



# UV LED Water Disinfection

UV LEDs are the next wave in the LED revolution. Operating in the germicidal wavelength range, they have the power to eradicate bacteria, viruses, cysts and mold from water easily, safely and effectively.

UV disinfection is a tried and trusted technique for producing potable water efficiently and without the use of chemicals, and has been approved by the US Department of Health and the Environmental Protection Agency (EPA).

Traditionally, germicidal UV light is produced with high voltage plasma arc-discharge lamps. These lamps are effective in disinfection, but are not user-friendly, and require significant setup and maintenance.

Miniature, robust and highly stable, UV LEDs can easily be incorporated into simple water filters providing a highly effective solution for potable water needs that is easy to install and use with minimal supervision, maintenance and space.



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**OBJECTIVE:** Demonstrate a compact, low power UV LED based water disinfection reactor that disinfects tap water to NSF-55 standards with >99.9999% reduction of bacteria and >99.99% reduction of viruses.

**EQUIPMENT:** A cylindrical reactor measuring 3-inches in diameter and 6-inches tall was fabricated from stainless steel.

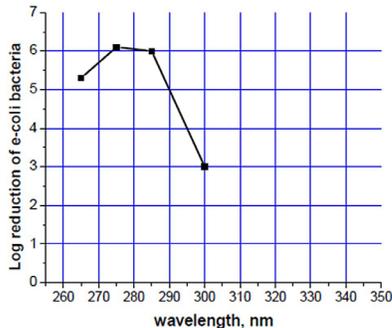
Four high power UVCLEAN® lamps were integrated into the bottom of the reactor, with external cooling by way of an aluminum heat-sink and fan.

Each UVCLEAN lamp could be driven separately up to a maximum of 50mW each.

**OPERATION:** Tap water, dosed with E.coli and MS2 (independantly) was pumped through the reactor at flow rates of 0.5 liters per minute to 2 liters per minute. Disinfection efficacy was tested with varying wavelengths and UV powers using standard NSF testing procedures.



## WAVELENGTH:



Conventional systems using mercury lamps operate at 254nm: it is well known that this is not the peak absorption wavelength of bacteria and viruses, but is a convenient line of mercury that close enough to have a significant germicidal effect.

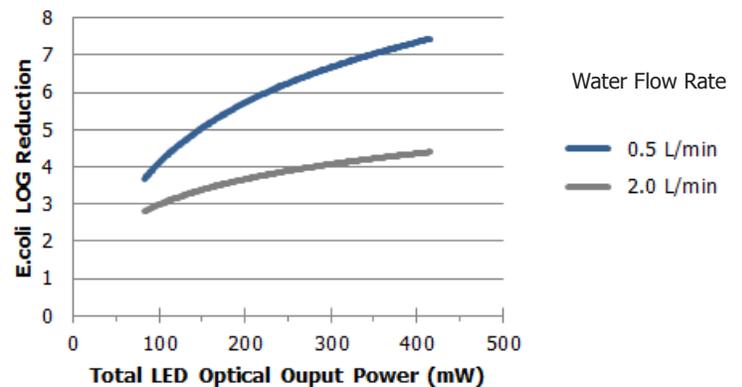
It was expected that 260nm to 265nm would be the most effective wavelength range for disinfection, as this is the peak wavelength band in the action spectrum.

However, due to the absorption of water, a wavelength range of 275nm to 280nm proved to be the most effective wavelength for microbial disinfection in tap water and Deionized water.

## DISINFECTION PERFORMANCE:

Microorganism	LOG Reduction	
	0.5 L/min flow rate	1.0 L/min flow rate
<b>Bacteria</b>		
R.terrigena	>7.00	6.27
E.coli	>7.00	4.76
P.aeruginosa	>6.85	>6.85
<b>Viruses</b>		
MS2 phage	3.05	1.73
fr phage	2.25	2.00

150mW total optical power



## ADVANTAGES

- Optimized wavelength
- Instant on/off without any warm-up/wait time
- Small, compact
- Robust, long life
- Stable output with cold water

## BENEFITS

- Most efficient disinfection
- Extremely user friendly
- Easy integration into convenient systems
- Minimal maintenance
- Safe and trusted disinfection