2024 Case Study Alameda County Water District - Fremont, CA



CARBON DIOXIDE FOR BROMATE CONTROL



Application: Bromate Reduction

- 28 MGD WTP that uses pre-ozonation for disinfection, oxidation, and taste and odor control.
- Treats Sacramento-San Joaquin Delta water which periodically has high levels of bromide.
- Bromide turns to bromate when water is ozonated. Bromate is a carcinogen!
- Lower pH during ozonation leads to lower bromate formation. This is due to lower oxidation potential at a lower pH.

In the town of Fermont, California, the Almeda County Water District performed a case study to demonstrate how carbon dioxide can be utilized for bromate control.



Carbon Dioxide Use:

- CO₂ addition may seem like a drawback due to the need for a higher postfiltration NaOH dose for pH increase post-ozonation compared to a mineral acid.
 - If CO₂ could be removed from the water after ozonation, the downstream NaOH dose, and thus cost, would be reduced.
 - $\circ~$ Air stripping in the ozone contactor's last chamber is used to remove some of the CO_2 from the water.





Result Since 2002:

• With the CO₂ system in place, the plant has been able to produce water with bromate less than 10 ug/L, even during periods of high water bromide.



Overall Result:

- The addition of CO_2 leads to reduced ozone dosage required to achieve the same disinfection CT value.
 - This is due to ozone residual decaying more slowly at lower pH values.



Summary:

 Although the caustic (NaOH) dose had to be increased to compensate for the CO₂ addition, the results show that the reduction in the cost of ozone compensates for the increased cost of the caustic and the additional cost of carbon dioxide.



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Table - Summar	v ot selected	chemical	doses &	COSTS.	pre- and	post- c	carbon	dioxide
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	2001 Dose (mg/L)	2001 Dose (mg/L)	2001 Annual Cost	2002 Annual Cost	Cost Difference
Ozone	2.35	1.48	\$152,015	\$95,7 3 7	-\$56,278
Caustic	19.63	23.01	\$101,585	\$119,076	\$17,491
CO ₂	0	15.06	0	\$32,733	\$32,733
Net Change					-\$6,054

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