



Anaerobic Digestion on Hog Operations

Anaerobic digestion of animal manures shows great promise in the United States and has environmental and economic advantages over land application of untreated manure. Although dairy farms have experienced steady growth in digester use, hog operations have lagged behind. Understanding current manure management and storage practices and barriers and solutions to anaerobic digestion can help to determine ways to increase its use.

Current Manure Management and Storage Practices

Depending on the region of the country, hog operators handle manure differently. Hog farms in some Midwest states, for example, typically involve **deep pit storage**, which allows excretions to drop into storage pits underneath slatted floors of the barn. Manure is pumped out once or twice a year and transported via drag line for land application and injection up to four miles away. Some digestion of manure does occur in the pits, resulting in odor issues and the release of methane into the atmosphere. A number of operations send vented air from barns through a bio-filter (i.e., a bed of activated media such as wood chips) for odor control. However, due to the infrequent removal of manure, operations using deep pit storage must modify manure management processes and structures to incorporate anaerobic digestion systems.

Flush collection, in which flowing water is used to move manure, is another common manure management practice, particularly in North Carolina. The collected dilute manure has traditionally been stored in outdoor **uncovered lagoons**. To make anaerobic digestion a more economical option, hog farmers have been taking steps to reduce the dilution of manure by switching to scrape or pull plug manure collection, thus reducing the size of the anaerobic digestion system needed and increasing the biogas production per gallon input potential.

Barriers and Solutions to Increasing Anaerobic Digestion

Current barriers that limit anaerobic digestion adoption on hog farms fall into the following categories described below:

- Knowledge
- Technology
- Economics

Knowledge: In general, the hog industry does not fully understand anaerobic digestion systems and their associated benefits. Some misconceptions include that available nutrients are reduced when manure is digested, that biogas production cycles do not match on-farm energy needs, or that extremely large herds are required for a system to work. Without well-documented examples of successful anaerobic digestion systems on hog farms and their associated benefits, farmers usually do not seriously consider these systems as an option.



For the latest statistics on operating hog digesters, visit [AgSTAR's projects Web page](#).

For more information on the potential of anaerobic digestion, see [AgSTAR's Market Opportunities report](#).

Two hog operations with successful digesters include:

- [Danny Kluthe Farm \(Nebraska\)](#)
- [Barham Farms \(North Carolina\)](#)

Educating hog producers and others in the industry regarding the processes, benefits, and drawbacks of treating their manure with anaerobic digestion could increase system use. Improving knowledge could be accomplished by:

- Documenting success stories of hog digesters and conducting extensive outreach to the hog industry.
- Providing a resource with unbiased information on problems, innovations, and benefits of working systems.
- Helping hog farmers understand the overall impact of adding anaerobic digestion to their operations.
- Working with stakeholders to identify ways in which anaerobic digestion can strengthen the industry.
- Getting buy-in to anaerobic digestion system use from dominant pork producers.

Technology: Relatively few examples exist of successfully installed anaerobic digestion systems on hog farms compared to dairy farms. Slow adoption and past failures have led to negative perceptions and assumptions about the technologies offered. This leads prospective owners to conclude that the technology is not well established and may be excessively risky. Farmers are concerned about the availability of qualified, experienced designers, installers, and servicing technicians, and about being able to determine whether technology providers are legitimate.

Some technological changes could help increase anaerobic digestion adoption. These include:

- Designing less complex digesters that are easier to use and maintain.
- Adding technologies such as nutrient separation to provide nutrient management benefits and possibly fertilizer products that could be sold.
- Conducting performance evaluations of hog digesters and disseminating the results.

Economics: The primary challenge for the hog industry is staying profitable in a low profit-margin business. Producers must also find ways to cost-effectively comply with regulatory requirements, including manure management and nutrient management, which require producers to have access to a sufficient number of crop acres in order to apply nutrients at recommended agronomic rates.

Anaerobic digestion systems are typically seen as complex projects with large up-front capital costs. Additionally, typical hog manure management is designed to minimize the need for structures, and most hog operations keep personnel to a minimum. The majority of hog producers are located in areas with low electricity prices, limiting the potential for anaerobic digestion as an income stream. Dairy based anaerobic digestion systems have the added economic benefit of providing digested fibers for bedding. Hog anaerobic digestion systems typically do not have the economic benefit of providing a fiber source since hog manure has a lower fiber content than dairy manure and hog production systems traditionally do not need fibrous bedding. While there are numerous other benefits (e.g., odor reduction), they are difficult to quantify and do not typically result in cash for the farm.

Improving the economics of anaerobic digestion systems is key to increasing their use. Economics could be enhanced through the following measures:

- Increasing income from electricity sales (e.g., tariffs for biogas) or other types of energy sales.
- Providing direct financial assistance for feasibility studies and/or up-front costs, as well as more creative financing mechanisms such as tax credits and low interest program investment loans.
- Developing lower cost digester systems.
- Providing a better characterization of benefits of anaerobic digestion use to hog farmers.
- Seeking additional revenue-generating options (e.g., finding additional uses for on-farm heat; accepting off-farm wastes for tipping fees; concentrating nutrients for fertilizer products).
- Implementing different business models, such as third party build/own/operate models.