

Energy-Neutral in Victor Valley



Above: VVWRA service box
Below: Site overview of the retrofit system



By Gilbert Perez, Juan Josse, Meganne Harvey, Andrew Benedek & Andrew Dale

California wastewater
reclamation
agency optimizes
digestion capacity

Municipal wastewater treatment is an energy-intensive process, and, in California, represents 0.5% of all electricity demand. The sludge, or solids portion of municipal wastewater, has high energy value, and if processed utilizing anaerobic digestion, produces biogas—which in turn can be converted to electricity. Although municipal sludge has significant biogas potential, the amount of biogas generated from sludge can only produce 35% to 45% of the wastewater plant electricity requirements.

Municipal anaerobic digesters are designed based on a target hydraulic retention time for the sludge, and because sludge fed to digesters is diluted, digesters are inefficiently utilized. Because anaerobic digesters have historically been designed to operate with low solids content, digester mixing, heating and other equipment are designed to operate with low solids. For these reasons, existing digesters cannot receive significant loading from organic waste without significant operational problems. In order to generate enough electricity to cover the entire wastewater treatment plant demand, bringing additional external organic waste is a necessity; however, with current technology, this would require additional digester volume to be constructed at a high cost.

Anaergia developed its Omnivore technology in order to increase the capacity of existing digesters at a relatively modest cost and thereby allow plants to become self-sufficient in energy without

cost-prohibitive capital investments. The installation at the Victor Valley Wastewater Reclamation Agency (VVWRA) in Victorville, Calif., is the first North American demonstration of this technology.

Resource Recovery

The primary motivation for the installation at VVWRA was not solely to solve operational problems or provide low-cost expansion capacity. It was to optimize its digestion capacity in order to achieve full energy neutrality. The Omnivore approach will enable VVWRA to attain its vision of transforming its assets into a resource recovery center rather than a cost center for wastewater treatment. The plant now has an economically effective method to convert its existing digesters into significantly higher energy-generating digesters that can meet or exceed the needs of the plant.

Existing infrastructure at VVWRA, including a 300,000-gal anaerobic digester with floating cover, has been retrofitted and recommissioned to demonstrate the advantages of the system. By reusing existing infrastructure and equipment, VVWRA was able to save millions of dollars that otherwise would be required for new construction. There was an increase in solids content and improved mixing capabilities, and gas-producing solids remain in the digester for longer durations and in greater quantities. This project demonstrates a cost-effective option for wastewater treatment plants with existing anaerobic digestion infrastructure to dramatically increase their digester capacity and biogas production without investing in costly additional tank volume.

The digester is fed a combination of primary

sludge and thickened waste-activated sludge resulting from the wastewater treatment process. A variety of high-strength waste streams are also fed to the digester for co-digestion to further increase biogas generation. Wastes used for co-digestion include fats, oils and grease (FOG), food processing waste, and organic fraction of municipal solid waste. The use of Anaergia proprietary high solids digestion technology enables the organic loading rate (OLR) of the digester to be tripled compared with conventional anaerobic digesters. The result is a threefold increase in solids handling capabilities and useful gas production within the same footprint.

Anaergia's equipment is used to maintain high solids content in the digester, increasing the solids retention time (SRT) such that the tank can reach higher volatile solids destruction and ultimately produce more biogas. The digester operates with an SRT of more than 25 days and a hydraulic retention time (HRT) of fewer than 10 days. Results show that a vast majority of biomass is retained in the digester, such that the digester has higher biomass inventory available for digestion and the production of useful gas.

Lucrative Energy Neutrality

The retrofit included the installation of two high-torque hydraulic power-driven submersible mixers for high-solids mixing. The mixers are located on opposite sides of the digester and at different heights in order to promote complete mixing. Each mixer can be raised, lowered and positioned to point in the desired direction at will without opening the digester. Integrated service boxes allow the mixer to be accessed for service without shutting down digester operation.

The operational period of the Omnivore thus far has shown that increasing the solids content, loading rate and gas production capacity of a retrofitted digester is cost-effective, practical and has the potential to be profitable. The digester currently is in stable operation. The digester is well mixed, the mixers show no signs of ragging and they operate reliably with low energy consumption. Biomass health parameters have remained stable, and biogas yield is higher than that of the control digesters operated by VVWRA, which function at much lower OLR and longer HRT.

Biogas generated by VVWRA's digesters will produce electricity for the plant using newly installed combined heat and power engines. The two engines have a total combined capacity of 1.6 MW,

which exceeds the plant's current energy demand of approximately 1.2 MW. Future retrofits of two decommissioned digesters at VVWRA, in conjunction with the existing installation and two conventional digesters, will provide enough biogas to maximize the generation potential of the CHP engines. This will generate enough biogas and, ultimately, electricity to allow VVWRA to export power back to the grid. Furthermore, waste heat generated by the CHP engines will be used to offset the plant's heat demand.

VVWRA not only will be able to realize the goal of becoming an energy-neutral facility, but also will be able to utilize its existing assets to generate significant revenue by selling power to the utility and

receiving tipping fees for external waste. **w&wd**

Gilbert Perez is director of operations for the Victor Valley Water Reclamation Agency. Perez can be reached at gilbertperez@vvwra.com or 760.246.8638. Juan Josse is chief engineer, Meganne Harvey is project engineer, Dr. Andrew Benedek is chairman and CEO, and Andrew Dale is project engineering lead for Anaergia. Josse can be reached at juan.josse@anaergia.com. Harvey can be reached at meganne.harvey@anaergia.com. Benedek can be reached at andrew.benedek@anaergia.com. Dale can be reached at andrew.dale@anaergia.com.

For more information, write in 1111 on this issue's reader service form on page 47.



Transcend: Today's Valves Ready for Tomorrow's Water Systems. Introducing the 350 psi Mueller A-2361 Ductile Iron Resilient Wedge Gate Valve



Water distribution gate valves have evolved over the years as increasing water demand is requiring higher water main pressures. To meet the higher system pressure demands and as we replace our aging water infrastructure, Mueller Co. introduces the new "norm" for valve pressure ratings — the 350 psi **Mueller® A-2361 Ductile Iron Resilient Wedge Gate Valve**.

- 350 psi AWWA/UL/FM working pressure
- New dual purpose lifting lugs provide stability for valve box. Accommodates strap or hooks; provides valve box alignment, eliminating need for valve box adaptor
- Unique 'pressure assist' wedge geometry needs equal or less torque to seal at 350 psi than current valves require at 250 psi
- Improved T-head bolt retention feature eliminates need for anti-rotation bolts

Plus, the internal components of the 350psi RW Gate Valve are interchangeable with existing installed Mueller 2300 RWGVs so no additional inventory is required. Do all that you can today to make sure your system will meet future water demand by checking out the newest valve in the Mueller 2300 series.

Superior performance... past, present, and into the future.

For more information about Mueller or to learn more about the 350psi ductile iron gate valve call 1.800.423.1323 or visit www.muellercompany.com.

Mueller Co. Smart Move™

Copyright © 2014 Mueller Co., LLC. All Rights Reserved.
The trademarks, logos and service marks displayed in this document herein are the property of Mueller Co., LLC, its affiliates or other third parties.