case study

Membrane Filtration System Cuts Water Use and Eliminates Wastewater Discharge

Summary

New wastewater regulations from the Regional Water Quality Control Board (RWQCB) left the Tri Valley Growers' Oberti Olive plant in Madera, California, with three options: install a double plastic liner and a leachate collection system in its 160 acres of evaporation ponds, find another alternative to meeting stricter regulations, or close down. After evaluating several alternatives, Oberti installed a membrane filtration system that reuses 80% of the plant's process water flow. As a result, the plant remained open, became a zero-discharge facility, and implemented process improvements that reduced operating costs—offsetting the costs of operating the filtration system.

Background

Oberti opened their olive-packing plant in 1935, using clay-lined evaporation ponds to hold the brine. In 1969, revised RWQCB regulations forced Oberti's new owners, Tri Valley Growers (TVG), to line its evaporation ponds with a single layer of plastic to eliminate seepage. The project was completed in 1979 at a cost of $11 million.

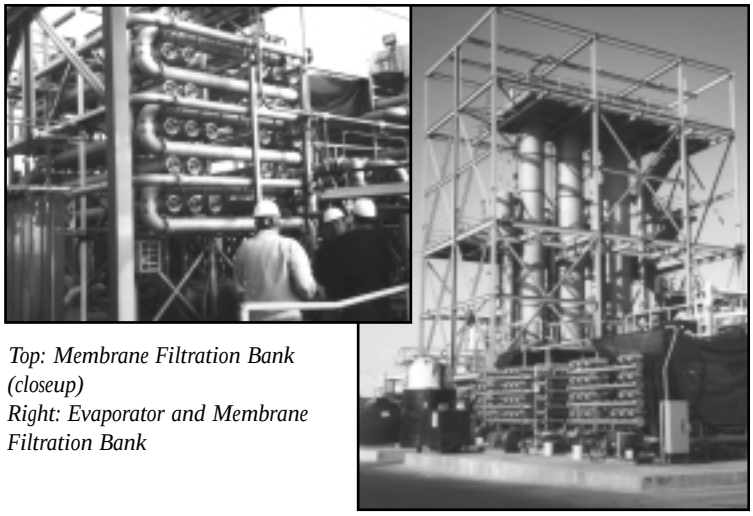
Tri Valley Growers' Oberti Plant

In 1984, RWQCB once again revised its standards, which required the plant to install a double plastic lining and a leachate collection system in its 160 acres of evaporation ponds. Because the project's cost was estimated to be $40 million, TVG sought a less costly solution that would achieve the same environmental goal.

Membrane Filtration

Initial alternatives included fermenters, a bio-trickling filter, and using a bio-digester to convert the wastes to yeast, which would subsequently be sold as animal feed. The bio-digester was pursued, but dropped after the company learned that its discharge options were limited and determining that the system design was too complex and costly.

TVG identified three prerequisites for its new wastewater treatment system: that it be environmentally friendly, have zero-discharge outside the plant, and operate easily. While analyzing plant processes to determine the best method for achieving these goals, TVG staff developed a patented process that shortened curing time from seven days to three, which cut water use by 53%.



Top: Membrane Filtration Bank (closeup)
Right: Evaporator and Membrane Filtration Bank

The company finally settled on a combination of membrane filtration and evaporation. TVG worked with the California Institute of Food and Agricultural Research (CIFAR) at the University of California at Davis, Pacific Gas & Electric, the Electric Power Research Institute, the RWQCB, and others to develop a workable design. After 13 demonstrations with CIFAR's mobile membrane filtration demonstration trailer, researchers recommended specific ultrafiltration (UF) and reverse osmosis (RO) membranes to deliver potable water for process applications.

The design that TVG adopted processes black ripe olives, recycles or converts all water, chemicals, and olive pomace to a useful byproduct, and has no adverse environmental impact.

Performance Characteristics

Plant startup was very difficult and was essentially an ongoing process for two years. Overall operating costs are about 400% higher than expected; however, reducing the curing process from seven days to three days cut chemical costs dramatically (the dollar value is proprietary). Further, well-water pumping is down by 92%. The net result is that TVG can produce competitively-priced products. During implementation of the filtration system, TVG staff identified many strategies to ensure success, most notably to make process changes that reduce wastewater flow before installing a filtration system.

TVG worked with the Madera County Economic Development Commission, to obtain a state bond to fund the $8.4 million project. To defray installation costs, TVG received $700,000 in the form of grants and rebates from the U.S. Department of Energy's NICE^3 program, the California Defense Conversion Council, and Pacific Gas and Electric Company.

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U.S. Department of Energy Office of Industrial Technology: www.oit.doe.gov/nice3