Progressive Solution for Winery Wastewater

By Richard Dennis

Founded in 2001, Niner Wine Estates is dedicated to making the highest-quality wines possible in the Paso Robles appellation. Although the wine label has a nine-year history, only recently has it had a place to call home with its new production facility and tasting room.

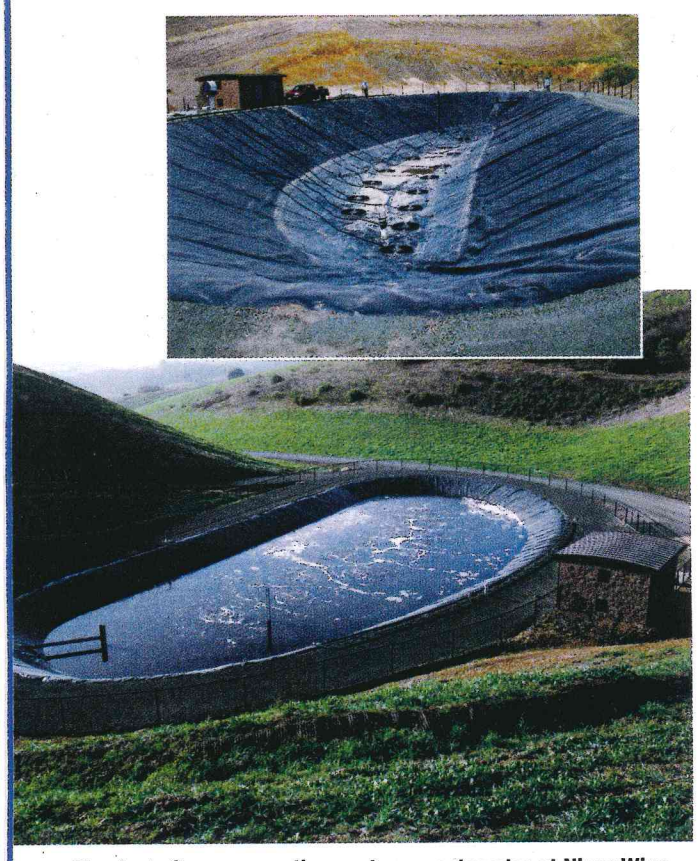
Aeration system provides unique sustainability and environmental benefits

Of course a 50,000-case-per-year production facility, estate vineyard and luxurious tasting room are all going to have their impacts to surrounding natural resources. Perhaps one of the largest concerns during the planning stage was the impact of irrigating 54 acres of grapes from an aquifer that was already parched from several other surrounding vineyards. Realizing that a facility this size was going to have to treat its own process wastewater, neighbors also were concerned about the noise and odor that typically come from a winery wastewater lagoon.

These concerns drove designers to look for progressive solutions that would shift the way that winery wastewater was viewed. In this case, wastewater could no longer be viewed as a liability or something to simply dispose of, but rather something to be used for irrigation and for providing fire protection.

The wastewater treatment system had to meet state-mandated discharge requirements for land disposal at 200 mg/L biochemical oxygen demand (BOD) and 200 mg/L total suspended solids (TSS). In addition, it had to be as quiet as possible, and odorless so as not to interfere with the ambiance of Niner Wine Estates tasting room, or those of its neighbors. With California paying some of the highest energy costs of any state in the nation, operating cost was a concern as well.

With influent values regularly exceeding 5,000 gal per day at 5,000 mg/L BOD and 300 mg/L TSS during crush season, the aeration system had to be sized to meet strong flows while not being so large that energy was wasted during the eight months out of the year when there is very little flow.



Thanks to its new aeration system, wastewater at Niner Wine Estates no longer is viewed as a liability or something to simply dispose of, but rather something to be used for irrigation and for providing fire protection.

Environmental Solution

As exclusive California distributors of Air Diffusion Systems (ADS), EP Aeration recognized that ADS' fine-bubble aeration system was uniquely suited to the environmental concerns at Niner Wine Estates. ADS was chosen because of its five-year guarantee to be odorless and meet discharge requirements while operating at a fraction of the energy required by an industry-standard surface aerator.

The aeration system consists of a grid work of 14 proprietary ADS air diffusers, which lay on the bottom of the primary lagoon. Unlike membrane diffusers, ADS uses 0.5-in. low-density polyethylene tubing, which is surgically cut to produce a guaranteed bubble size of ⅛-in. diameter or less, giving the bubble plumes a laminar flow. The tubing can be configured in a linear fashion or, in this case, be wrapped inside a 4-ft-diameter stainless steel frame to produce the more common "disk" style of diffusion. The diffusers are supplied with air through self-weighted feeder tubing that is attached to 2-in. butt-fused header pipe that runs on shore along the length of the lagoon. Two of the 14 diffusers are separated by a floating baffle on the effluent end of the lagoon to facilitate solids settling.

The air is produced via a series of three Kaeser Omega Model BB 52 C Rotary Tri-Lobe positive displacement blowers. These blowers were chosen for their performance, producing 70 cu ft per minute each at 7 psi and incredibly quiet operation at only 72 dB(A). A staged approach to air supply was applied so that during the eight months of the year when the winery is not producing much waste, the system operates on 3.8 brake horsepower (bHp). During peak processing season, a second blower can be turned on to provide oxygen for the added flows and loads for a total of 7.6 bHp. A third blower is kept as a standby in case one of the others breaks down or needs to be serviced. It also acts as a supplemental air supply to provide oxygen for any spike loading. Blower use is rotated manually to maintain equal wear and tear.

Unlike surface aerators that "beat" oxygen into the surface of the water, the air diffusers utilized by EP Aeration are bottom-laid, fine-bubble systems that achieve oxygenation via mass transfer of oxygen between the bubble and the water. At 3% SOTE per foot of depth, they have among the industry's highest independently tested oxygen transfer rates.

As important as the oxygen transfer rate is where the oxygen is being delivered. By ensuring appropriate dissolved oxygen levels at the sludge-water interface, the system facilitates an aerobic community of bacteria that consume organic sediments more quickly than anaerobic bacteria, extending dredge intervals to 20 years plus.

ADS diffusers also produce a tremendous amount of mixing, which eliminates anaerobic "dead spots" that are the source of the odor so commonly associated with winery wastewater lagoons. Due to the laminar flow achieved by the diffusers, sediments are not lifted or mixed. Rather, they are able to settle around bubble plumes, where they will be digested by aerobic bacteria. As the bubbles lift the water to the surface, additional oxygenation occurs by contact with the atmosphere.

Sustainable Results

The result of the August 2009 installation is high-quality water that is odorless and meets state-mandated water quality requirements while operating at 25% of the electrical requirements of industry-standard surface aerators. Once the water is treated to dischargeable levels, it is sent through a constructed wetland for polishing and finally into a pond where it will be held until it is used to supplement approximately 15% of the estate vineyard's water demand. The recycled water and energy savings make the system a model of sustainability. WWD

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