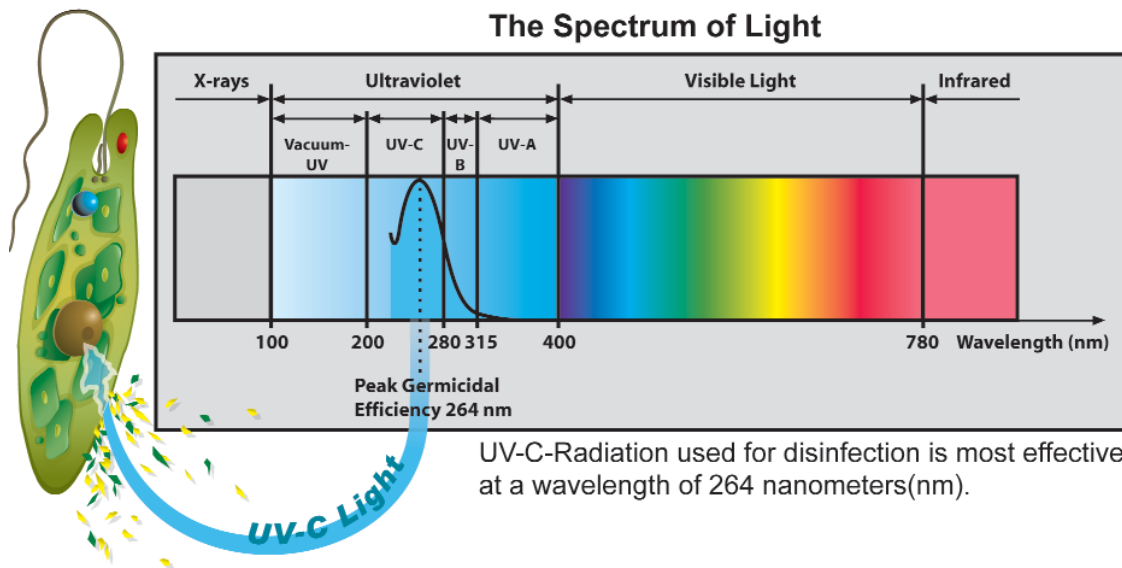


# what you **NEED** to know about... **Ultraviolet Sterilization**

UV sterilization is a proven solution to waterborne planktonic algae and other harmful pathogen problems commonly associated with aquatic recirculating systems such as, but not limited to mammal/reptile bathing pools, fish/invertebrate exhibits, and fish culture systems. Our objective here is to educate, focusing attention on critical UV performance factors that greatly affect the performance of all UV equipment in an aquatic application, no matter whose name is on the box.

## How UV-C Light Works

Ultraviolet light is a specific spectrum of light just below the range visible to the human eye (below the blue spectrum of visible light). UV light is divided into four distinct spectral areas – Vacuum UV (100 – 200 nanometers), UV-C (200 – 280 nanometers), UV-B (280 – 315 nanometers) and UV-A (315 – 400 nanometers). The germicidal action spectrum is identified on the light spectrum chart below with 264 nanometers being most efficient as a living microorganism disinfectant.



## The Safe and Natural Solution to Harmful Waterborne Pathogens

Ultraviolet light or more specifically UV-C light within the “Germicidal Action Spectrum” (250 to 280 nanometers) is the most lethal light wavelength for microorganism disinfection. UV light is as natural as sunlight. Unlike chemical treatments and ozone, UV-C light does not leave a residual in the water...in other words; it's not harmful to the inhabitants—plants and fish alike.

## Using UV-C Light to its Maximum Potential

When considering the purchase of a UV, be aware that the equipment's performance is totally dependant upon it's usage and operating capacity. A UV's operating capacity (UV Fluent Rate) is established by the UV lamp's performance characteristics and the design of the UV exposure chamber. The UV's effectiveness essentially boils down to the dwell time; how long the targeted microorganism is exposed to the UV-C light.



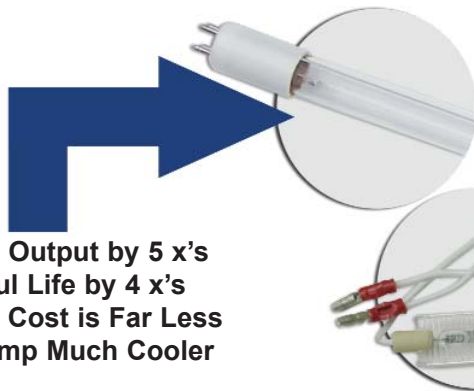
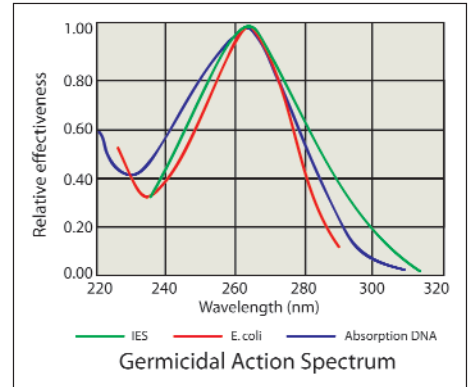
# Important UV Equipment Performance & Operating Factors

## The UV Lamp

**The UV Lamp “Input Watts to UV-C Output Watts” Conversion** refers to the amount of UV-C light converted from the initial Input Watts. There are two primary types of UV lamps, Low-pressure and Medium/High-pressure lamps. Low-pressure lamps greatly outperform Medium/High-pressure lamps in UV-C output by nearly five times (Low-pressure 38%. Medium/High-pressure 8%).

**UV Arc Length** is the portion of the lamp that produces the UV-C light. This performance factor is instrumental in establishing UV fluency and, as a rule, the longer the lamp’s arc length the greater the UV exposure area.

**UV Lamp Useful Life** is the period of time in which a lamp, when run continuously, is still effective. This hourly number is established by the UV lamp manufacturer through testing with UV light sensing equipment. Typically, high quality Low-pressure lamps manufactured of either Hard Quartz Glass or coated soft-glass offer a useful operating life of between 8,000 to 9,000 hours (of continual operation). In contrast, Medium-pressure lamps only offer approximately 2,000 hours of continual useful operation.



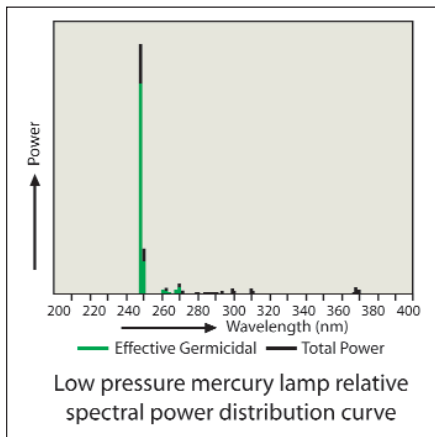
- Greater UV-C Output by 5 x’s
- Greater Useful Life by 4 x’s
- Replacement Cost is Far Less
- Operating Temp Much Cooler

### Low-Pressure UV Lamps

- 38% Input Watt to UV-C Output Watt Performance
- Typically offers an End of Useful Lamp Life of 9,000 hours continual operation until reaching 60-80% efficient
- Operates at 40°C or 104°F

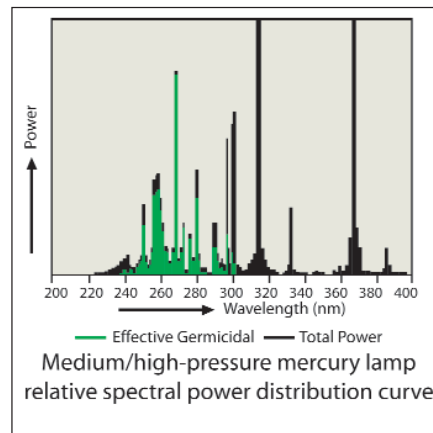
### Medium-Pressure UV Lamps

- 8% Input Watt to UV-C Output Watt Performance
- Typically offers an End of Useful Lamp Life of 2,000 hours continual operation until reaching 60% efficient
- Operates at 600°C or 1,112°F



**Exceptional UV-C Output**

Low pressure mercury lamp relative spectral power distribution curve



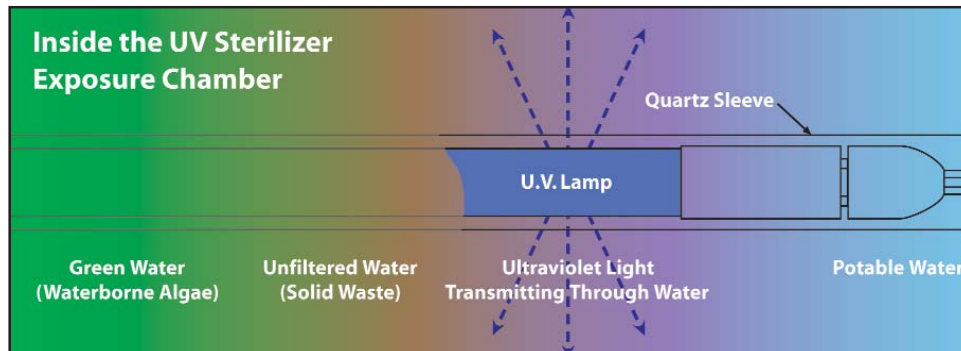
**Low UV-C Output**

**UV Lamp Glass** is an essential factor in regards to lamp performance and useful life. Low-pressure lamps are manufactured using two types of glass: less expensive soft glass and the higher quality Hard Quartz Glass. The difference between the two is their resistance to solarization, a term signifying the plating of mercury onto the internal surface of the lamp’s glass envelope. During lamp operation solarization progresses, thus lowering the UV-C output efficiency over time. Some UV manufacturers apply a protective coating to their lamps which fights against solarization. Emperor Aquatics, Inc. is one of them. All EA Standard Output T-5 and High Output T-6 UV lamps feature coated Hard Quartz Glass... the most efficient UV lamps available. EA lamps’ Hard Quartz glass is actually “L” glass. This type of glass prevents ozone emission. Ozone production causes a problem with uv transmittance through the eventual buildup of an opaque chalky substance uv lamp and sleeve.

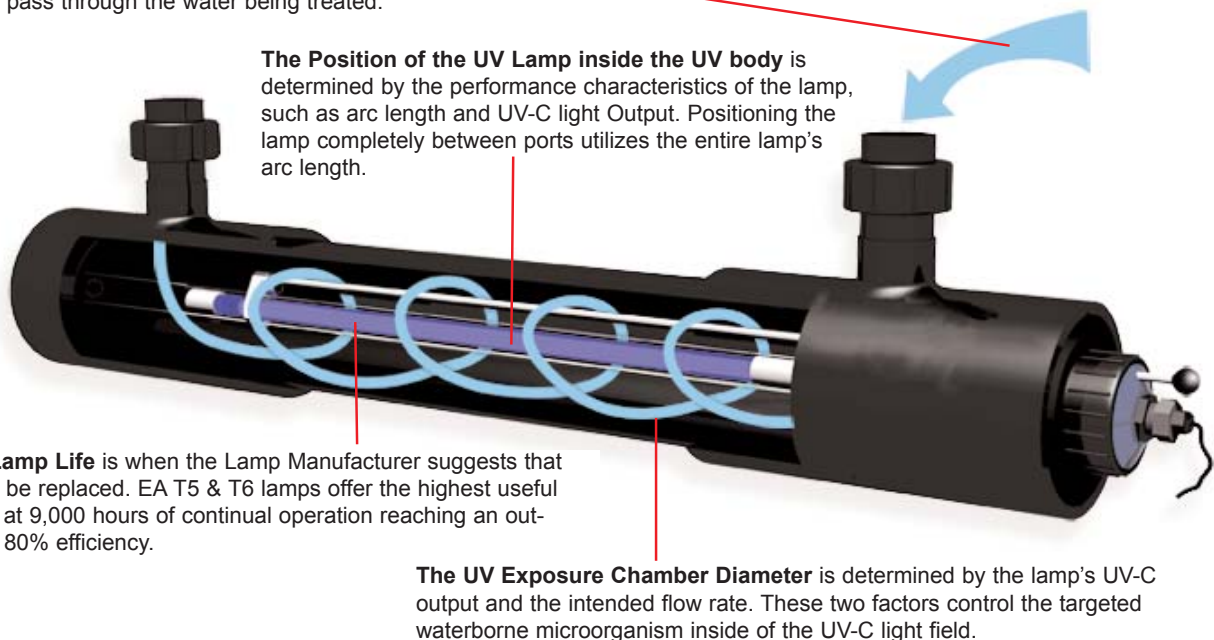
**UV Lamp Input Power** is very specific to the individual lamp’s operating requirements. Over powering a lamp will operate the lamp harder and while the UV-C output watts may initially be greater, the overall expected useful lamp life will significantly decrease. Under powering a lamp below its required operating input power will result in less UV-C output.

## UV Transmissibility

UV transmissibility represents the ability of the UV-C light to penetrate through the water being treated. Impurities that include both solid and dissolved wastes will absorb valuable UV-C light; therefore, identifying the UV transmissibility of the water is critical when sizing all UV equipment. UV transmissibility is measured in percent. For example, an application with water experiencing an algae bloom could have a UV transmissibility of 80%. This must be considered when calculating the flow rate. With a small water sample of the intended application, EA can provide a UV transmissibility test for our customers.



**Percent UV Transmissibility** is the rate at which the UV-C light produced by the lamp can pass through the water being treated.



## Optimal UV Design

Optimal UV sterilizer design focuses on using the lamp's UV-C output to its maximum potential. It is vital that the design considers lamp performance characteristics and how the lamps are positioned inside the UV exposure chamber. The above diagram provides critical information regarding the most important UV performance factors.

## UV Operation

**EA Suggested Flow Rates** represent a UV transmissibility of 90% and consider the lamp's performance at the end of its useful lamp life. These two factors combined with truthful equipment capacity explain why our flow rates are so much more conservative than many of our competitors' recommended flow rates. All EA UV equipment contains the highest quality, most efficient UV lamps available and are designed to utilize them to their maximum potential.

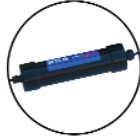
**UV Equipment Care** is too often overlooked due to misinformation from the UV manufacturer. Lamps should be replaced according to their "end of useful lamp life" rating, while quartz sleeves must be clean to allow maximum UV transmissibility. Quartz sleeve rubber gaskets / o-rings perform a vital seal (protecting the lamp from water damage) and should be replaced annually.

# The EA Advantage:

Product Quality  
Engineering Support  
Extensive UV Equipment Product Line



**SMART UV Sterilizers** offer several models to choose from, watertight and UL listed.



Sealed power supply.

**Premium High-Output Multi-lamp UV Sterilizers** offer several multi-lamp models with features that include NEMA x4 Remote Power Supply Enclosure with Lamp LED's, Re-settable Hour Meter, On/Off Switch and Operating Light.



Remote Power Supply Enclosure

**Ultra Pure High-Output Stainless Steel Multi-lamp UV Sterilizers** offer heavy gauge 316 stainless steel construction and are available in several models (all models use multiples of 80 Watt High-Output lamps).



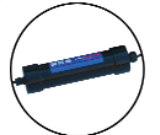
Remote Power Supply Enclosure

**Vertical High-Output Multi-lamp UV Sterilizers** offer single-end glass loading with features that include NEMA x4 Remote Power Supply Enclosure with Lamp LED's, Re-settable Hour Meter, On/Off Switch and Operating Light.



Remote Power Supply Enclosure

**SMART High-Output Multi-lamp UV Sterilizers**, four models to choose from, economical, designed for commercial applications, watertight and UL listed.



Sealed power supply.

**Open-Channel High-Output UV Modules** are available in both Open-Frame and Baffle styles. Constructed of corrosive resistant materials, easy to service and are manufactured to your application's specifications.



Remote Power Supply Enclosure



EA Engineer performing a final inspection on a 9,300 Watt Open-Channel UV prior to shipping to Montana Fish, Wildlife & Parks, Fort Peck Hatchery

Emperor Aquatics, Inc. affiliates.