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.

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.

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

Authors
Kimberly L. Bothi & Brian S. Aldrich
Dept. of Biological and Environmental Engineering
Cornell University
May 2005
who to contact

Brian S. Aldrich  
Dept. of Biological and Environmental Engineering  
Cornell University  
bsa9@cornell.edu  
(607-255-1819)  

Tom Fiesinger  
Project Manager  
NYSERDA  
twf@nysersda.org  

(518- 862-1090, ext. 3218)

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


References

Acknowledgements
The research for this fact sheet was supported in part by funds provided by the New York State Energy Research and Development Authority, under agreement 7536, “Transferring Technology from NYSERDA Agricultural Innovation Manure Projects”. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author and do not necessarily reflect the views of NYSERDA or the State of New York, and reflect the best professional judgment of the author based on information available as of the publication date.

on-site centralized

advantages disadvantages advantages disadvantages
transportation
• No significant transportation costs • May be expensive and logistically difficult in some areas if distance between farms and digester is significant
maintenance/operation
• 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)
by-products
• Regulations may not be as stringent for an individual dairy compared to a centralized digester operation • Construction/operation and reporting requirements may be burdensome
regulations
• Regulations may be more stringent for a centralized operation