

CASE STUDY

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Sludge Thickening
Valley Center, California



TORAY

Innovation by Chemistry

Cost-effective Sludge Thickening Processor using MEMBRAY™ Membrane Bioreactor at Valley Center, California

OVERVIEW

The Valley Center Municipal Water District (VCMWD) operates two wastewater treatment facilities in Valley Center, which is located in the northern part of San Diego County, California. These two sites are the Lower Moosa Canyon and the Woods Valley Ranch Water Reclamation Facilities (WRF). Both WRF's incorporated an in-house membrane thickener (MBT) design and selected Toray's MEMBRAY™ Membrane Bioreactor (MBR) modules for the process. VCMWD's objectives were to conserve water and meet the Regional Water Quality Control Board's effluent standards (Title 22), so the reclaimed water can be used for irrigation and other reuse applications. The MEMBRAY™ MBR modules helped the local utility achieve these goals.

ADVANTAGES

Using MBT has several economic advantages compared to other conventional methods of sludge thickening (i.e., rotary drums, belt press or filters). Chart 1 below compares the overall capital and operating expenditures between different sludge thickening processes. The MBT process has a number of significant advantages:

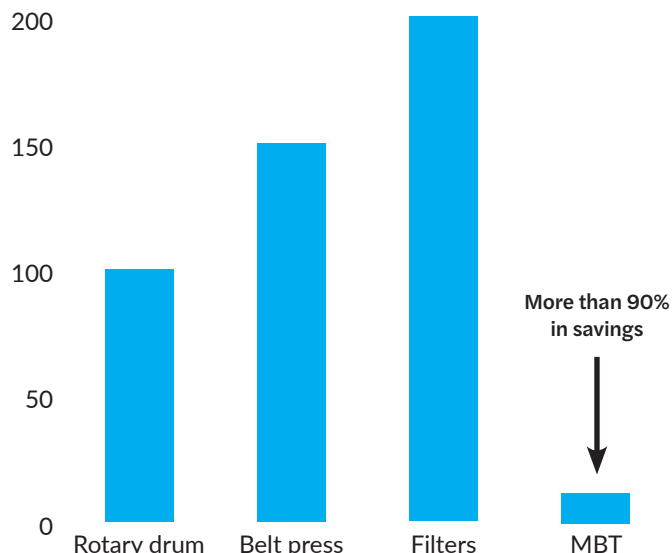
- Reduced footprint with the use of smaller tanks;
- Longer sludge retention time (greater than 100 days) leading to fewer costs associated with labor, energy consumption, chemicals for maintenance (cleaning is by air scouring for MBT and no need for polymers), and dewatering;
- Production of higher permeate quality and less reliance on additional treatment to meet water quality standards.



Toray's MEMBRAY™ TMR140-050S and TMR140-100S MBR modules are operating at Valley Center MWD. Pictured here is TMR140-100S.

Chart 1
Cost Comparison of Sludge Thickening Processes

Unit: K\$



MEMBRAY™ MBR AT VALLEY CENTER

- The MBT tank is filled with Waste Activated Sludge (WAS) and with a pore size of 0.08 microns, MEMBRAY™ is an effective physical barrier while producing high-quality filtrate.
- The solids concentration in the MBT tank increases from 1% (10,000 mg/L) up to 3% (30,000 mg/L).
- Higher solids concentrations allow for longer retention time, which improves solids digestion.
- Improved digestion reduces bio-solids to be hauled, which translates into less labor and transportation costs.
- The Lower Moosa Canyon WRF required a centrifuge with a 40 hp motor to thicken solids. By integrating MEMBRAY™ modules, only a 1.5 hp motor was required and considerably reducing energy costs.



Table 1 — Combined savings at Valley Center

Total projected annual savings with membrane thickening processor using MEMBRAY™

Energy	\$22,000
Chemicals	\$6,000
Hauling	\$8,000
Total savings	\$36,000

RESULTS

Toray's MEMBRAY™ MBR modules helped each of VCMWD's wastewater treatment facilities to improve CAPEX and OPEX in the following areas:

The Lower Moosa Canyon WRF

- Reduced electrical use of up to 32% or 167,820 kWh per year;
- Reduced equipment run-time (centrifuge, chemical pumps, and aerator) by 86%;
- Less dependence on chemical usage;
- Reduced bio-solids hauling.

Woods Valley Ranch WRF

- Reduced sludge hauling by 80%;
- Reduced energy and chemical consumption by 53%;
- Reduced equipment run-time eliminating the need for one aeration blower;
- Increased reclaimed water sales (1 acre-foot per year);
- Annual savings of \$20,000.

Furthermore, as Table 1 shows, the combined annual savings at both facilities for VCMWD is \$36,000.

As a result of the cost-effective operation of the membrane thickening process using MEMBRAY™ MBR modules, the Woods Valley WRF was awarded the 'Outstanding Energy Management Award' in 2012 by the Cal-Nevada Section of the American Water Works Association (AWWA).

ADVANTAGES OF MEMBRAY™ MBR

- Incorporates Toray's PVDF (polyvinylidene fluoride) technology that gives the membrane superior physical strength and chemical resistance;
- The distribution of numerous and uniform pore sizes (0.08 µm) produces high-quality filtrate and less fouling of the membrane;
- The flat-sheet construction does not require a backwash system to operate reliably. It incorporates a simple design that allows for easier maintenance and cost-savings compared to hollow-fiber MBRs.

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