



Food Waste Co-Digestion at Hermitage Municipal Authority (PA)

Business Case Analysis Snapshot

Glossary

CHP	Combined heat and power
HMA	Hermitage Municipal Authority
kW, kWh	Kilowatt, kilowatt hour
mgd	Million gallons per day
scf	Standard cubic feet

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Cover photo is an aerial view of the Hermitage Food Waste to Energy and Wastewater Reclamation Facility, courtesy of HMA. Cover design by Evan Odoms.

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Food Waste to Energy and Wastewater Reclamation Facility

Hermitage Municipal Authority, Hermitage Pennsylvania

Located in western Pennsylvania on the border with Ohio, the Hermitage Municipal Authority (HMA) PA operates a Food Waste to Energy and Wastewater Reclamation Facility (WRF). Its 7.7-mgd rated wastewater treatment program serves 7,700 customers and 16,000 residents in the City of Hermitage and nearby townships and boroughs. In addition, Tom Darby, the City's Wastewater Superintendent and the Director of the Facility, has developed an Organics Recovery Program, which manages the acquisition and preprocessing of food waste liquids and solids – including packaged materials - to supply as feedstock into his digesters. A long-time proponent of resource recovery, Darby runs the organics program as a second line of business, which provides revenues and cost savings to support the core mission of the authority – water quality.

The wastewater utility added food waste co-digestion as part of Phase II of a \$32 million upgrade to the WRF's anaerobic digesters and other treatment processes, completed in 2014. Phase II of the upgrade included: installation of a thermophilic anaerobic digester, chosen to satisfy US Environmental Protection Agency and Pennsylvania Department of Environmental Protection requirements for producing Class A EQ biosolids; upgrades to two mesophilic digesters; installation of a combined heat and power (CHP) engine to generate electricity from the biogas; and construction of a \$1.5 million food waste receiving station.

Hermitage is the first AD facility in its region to accept packaged food waste for recycling. Located close to both I-80 and I-376 halfway between Pittsburgh and Cleveland, it is well situated to provide a food scrap recycling solution for numerous food manufacturing and food retail generators with zero waste goals located within its market area. Sufficient food waste is accepted at the WRF to produce enough additional biogas to achieve energy neutrality.

Food Waste Feedstock Strategy

Originally, Hermitage was prepared to accept only liquid wastes, such as fats, oils and grease (FOG) and food manufacturing process wastes. To market its food waste recycling capacity, Hermitage WRF staff contacted local manufacturers and the Chamber of Commerce. Its first source, which continues to be its anchor client, was a dairy located seven miles away. The dairy had been driving right past the WRF's door to haul two truckloads to Michigan each week, and was able to reduce its hauling costs substantially with this new recycling option.

When the dairy subsequently began offering packaged liquids, such as milk, yogurt and cottage cheese, Hermitage installed a REM depackager, which perforates plastic containers with liquid wastes and creates bales of the plastic waste. As it began accepting wastes from additional feedstock generators, the WRF found that the proffered feedstocks included a lot of solid packaged food, including fruits, vegetables, and institutional food meals. To preprocess the solid packaged food, the WRF purchased a Scott Turbo Separator, which removes packaging and creates a slurry. In 2020, it added a Veolia ECRUSOR™, which uses a screw press that results in less shattered plastic. The WRF also converted an open-air pavilion previously designated for biosolids storage into the Food Waste to Energy Recovery Facility for food waste storage and preprocessing, with a receiving dock, storage space for packaged food wastes, and the Scott Turbo, **ECRUSOR™**, and REM depackaging systems.

Without marketing its food waste recycling services and without long-term contracts, Hermitage currently receives on average 60-100 tons/week though, in some months, factory cleanouts may result in double that volume. About 70% of the waste is running through the solids depackaging equipment. All of the organics currently received are pre-consumer, but the WRF is considering ways of collecting and processing post-consumer organics.

A number of regular local customers (within 50 miles) - primarily from the food manufacturing sector - make weekly, monthly or quarterly deliveries. These customers provide a consistent flow of organics that supports its current needs for producing biomethane. In addition, it has received food waste from customers in New York, New Jersey, Ohio and West Virginia. The deliveries originate sometimes from word-of-mouth referrals from others they have served, but primarily from food brokers with large amounts of quality rejects or expired products to dispose of, which have included metal barrels of off-spec honey, frozen French fries, butter (by the tanker load), and salad dressing.

Tom Darby noted that many of their customers have made commitments to sustainability and are choosing Hermitage because it is the nearest option to recycle their organic waste, which translates to lower hauling costs for them. To highlight the beneficial impact of recycling, Hermitage provides disposal companies and their clients with a certificate of sustainable disposal, which in some cases is needed to comply with FDA disposal requirements. The WRF also can provide an estimate of how much biogas a given product generates through co-digestion.

The plant feeds to the digester on average about 10,000 gallons per day of food waste feedstocks (including FOG, food manufacturing process wastes, and food scrap slurry). The shares of the different food waste feedstocks vary from week to week, but FOG represents 20% or less on average.

Energy Strategy

Acquired in 2013, the first cogeneration system, a 600 kW generator, runs on 70-80% biogas and 20-30% natural gas. The plant operators found that the energy system requires substantial maintenance. The WRF has recently added a new 375 kW CHP generator from NISSEN energy a/s that will operate 100% on biogas. The new engine system is still in the start-up phase, but the plant operators anticipate it will require less major maintenance. Once the new engine is fully operational, the facility will alternate using the two engines. The plant also has two diesel generators that can power plant operations in the event of an outage. The facility is constructing a 100,000 scf biogas storage vessel, which will allow them to maintain a biogas reserve for times of AD maintenance or outages.

Currently the digesters are producing about 150,000 scf per day of biogas, and engines are generating about 12,000 kWh of electricity. With co-digestion of high-strength organic wastes representing about 30% of throughput to the digester, Hermitage is able to produce sufficient additional biogas for the facility to achieve energy neutrality.

Financial Impacts

The \$825,000 cost for purchasing the first CHP engine was funded by a Pennsylvania Growing Greener grant from the PA Department of Environmental Protection. The second engine cost \$650,000. The installation of a thermophilic anaerobic digester and a Biospark biogas fuel conditioning system and the upgrades to two mesophilic digesters cost \$5 million. The receiving station conversion and depackaging equipment cost \$1.2 million. The current contract to replace the fabric domes on the digester and to construct the 100,000 scf biogas storage vessel is for \$1,200,000.

Over the past three years, revenues and savings from co-digestion have remained fairly consistent. Hermitage sets tip fees based on the costs of labor required to break it down and the potential for resale of packaging material. It currently charges \$35 per ton for solid food waste and \$.12 per gallon for bulk liquid waste disposal, which covers FOG as well as other liquid food wastes. Total food waste tip fee revenues have averaged around \$250,000/year.

The facility's average monthly electric bill dropped to \$5,000/month in unavoidable distribution fees from \$25,000 to \$30,000/month. First Energy, the utility's electricity provider, charges the plant \$.0736/kWh. The utility is credited for the electricity it supplies to the grid through a net metering agreement. It has added other City-owned sites to its credit list, so if it produces more than is needed at the facility the electricity can be credited against usage by other city sites.

By producing Class A EQ biosolids (10 tons/day), which the utility provides at no cost to farmers for land application, the plant has saved the \$8,000 to \$10,000/month it had been paying to dispose Class B solids. Packaging materials are recovered; dry, clean cardboard and aluminum recoveries are sold, providing an additional small source of revenue. The WRF has four staff members dedicated to organics recycling plus two who have flexible assignments (out of 18 total staff at the plant), whose salaries are paid from revenues from the co-digestion program.

The project costs not covered by grants were financed through a bond issue and some local financing. The utility is on track to achieve payback for the \$32 million upgrade in 8 to 10 years from the time of completion of the project.

Sources

Darby, Thomas, Superintendent, Water Pollution Control Division, Public Works Department, City of Hermitage. Interviews with the authors, December 18, 2018, October 13, 2020, and March 22, 2021.



Veolia ECRUSOR™ preprocessing equipment in the Food Waste to Energy Recovery Facility. Source: HMA.



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