflow, killing any contaminants that enter the chamber. In certain incubator models¹⁾, the UV light is also able to hit the water pan helping decontaminate the water at the same time. HEPA filters still have live contaminants trapped on their surface, which may accidentally leak back into the incubator chamber. In frequently used incubators, HEPA filters may also need to be changed out much more often than twice per year. HEPA filters and UV light both offer contamination control, but be sure to understand the trade-offs of each and how they can best serve your incubator's needs.

1. Select incubators have an isolated UV lamp that decontaminates circulated air and the humidity water reservoir without harming the cultured cells.

	Advantages	Disadvantages
HEPA Filters	<p>Establishes ISO-5, Class 100 cleanroom air quality within 5 minutes after door opening. Filters entire chamber air volume every 60 seconds.</p> <p>HEPA filters generally have a rating of 99.99% effective.</p>	<p>HEPA filters are consumable products. They cannot be cleaned, thus must be replaced routinely to prevent contamination issues.</p> <p>Typically cannot filter out contaminants smaller than 0.3 microns, including viral and bacterial contaminants like Mycoplasma.</p> <p>Not guaranteed to be leak proof so contaminated air can still pass through back into the chamber.</p> <p>Replacements have to occur frequently to maintain a clean incubator environment; replacement filters are costly and easily damaged.</p> <p>Collects contaminants but does not destroy them.</p> <p>Filter life-span heavily dependent on amount of usage and general cleanliness of surrounding areas and incubator. No means of determining filter loading and effectiveness.</p>
Ultraviolet Light	<p>Provides continuous decontamination of the interior airflow and water in the humidity pan.</p> <p>5000 hour UV bulb can last up to 7 years and rarely requires a replacement. This is dependent on incubator door openings per day.</p> <p>Affects contaminants of all sizes, including Mycoplasma and viruses.</p>	<p>Decontamination effectiveness is reduced as the UV bulb ages. However, the UV timer auto-adjusts to extend UV up-time to maintain efficacy.</p>