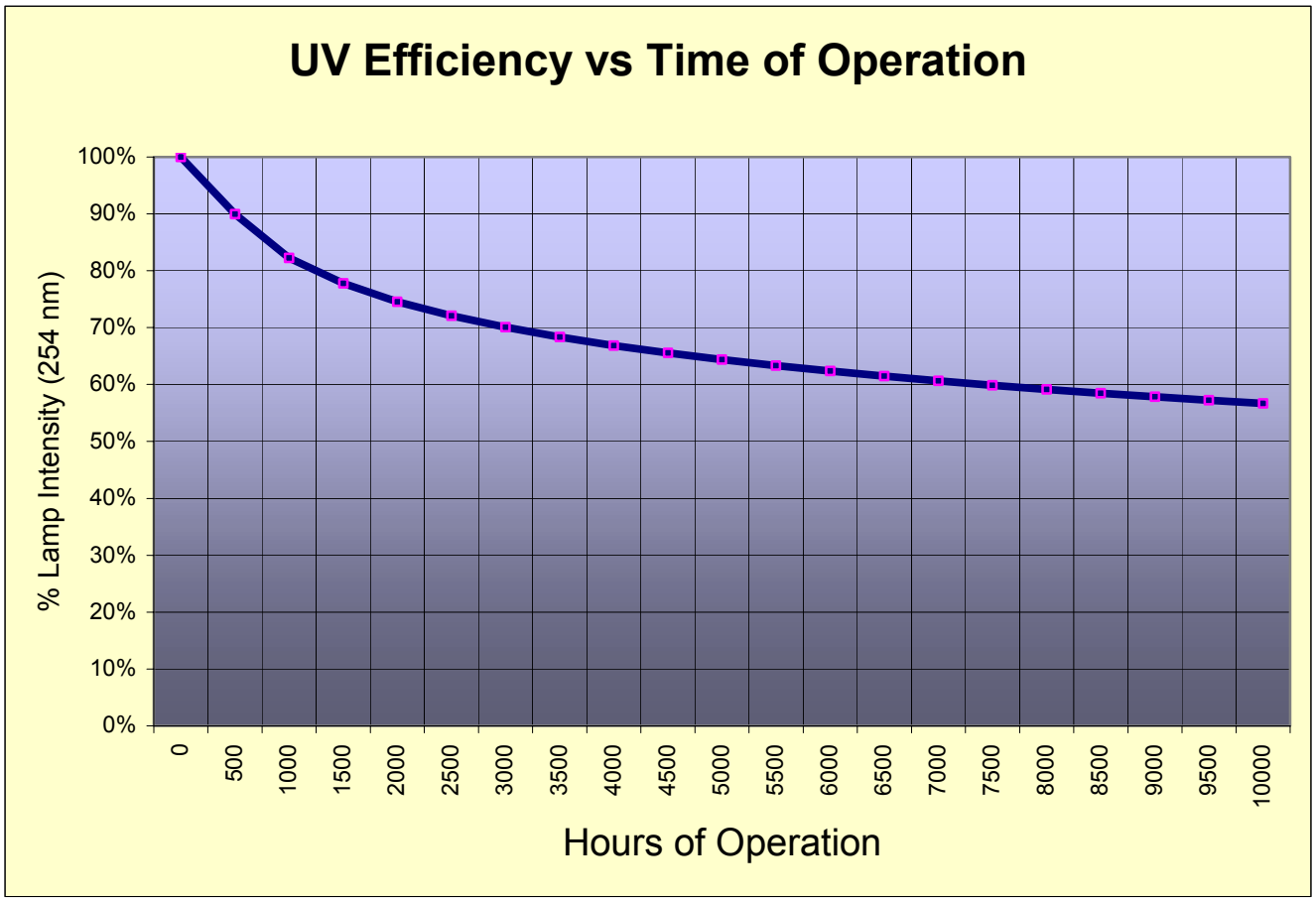
Cal Water
Industrial Water Purification
(800) CAL-WATER

Ultraviolet (UV) Lamps

Lamp Life – Effectiveness

The effectiveness of UV sterilizer lamps in producing light of the germicidal wavelength of 254 nm drops off significantly over time of operation:



UV Efficiency Lost to Solarization

UV efficiency is lost because of the cumulative effect of **solarization** of the quartz UV lamps themselves. Solarization is the photochemical ageing process that naturally occurs in the presence of high ultraviolet radiation over time. While the above curve shows radiation being produced past 9500 hours, mercury vapor lamps become unreliable after about 8,000 hours of operation. UV lamps must be replaced on a routine basis to prevent a sterilizer from becoming just an expensive piece of pipe.

Because lamp output degrades over its' life it is important to size a system to supply 100% performance at the End-Of-Lamp life (EOLL). Throughout the life of the lamp you will actually achieve a higher UV dose.

The flow rates listed in most manufacturers **Sizing and Selection** guides are based on an ultraviolet radiation dosage of 30,000 μws/cm2/sec. after 9000 hours of lamp operation. Organisms commonly found in city water are killed at this dosage. In certain specialized applications, different species are encountered that require more or less radiation to kill.

Microorganism Table

D-10 (90% kil)l by standard dosage of 30,000 mws/cm2*
UV Radiation at 254 nm

Microorganism	mws/cm2	Microorganism	mws/cm2
B. Megatherium sp. (veg.)	2,500	Neisseris catarrhalis	8,500
Streptococcus viridans	3,800	Phytomonas tumefaciens	8,500
Eberthelia typosa	4,100	Bacillus anthracis	8,700
Salmonella typhosa (Typhoid fever)	4,100	Streptococcus lactis	8,800
Dysentery bacilli	4,200	Baker's Yeast	8,800
Bacillus megatherium	5,200	Mycobacterium tuberculosis	10,000
Streptoccus hemolyticus	5,500	Pseudomonas aeruginosa	10,500
Leptospria Spp. (Infectious Jaundice)	6,000	Bacillus subtilis	11,000
Poliovirus (Poliomyelitis)	6,000	Oospora lactis (white)	11,000
Bacillus paratyphosus	6,100	Micrococcus candidus	12,300
Salmonella paratyphi (Enteric fever)	6,100	Saccharomyces elliposideus	13,200
Corynebacterium diphtheria	6,500	S. typhimurium	15,200
Vibrio comma (Cholera)	6,500	Microcroccus sphaeroides	15,400
Escherichlia coli	6,600	Saccharomyces sp.	17,600
Proteus vulgaris	6,600	Bacillus subtilis spores	22,000
Pseudomonas fluorescens	6,600	Clostridium tetani	22,000
Bacteriophase (E. coli)	6,600	Penicillium expensum	22,000
Influenza	6,600	Chlorella vulgaris (algae)	22,000
S. enteritidis	7,600	Sarcina lutea	26,400
Virus of Infectious Hepatitis	8,000	Penicillium roqueforti (green)	26,400

Additional Sterilization Required
(Sub-micron filtration - oxidizer - additional UV)

Microorganism	mws/cm2	Microorganism	mws/cm2
Mucor racemosus A (white gray)	35,200	Aspergillus flavus	99,000
Mucor racemosus B (white gray)	35,200	Paramecium	200,000
Aspergillus glaucus (bluish green)	88,000	Rhisopus nigricans	220,000
Penicillium digitatum (olive)	88,000	Aspergillus niger	330,000
Nematode eggs	92,000	Tobacco mosaic	440,000