Centralized Anaerobic Digestion Options for Groups of Dairy Farms

Introduction

Anaerobic digestion is a microbial process that converts organic carbon to "biogas", a gas composed primarily of methane and carbon dioxide. A growing number of larger dairies are anaerobically digesting manure to reduce odors and pathogens, and produce biogas for heating and electricity. In 1997, a research group at Cornell University completed a study for the USDA - Natural Resources Conservation Service to evaluate the feasibility of community digesters in New York State. This fact sheet was developed from the results of their final report, *Evaluation of Anaerobic Digestion Options for Groups of Dairy Farms in Upstate New York*.

Why Anaerobic Digestion?

As dairy farms grow in size and produce more manure, their environmental impacts come under increasing public scrutiny. The odor control afforded by anaerobic digestion can reduce neighbor complaints, and it offers producers more options for both the timing and location of applying manure to cropland. Anaerobically digested manure can be further processed to make economically valuable by-products such as compost and stall bedding.

On-Site vs. Centralized Digesters

High capital costs are one of the greatest obstacles to installing an anaerobic digester, which this Cornell report found may require at least 850 cows to be financially viable. For farms with fewer cows, it may be possible for two or more farms to share the costs of a "centralized" or community digester. A centralized facility could also be built and operated by an independent party, releasing the dairy operation from the duties of managing the system.

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The table on the back summarizes some of the advantages and disadvantages of on-site vs. centralized digestion.

Key Considerations

The following are some of the most important factors to evaluate when considering centralized vs. on-site manure digestion systems:

1. **Business goals:** Environmental benefits such as pollution or odor control may be as desirable, or more desirable, than the economic benefits of energy generation or bedding production.
2. **Economics:** The farm budget will ultimately determine the type of system that can be installed. Sufficient funds are needed to cover capital costs. The maintenance and operating costs of the system must also be taken into consideration. A centralized facility may be large enough to attract venture capital.
3. **Transportation:** The method of moving manure from farms to a centralized digester must be cost-effective, logistically feasible, and meet municipal and county regulations. Distance, topography, and road and field locations all affect the choice of hauling or piping transport options.
4. **Management preferences:** Some farms may prefer having an independent treatment facility in charge of all operating and maintenance responsibilities off-site.
5. **Biosecurity:** While digestion can reduce pathogens, the spreading of disease organisms between farms is still a concern for treated manure.

These issues must be thoroughly evaluated before installing any type of anaerobic digestion system. Centralized digester systems can have considerable potential to reduce the cost per farm of waste management compared to single-farm digesters, and to generate profitable quantities of renewable energy and useful by-products. Since the factors governing

	On-Site		Centralized	
	Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
Transportation	• No significant transportation costs			• Can be expensive and logistically difficult in some areas if distance between farms and digester is significant
Maintenance/ Operation		• May be expensive and time-consuming for a smaller dairy operation	• A trained manager devoted to the facility could handle all tasks proficiently	
By-products	• Readily available products for quick application and use (e.g. heat for the digester, composted solids for sale or possible use as stall bedding, liquids for fertilizer)	• May not be able to make cost-effective use of all by-products (e.g. sale of excess electricity may not be worthwhile)	• Large volumes of saleable by-products may be produced for niche markets • Larger quantities of electricity may be available for sale to a utility at a profit	• Costs to transport useable by-products back to the dairy operations may be considerable, depending on logistics • Biosecurity concerns
Regulations	• Regulations may not be as stringent for an individual dairy compared to a centralized digester operation	• Construction/operation and reporting requirements may be burdensome	• Compliance becomes the full responsibility of third party operator	• Regulations may be more stringent for a centralized operation

the technical and economic feasibility of centralized digestion are highly site-specific, each location must be evaluated on a case-by-case basis.

Further Information

Bothi, K.L., and B.S. Aldrich. 2005. Single, paired, and aggregated anaerobic digester options for four dairy farms in Perry, New York. Fact Sheet FS-2. Dept. of Biological and Environmental Engineering, Cornell University, Ithaca, NY. http://www.manuremanagement.cornell.edu/HTMLs/FactSheets.htm

Bothi, K.L., and B.S. Aldrich. 2005. Feasibility study of a central anaerobic digester for ten dairy farms in Salem, NY. Fact Sheet FS-3. Dept. of Biological and Environmental Engineering, Cornell University, Ithaca, NY. http://www.manuremanagement.cornell.edu/HTMLs/FactSheets.htm

References

Jewell, W.J., P.E. Wright, N.P. Fleszar, G. Green, A. Safinski, and A. Zucker. 1997. Evaluation of anaerobic digestion options for groups of dairy farms in upstate New York. Dept. of Agricultural and Biological Engineering, Cornell University, Ithaca, NY. This report (ABEN 97) can be obtained from the Natural Resource, Agriculture and Engineering Service. 607-255-7654. www.nraes.org/publications/aben97.html.

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