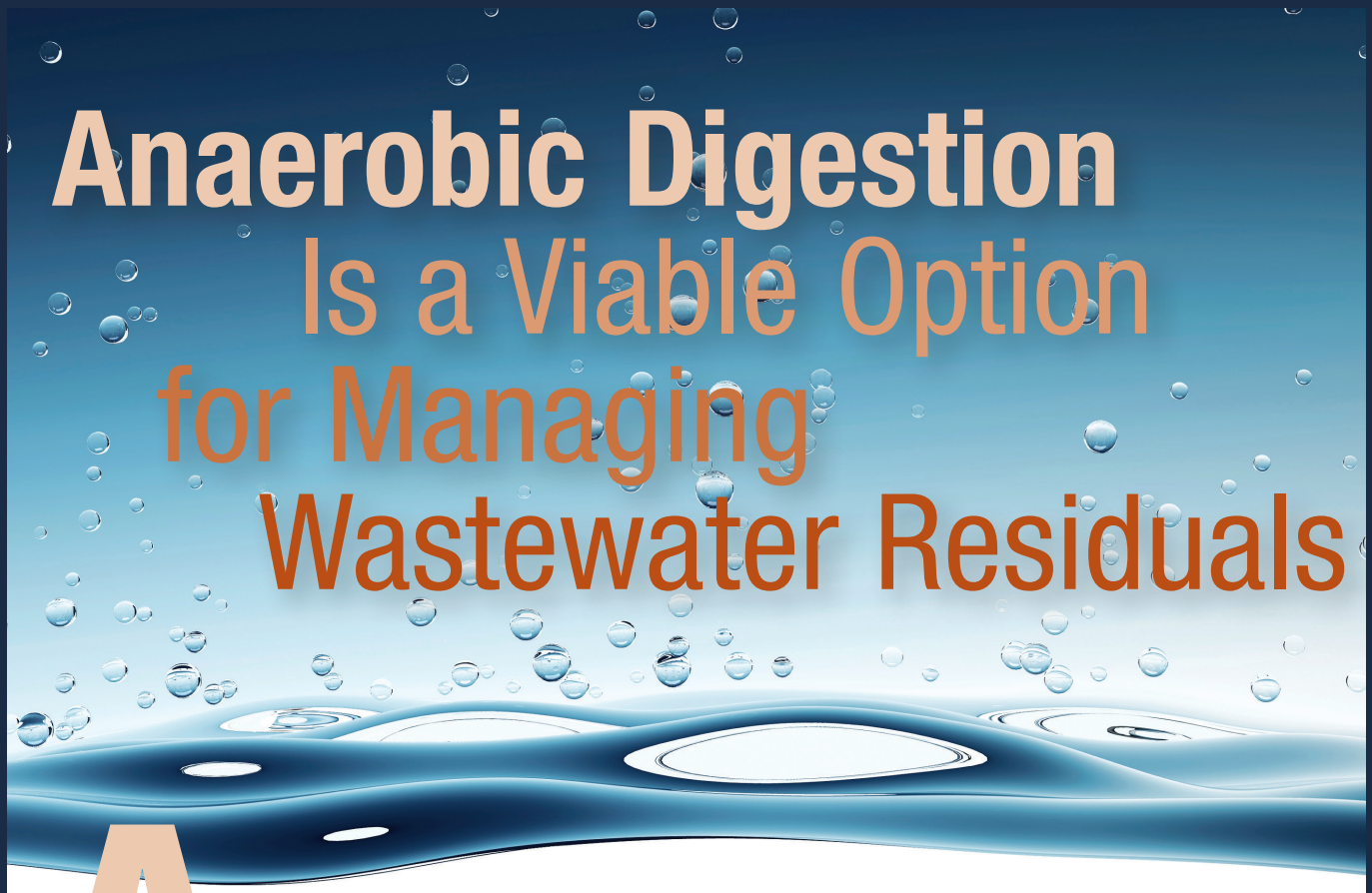

Anaerobic Digestion Is a Viable Option for Managing Wastewater Residuals

By Ann Lowery

Anaerobic digestion is not a new technology, but "AD" is receiving renewed interest as a means of reducing the volume of wastewater residuals—simultaneously cutting waste removal costs, producing useful nutrient-rich byproducts, and generating renewable energy. Anaerobic digestion is a biological process in which microorganisms break down or "digest" organic materials in the absence of oxygen to reduce odor-causing chemicals, eliminate pathogens, and inactivate harmful bacteria. The process also creates biogas.

Six wastewater facilities in Massachusetts are currently using anaerobic digesters (see chart). The technology has been successfully used in waste-water treatment primarily to stabilize and reduce the amount of organic materials remaining from the treatment process.

Opportunities for wastewater systems using digesters are increasing. A major contributor to increased interest in digesters is the state's new food waste and organics ban, which will become effective on October 1. The new regulations will prohibit source-separated organics and food waste from large institutions from being added to the solid waste stream that ends in landfills or incinerators. (Residential food materials and food waste from small businesses are not included in the ban.) The disposal ban will affect approximately 1,700 businesses and institutions, including supermarkets, colleges, universities, hotels, convention centers, hospitals, nursing homes, restaurants and food service and processing companies. Food and other organic materials from these entities will need new destinations. Digesters at wastewater treatment plants can be among those new destinations, where a wastewater facility could combine and stabilize wastewater residuals with organic materials.

Benefits and Challenges

The benefits of such an operation can include:

- Reducing the volume of residuals
- Reducing disposal costs for residuals
- Reducing the volume of materials that otherwise would have been buried at a landfill or incinerated
- Generating, through the treatment process, biogas, which can be used on-site at the treatment plant to maintain the temperature of the digesters, run a combined heat and power system, and generate electricity
- Generating "tipping fee" revenue when organic materials are brought to a digester
- Producing organic fertilizer materials, as digesters create these materials from feedstock that otherwise would have been buried at a landfill or incinerated

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PHOTO COURTESY MASSACHUSETTS WATER RESOURCES AUTHORITY

The Massachusetts Water Resources Authority uses anaerobic digesters at its Deer Island facility in Boston Harbor.

- Producing nutrient-rich byproduct (of a certain level of quality) that can be sold as soil amendments or fertilizer products to generate additional revenue

Although the benefits of anaerobic digestion can be significant, running a successful digester operation can be challenging. At this time, only one wastewater facility is planning to introduce organic materials and combine them with wastewater residuals in their digesters. An organics pilot study is being conducted by the Massachusetts Water Resources Authority at Deer Island starting late this spring. The familiar egg-shaped digesters at Deer Island, constructed in the 1990s, are Boston Harbor landmarks. Of the twelve digesters, only six or seven are operational at any given time, meaning there is available capacity for the introduction of additional organic material from other sources. Although the system is operating at less than full capacity, the digester gas is producing results: saving $15 million in fuel oil costs and $2.8 million in electricity per year. The Department of Environmental Protection is encouraging other communities to consider digesters for these economic reasons, as well as their environmental benefits. The MWRA's pilot project will begin introducing seven to twenty-one dry tons of source-separated organics daily into its digesters, and will track energy generation and process changes for up to three years.

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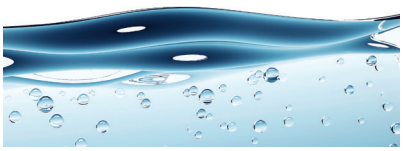


Other factors that should be considered for starting larger-scale operations with organic materials as feedstock include transporting organics

Facilities with Currently Operating Anaerobic Digesters

Plant Name	Design Flow MGD	Current Use of Biogas	Combined Heat and Power System
Deer Island Sewage Treatment Plant (MWRA)	1270	Combined heat and power	Steam turbine/ boiler
Pittsfield Wastewater Treatment Facility	17	Combined heat and power	Micro turbines
Fairhaven Waste Pollution Control Facility	5	Combined heat and power	Reciprocating engine
Clinton Wastewater Treatment Plant (MWRA)	3	Boiler for heating/flare	None
Rockland Wastewater Treatment Plant	2.5	Boiler for heating/flare	None
Greater Lawrence Sanitary District	52	Burned to make sludge pellets for incineration	None

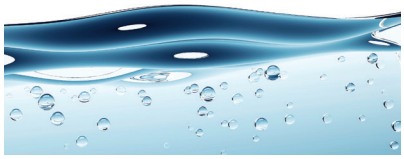
Source: Department of Environmental Protection

to the digesters and obtaining a reliable, suitable and consistent type of organic materials. Examples of industrial facilities that consistently generate materials with high organic content suitable for introduction into digesters include dairies, breweries, and other food production businesses. For wastewater systems that already have digesters, or unused digester systems that they may rehabilitate, integrating new components into an existing operation can be challenging. Special attention should be paid to the compatibility of modern electronic and mechanical elements with older systems. As more use is made of existing digesters, and as new digesters are constructed, there will be an ongoing need for technically qualified anaerobic digestion plant operators.

Practical Considerations

Financing is always an important consideration for evaluating new operations, and several communities have recently been investigating the feasibility of building new digester operations at wastewater treatment facilities with the support of funding from the Massachusetts Clean Energy Center. Opportunities for regional collection of organics and cooperative partnerships with producers of organic materials may benefit both industry and groups of municipalities as the market adjusts to the new organics ban. Opportunities at state facilities, on state lands, have also been explored and may result in the construction of new digesters for regional wastewater residuals treatment as well as organic materials in the future.

In this emerging area, Massachusetts is leading many other states with its spirit of innovation and willingness to take on technical challenges.



Of course, at the end of the day, the quality of the final effluent and other byproducts created by the wastewater treatment process is paramount. Digesters at wastewater treatment plants cannot interfere with or disrupt the important public health and environmental services provided for citizens through effective wastewater treatment. Technical and operational expertise, engineering and design professionals, financing, and public support for the technology will be needed to add more digesters to the wastewater sector in Massachusetts and bring the many potential benefits to reality. In this emerging area, Massachusetts is leading many other states with its spirit of innovation and willingness to take on technical challenges.

More information on anaerobic digestion can be found at the MassDEP website: www.mass.gov/eea/agencies/massdep/service/energy/anaerobic-digestion.