Electrical Energy per Order (EE/O) of a UV or AOP Reactor

Electrical energy per order of magnitude of contaminant destruction for a UV photolysis or advanced oxidation reactor from lamp power, flow and removal.

Input parameters

Unit system: SI

Parameter	Value	Unit
Lamp electrical power	60.000	kW
Flow	50.000	L/s
Influent concentration (any unit)	3.0000	
Effluent concentration (same unit)	0.30000	

Calculated results

Parameter	Value	Unit
Orders of magnitude removed	1.0000	
Electrical energy per volume treated	0.33333	kWh/m³
Electrical energy per order	0.33333	kWh/m³
EE/O per 1,000 US gallons, kWh	1.2618	

Notes for this case

- EE/O (Bolton et al.) applies to dilute, first-order destruction where the energy for each order is constant. Typical UV/H_2O_2 values are 0.05–0.5 kWh/m³ per order.

Formula and method

$$EE/O = \frac{P}{Q \log_{10}(C_i/C_f)}$$

Variables

P	Lamp electrical power	W
Q	Flow	m³/s
C_i	Influent concentration (any unit)	-
C_f	Effluent concentration (same unit)	-
$\log(C_i/C_f)$	Orders of magnitude removed	-
E/V	Electrical energy per volume treated	J/m³
EE/O	Electrical energy per order	J/m³
EE/O_{US}	EE/O per 1,000 US gallons, kWh	-

Method and standards

Electrical energy per order figure of merit (Bolton et al., 2001).

Assumptions and limits

- First-order destruction; electrical energy only.

Report details

Report reference	FCC-SAQW-NSAY (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/drinking-water/uv-aop-electrical-energy-per-order

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.