

New Wastewater Treatment Plant Protects Ventura River Habitat with Automated Chlor/Dechlor Control

Demand-based chlorination at the new Ojai Valley Sanitary District wastewater treatment facility helps ensure the purity of water discharged to the Ventura River. The system has improved the results of chronic toxicity tests.

by Mark Rios, Plant Supervising Officer, Ojai Valley Sanitary District, Ojai, Calif.



The Ojai Valley Sanitary District 3.0 MGD tertiary treatment facility is located between Ventura and Ojai in the south coast region of California.

With the issuance of a new operating permit for the Ojai Valley Sanitary District Treatment Plant in 1990, the California Regional Water Quality Control Board (CRWQCB) established stringent requirements for effluent discharged into the Ventura River. An engineering study of the steps necessary to comply with the new requirements demonstrated that the existing plant could not be adequately modified.

The decision was made to replace the old plant with a new, more technologically advanced facility, a construction project that was completed eight years later in the summer of 1997. The new 3.0 MGD tertiary treatment facility, built on the existing site, is located between Ventura and Ojai in the south coast region of California. It serves a population of approximately 25,000.

The new facility design included an ultra-violet (UV) channel for chemical-free effluent disinfection, with chlorination and dechlorination systems as the backup for storm flows and during routine maintenance intervals. When the UV system is non-operational, the chlor/dechlor systems are the primary disinfection treatment processes for all the plant's effluent.

Overtreatment Suppresses DO

The Ojai Valley plant is an inland dscharger, which dictates that effluent must meet a total coliform limit of 2.2 MPN/100 m/1 (most probable number), yet contain less than 0.1 mg/l chlorine upon discharge into

the river. The strict effluent limits are designed to protect aquatic organisms in the Ventura River, including the steelhead trout fishery.

The state's new regulations also require that effluent cannot impact the river's dissolved oxygen (DO) level. Overdosing with the dechlorination chemical sodium bisulfite can suppress DO and lower the oxygen level in the river near the discharge site, endangering aquatic life. Therefore, operators should use only the minimal effective dosage of sodium bisulfite.

Using flow pacing and residual chlorine analysis to control chlorination and dechlorination sometimes resulted in overdosing with sodium bisulfite. There was no way to determine the precise, minimum dosage required to eliminate chlorine, and operators did not want to risk chlorine breakthrough.

To correct the problem, they switched to a demand based treatment system which automatically matches dosage to actual oxidation reduction potential (ORP), or oxidant demand. The automated system continuously maintains accurate chlorination and dechlorination with the minimum safe dosages required to ensure compliance. The DO level is no longer affected.

Accurate Chlor/Dechlor Control

The automated system used by Ojai regulates dosage to match the current demand in the system. The High Resolution Redox (HRR) chlor and dechlor controllers receive signals from specially designed platinum



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sensors placed in the chlorine contact chamber and in the dechlorination tank.

The sensors register minute electrochemical changes generated by electron transfers between the reductant (organic matter or sodium bisulfite) and the oxidant (chlorine). The changes are measured in millivolts.

The chlorination controller is programmed with a predetermined HRR setpoint that corresponds to the desired pathogen kill rate below 2.2 MPN/100 ml total coliform



Each sensor is equipped with an optional self-cleaning kit which periodically rinses the probe in a mild solvent solution.

count, The significantly lower setpoint on the downstream dechlorination controller ensures the complete removal of chlorine and prevents overdosing with sodium bisulfite.

The 4-20 mA signals from the controllers modulate chemical injection rates of the chemical feed

pumps. As organic loading and ORP change, the controller adjusts dosages to meet actual demand, regardless of flow rate.

When compared to conventional chlor/dechlor control with flow pacing and residual analyzers, the demand-based system, manufactured by USFilter/Stranco, offers greater precision with minimal maintenance requirements. Ojai plant personnel continue to monitor the final effluent with chlorine residual analyzers, but this is done only to conform with CRWQCB reporting standards established by the State of California.

A Healthy Aquatic Habitat

The effluent is tested monthly for chronic toxicity at a commercial lab. Varying proportions of effluent are added to a tank containing Ceriodaphnia, or "water fleas," tiny aquatic organisms that are highly sensitive to the quality of the discharge. The survival and reproduction rates of the Ceriodaphnia are tested in a 10 percent effluent environment, then the proportion of the sample is increased until the environment is 100 percent effluent.

Chlor/Dechlor control with the new ORP system resulted in an improvement in the Ceriodaphnia survival and reproduction rates. Now there is no longer a risk of chlorine breakthrough or a problem with the sodium bisulfite lowering DO levels. The system also prevents the development of undesirable chemical by products from using too much bleach or bisulfite.

The automated chlorination system at Ojai includes time-based proportional control, which adjusts dosage to closely match changes in flow rate, preventing chemical overfeed or underfeed during flow transitions. The controllers monitor the effect of the new flow rate on lag time and ORP values, then signal the injec-

tion pump to modulate its pump rate. As ORP readings begin to approach the chlor/dechlor setpoints after a flow rate change, the controllers reduce chemical feed and avoid overshooting the desired setpoints.

Improved Efficiency, Lower Costs

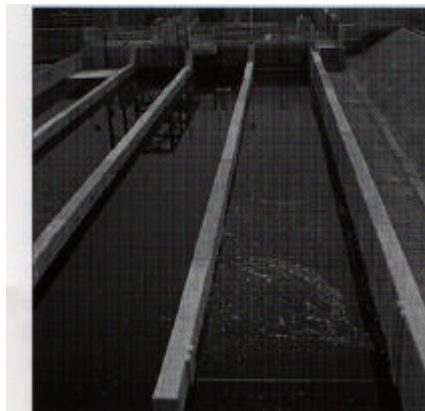
Labor requirements are reduced with the automated system. Installation of the chlor/clechlor system was completed in-house with no problems. Maintenance consists of cleaning each sensor once a week with a small brush, a 10-minute task. The sensors are warranted for two years' service and have held up well in other central California wastewater treatment plants.

Based on sodium bisulfite savings alone, the chlor/clechlor system will pay for itself within a year. Prior to implementing ORP-based control, the plant was using 150 gallons per day at a cost of approximately \$.80/ gal. The average daily usage has dropped to 100 - 110 gallons per day, a reduction of more than \$13,000 annually in chemical costs.

An Environmentally Conscientious Community

The 1997 opening of the new Ojai Valley Sanitary District plant was timely. In addition to serving 25,000 residents, the plant also has among its customers a large county jail and a rapidly expanding Dairy Farmers of America facility that produces Starbucks Coffee products.

The primary concern at Ojai Valley Sanitary District is water quality. Because it is one of the first plants to successfully meet and maintain the stringent new effluent standards mandated by the CRWQCB, it serves



The automated Strantrol chor/dechlor system saves labor by minimizing the need for manual chlorine residual testing while ensuring compliance with effluent limits.

as a model for other plants making the necessary modifications to be in compliance. The water leaving the Ojai Valley Sanitary District treatment plant is as clean as present technology can make it. In addition to the

highly accurate chlor/clechlor system, the plant utilizes a biological nutrient removal (BNR) process to eliminate nutrients that could stimulate nuisance growth of aquatic vegetation in the river. The efficient plant design provides protection for the existing aquatic habitat and long-term support for community growth.