

OPPORTUNITY

How much water do cooling towers routinely blow down?

UP TO 50% COOLING WATER IS FLUSHED TO MINIMIZE SCALE BUILD-UP¹

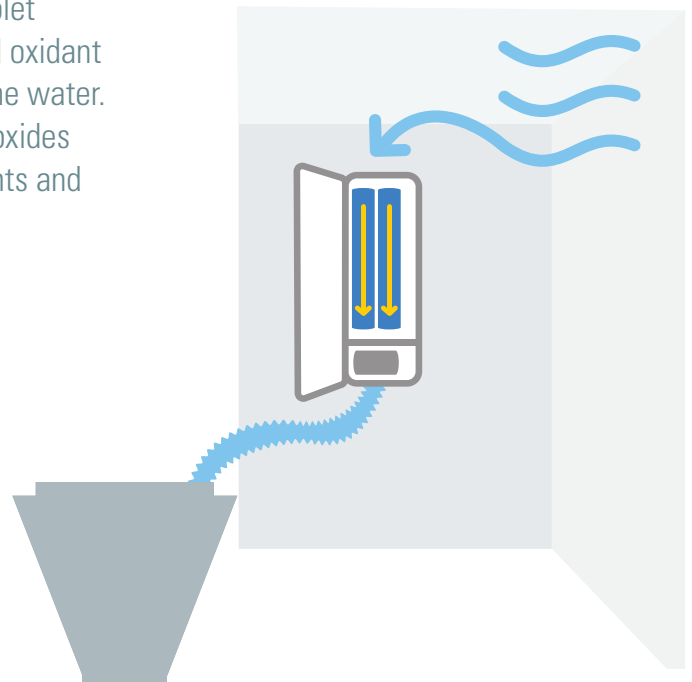
TECHNOLOGY

How does the advanced oxidation process (AOP) for cooling towers work?

PHOTOCHEMICAL TREATMENT

OXIDIZES MINERALS AND CONTAMINANTS

Air drawn into the ultraviolet reactor generates a mixed oxidant gas that is diffused into the water. Hydroxyl radicals and peroxides form to attack contaminants and oxidize minerals.



M&V

Where did Measurement and Verification occur?

NATIONAL RENEWABLE ENERGY LABORATORY (NREL) assessed an advanced oxidation process system provided by Silver Bullet Water Treatment Company in two 250-ton cooling towers at the Denver Federal Center (DFC)

RESULTS

How did the advanced oxidation process perform in M&V?

26%
WATER SAVINGS

Estimated savings from 23% to 30%²

50%
MAINTENANCE REDUCTION

Reduced scaling might also save energy, though this was not assessed³

MET
GSA WATER STANDARDS

No additional chemicals were needed⁴

2
YEAR PAYBACK

@ GSA avg. water/sewer \$16.76/kgal⁵

Advanced Oxidation Process Return-On-Investment

@ GSA average water/sewer cost of \$16.76/kgal

	Baseline (Before)	AOP System (After)
Installed Equipment (two 250-ton cooling towers)*	N/A	\$22,487
Annual Maintenance	\$5,855	\$3,333
Annual Water Consumption (gal/yr)	2,003,273 gal	1,475,482 gal
Annual Energy Costs (5,250 kWh/yr @\$0.11/kWh)	\$0	\$578
Annual Water Costs (@\$16.76 kgal/yr)	\$14,303	\$5,457
Payback (yrs)		2.1
Savings-to-Investment Ratio		7.2

*Normalized installation cost of one unit

DEPLOYMENT

Where does the study recommend deploying the AOP system?

CONSIDER FOR ALL COOLING TOWERS

Anticipate changes needed to O&M contracts to transition from traditional chemical treatment to alternative water treatment systems

¹Demonstration and Evaluation of an Advanced Oxidation Technology for Cooling Tower Water Treatment, Jesse Dean, Dylan Cutler, Gregg Tomberlin, James Elsworth (NREL), December 2018, p.1 ²Ibid, p.17 ³Ibid, p.20,21 ⁴Ibid, p.17 ⁵Ibid, p.20