

Environmental

PROTECTION

Case study: FOG Solution Provides Biogas to Power Ken's Foods Plant

By Jim McMahon Jun 22, 2009

Expansion, a solution for problematic high-strength organic content wastewater, and a power source bonus—that's what Ken's Foods' plant in Marlborough, Mass., got when it upgraded its wastewater treatment facility with an ADI-AnMBR (anaerobic membrane bioreactor).



Ken Foods BVF prior to installing the AnMBR

The anaerobic treatment technology uses submerged membranes for biomass retention and solids-liquid separation. The system maximizes biogas production and increases solids digestion while handling the large-volume food manufacturer's wastewater, which has a high content of fats, oil, and grease (FOG). The company converted its existing low-rate anaerobic reactor to operate as the reactor portion of the new AnMBR. The combined system produces 200,000 to 300,000 cubic feet of biogas per day. This captured byproduct provides 100 percent of the wastewater treatment plant's heating requirements as well as enough residual biogas to power more than 50 percent of the company's manufacturing facility.

[ADI Systems](#) (ADI) in cooperation with [Kubota Corporation of Japan](#) developed the [AnMBR technology](#).

The Original Problem

Ken's Foods' wastewater originates from wash-down of cleaning mixers, filling machines, and other process equipment used to produce its salad dressings and marinades. The wastewater is screened and pumped into an equalization tank and then moves to the low-rate anaerobic reactor. Before the upgrade, effluent was polished using an anaerobic sequencing batch reactor (SBR). The plant was designed to treat a maximum flow of 550,000 gallons per week and 100,000 gallons per day. Due to production increases, excessive solids overloaded the SBR.

Dale Mills, chief operator for the Marlborough plant, explained, "We were manually monitoring the SBR decant to the city and stopping it when the water quality was not good enough." The city limits the concentration of suspended solids effluent to 600 mg/l.

"The SBR aerobic system was never the bottleneck," said Dwain Wilson, director of Process Operations for ADI Systems, which was hired to manage the problem. "The solution was to increase the capacity of the anaerobic reactor, and we suggested an anaerobic MBR application."

AnMBR is a high-rate anaerobic contact process providing a near-absolute barrier to solids. The biogas continually cleans the membranes during operation via a gas scour system.

"The anaerobic MBR increases the solids retention time within the system, reducing the amount of biomass that will require disposal," Wilson said. "It also allows the development of specialized bacteria that can acclimate to unusual organics."

The system has four anaerobic basins, each equipped with seven submerged membrane units. Removable geomembrane covers provide a gas-tight seal over each basin, allowing for the capture of biogas in the headspace above the cartridges and its return to the gas scour system for reuse.

The wastewater treatment system upgrade began construction in April 2008 and was fully commissioned by July.

The total suspended solids (TSS) concentration exiting the AnMBR averages less than 1 milligram per liter; biochemical oxygen demand (BOD) averages less than 25 mg per liter; and chemical oxygen demand (COD) removal is greater than 99.4 percent. The ADI-AnMBR system at Ken's, which has been in operation for more than nine months, is the first installation of this technology in North America and the largest in the world.

The upgrade has eliminated solids loading to the SBR, and clean effluent from the AnMBR flows into the SBR, which has been re-purposed as a sulfide oxidation and nitrification tank.

The new plant also removes and renders 36,000 gallons of FOG per year and reduces 500 tons of dewatered residual solids. The quality of water in the SBR is clean enough for automated release, allowing the maximum 100,000 gallons per day to be decanted, eliminating the manufacturing interruption previously caused by the treatment system.

The Added Benefit

"We capture the biogas produced in the anaerobic digester to heat the processing building and the reactor with it," said Mills. "We

have no fuel costs for heating the treatment building or the reactor, which is kept at 95 degrees F. We also have a considerable amount of extra biogas that we flare, between 200,000 and 300,000 cubic feet per day."



ADI provided a complete biogas recovery and utilization system encompassing gas collection, treatment, storage, compression, and delivery systems.

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Ken Foods wastewater
AnMBR

"We are evaluating the feasibility of using the flared biogas for co-generation of electricity in our manufacturing facility," said Mike Kolakowski, engineering manager for the plant. "The amount of biogas that is generated from the reactor will reduce our draw from the utility grid by well over 50 percent."

Kolakowski noted that the multi-million dollar investment in the AnMBR has had an immediate impact on plant operational costs. "In terms of wastewater plant operational costs alone, we've realized a direct savings of over 50 percent, a return on investment of more than 5 percent in the first nine months."

"Although this was a new technology in our application, we had confidence in ADI's design and operational expertise and liked the potential for savings," Kolakowski said.

"We've not only realized our capacity goals but are exceeding savings projections through reduction of biomass removal. Alternative solutions would have required the use of incremental chemicals for flocculation and precipitation, and increased the amount of residual for disposal or further processing. We have averted all three and eliminated the need for biomass removal for the foreseeable future."

ADI Systems Inc. is a technology and design-build company that provides a wide range of wastewater treatment systems to industrial companies around the world. It is part of the ADI Group, which has 23 offices throughout Canada, the United States, and the Caribbean.

A bout the Author

Jim McMahon writes on water and wastewater systems.

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