E3A: Anaerobic Digester Applications for the Farm or Ranch

Steps in the Anaerobic Digester Series

Determine economic feasibility

Once you have determined that anaerobic digestion is technically feasible and have measured your methane generation potential, next consider whether the project would be economically feasible.

You can subsidize many capital costs of building an anaerobic digester by securing grants or low-cost loans. Before making a large capital investment though, consider the net operating costs of an anaerobic digester. Before purchasing an anaerobic digester, conduct a detailed financial analysis to gain a clearer picture of those costs.

This guide will help you decide whether an anaerobic digester is economically feasible for your operation and whether it would be worthwhile to conduct a detailed financial analysis.

Photo credit: Rocky Mountain RC&D

General cost information

According to the U.S. Environmental Protection Agency AgSTAR, the capital cost of an on-farm anaerobic digester ranges from approximately $400,000 to $5,000,000, depending on the size of the operation and technology used. A typical on-farm anaerobic digestion unit costs approximately $1.2 million. Costs vary depending on the size, design and features of a unit. The type of anaerobic digester necessary for your operation, and therefore the cost, varies according to technical considerations and the number of livestock. Likewise, most digesters are customized somewhat by the provider, so capital outlay and operating and maintenance costs vary. Annual operation and maintenance costs — repairs, parts, labor and insurance — must also be included when considering the cost of an anaerobic digestion system. The AgSTAR website provides a good overview of expected costs and revenues at *http://www.epa.gov/agstar*. Their website is updated frequently with information about federal and state funding opportunities for anaerobic digestion projects.

Because of the capital-intensive nature of anaerobic digesters, you should thoroughly understand the parameters of any funding programs before investing in a system. You may wish to discuss any loan risk associated with a methane digester with an agricultural loan officer to ensure additional debt will not compromise your ability to access capital for your operation.

As part of economic analysis, determine the extent to which you will offset costs by generating revenue or reducing energy expenditures over the life of the digester. Utility contracts can vary considerably throughout rural communities. Some utilities have net metering policies in which small energy generators — like those with an anaerobic digester — can offset energy consumption by producing electricity. However, that value will vary by utility. Some will credit net-metered power at the retail rate, meaning there is a direct offset for every kilowatt-hour of electricity produced. Other utilities credit net-metered power at a discounted or wholesale rate. In the case of agricultural operations, you may be assessed a demand charge for electricity. Demand charges are not usually offset in net metering, but can comprise up to half of your electrical expense.

Check with your utility about their net metering policy. To increase profitability, producers should focus on reducing operational and maintenance costs, as well as offsetting energy usage with an anaerobic digester system.

Be wary of relying on an anaerobic digestion system to generate revenue by selling electricity to a utility, as they may be unwilling to enter into such an agreement. If they are willing, the rate offered is typically a wholesale price. Ensure that there are no contractual terms that might be problematic for you, such as a clause that a guaranteed amount of power be supplied in a given time period or an obligation to notify the utility of changes in electrical production.

Outline some of your expected costs and revenues over the life of the digester as you go through the process of determining what is best suited to your operation. Once you contact a technology provider, you can obtain more detailed information necessary to calculate actual costs.

Five indicators of economic feasibility

There are five indicators that an anaerobic digester might be economically feasible at your operation. These indicators should be viewed as a screening tool, and they can help determine whether you should pursue a comprehensive feasibility study of your operation. If your operation meets at least two of the criteria, conduct a more detailed analysis of your situation:

1. Your operation meets the definition of a Confined Animal Feeding Operation (CAFO).
2. There is a waste stream that could be combined with the waste stream of another operation or business. That is, there is potential for "co-digestion."
3. Your operation receives frequent or credible complaints about odor.
4. Your farm is a dairy, swine or poultry operation.
5. Your operation incurs more than $5,000 in average electricity or heating expenditures per month.

Brief descriptions of the five indicators

1. The operation meets the definition of a CAFO. CAFOs must comply with state and federal laws governing waste management practices. An anaerobic digester might complement a CAFO's plan for air emissions, nutrient or waste management.
2. There is potential for co-digestion. When agricultural producers and related industries, such as food manufacturers, or municipal waste treatment facilities are located nearby, there may be efficiencies that can improve the economic viability of a project. Feasibility studies have shown that co-digestion projects might be economically viable. If you or your community has an interest in a co-digestion project, you should review one of the reports in the reference section for more information.
3. Your operation receives frequent or credible complaints about odor. Anaerobic digestion units can provide a measurable reduction in odor, which can help to improve relations with neighbors and mitigate nuisance lawsuits. The financial risk associated with an odor-related lawsuit can be difficult to estimate because information about damage awards is not readily available. The majority of cases are settled out of court, and insurance companies typically pay a portion of the settlements. Most verdicts and settlements are not publicly reported. Avoiding a potential lawsuit and accompanying financial liability may help justify the capital expenditure of an anaerobic digestion project.
4. Your farm is a dairy, swine or poultry operation. Many nuisance claims involve these types of operations. These operations have also involved high punitive damage awards, which may encourage swine and poultry producers to consider adoption of anaerobic digestion units as a management practice to reduce the risk of a nuisance claims. The exact cause leading up to these nuisance lawsuits is not always clearly established; however, it is likely related to the strength and persistence of odor. The history of nuisance lawsuits involving swine and poultry operations indicates that even operations located in rural communities with few neighbors could still be vulnerable to a lawsuit. An anaerobic digester could be used for conflict mitigation.
5. Your operation incurs more than $5,000 in electricity or heating expenditures per month, on average. An operation's ability to offset average monthly energy costs affects the economic feasibility of an anaerobic digester system. An anaerobic digester might be economically feasible if a producer has the potential to offset a minimum of $5,000 in electricity or heating costs for an entire operation.

Electricity and heating expenditures reflect a specific category of operating expenses that could be offset by an anaerobic digester. These expenditures include propane, natural gas and electricity. If your operation has more than $5,000 in average energy costs each month, you should still conduct a detailed financial analysis to determine whether implementing a digester could offset those costs. Additionally, the type of digester necessary for an operation will also affect the economic feasibility.

The most cost-effective means of harnessing energy generated by the digester is in the use of biogas. If your feeding operation incurs more than $5,000 in energy

Table 1. Summary of financial awards from agricultural nuisance suits

Year	State	Award	Plaintiff or case	Operation
1991	NE	$375,600	Kopecky v. National Farms, Inc.	Swine
1996	KS	$12,100	Settlement — plaintiff/respondent both undisclosed in news article.	Swine
1998	KS	>$15,000	Twietmeyer v. Blocker	Beef feedlot
1999	MO	$5,200,000	Vernon Hanes et al. v. Continental Grain Company	Swine
2001	OH	$19,182,483	Seelke et al. v. Buckeye Egg Farm, LLC and Pohlman	Egg/Poultry
2002	IA	$33,065,000	Blass, McKnight, Henrickson, and Langbein v. Iowa Select Farms	Swine
2004	OH	$50,000,000	Bear et al. v. Buckeye Egg Farm, Anton Pohlman and Croton Farms, LLC	Egg/Poultry
2006	AL	$100,000	Sierra Club, Jones, and Ivey v. Whitaker and Sons LLC	Swine
2006	MO	$4,500,000	Turner v. Premium Standard Farms Inc.; Contigroup Co., Inc.	Swine
2007	IL	$27,000	State of Illinois (Plaintiff). Respondent undisclosed.	Swine

costs per month, you may be able to offset many of these expenses by using the biogas itself rather than converting it to electricity. The conversion of methane gas to electricity brings with it additional costs. Avoiding such costs will yield a higher net economic impact compared to any potential revenues that might be generated by supplying electricity to the grid (Keske, 2009). Converting methane gas into electricity requires a generator, adding additional costs. In addition to the added initial cost of a generator, you would need to plan on maintenance, labor costs and backup electricity resources. An operation that only uses biogas would likely incur fewer expenses.

Low electricity costs make it difficult to justify a digester investment. Return on investment takes longer when electricity costs are low and the value of selling excess electricity produced or offsetting consumption is also lower. In Missouri, electricity costs are generally lower than the eastern and western United States. This is primarily due to relatively inexpensive coal resources that are available for electricity generation. While the environmental damages resulting from burning coal could be factored into future energy policy, the current price per kWh of electricity is low compared to other regions of the country. In western states like California, the kWh price paid by the producer is likely higher than Missouri, making the total costs incurred by the operation higher. In this case, you should still review the net metering policies and "buyback" prices. As part of your economic assessment, you will need to determine your current cost of electricity and the price that you will receive from supplying electricity to the grid.

Other considerations for economic feasibility

- Include the cost of water in your spreadsheet.
- Do not count on revenues from greenhouse gas offsets to fund the system. These markets are voluntary in the United States and have shown considerable price volatility and low prices in recent years.
- Before calculating potential tipping fees, review state guidelines to determine waste transport policies for on- or offsite locations.
- Account for maintenance and labor costs, in addition to the capital outlay of an electricity generator.
- Include the costs of backup energy systems, in the event that your system is down for maintenance.
- Understand state and utility company policies about net metering and energy buyback programs.
- Consider all costs associated with building, storing and transporting manure. Also, consider the location of the digester relative to utility infrastructure. The cost to tie into the grid can be high depending on your operation's proximity to utility infrastructure.
- Estimate your methane generation potential and maintain a realistic perspective of energy costs that you might be able to offset.
- Factor in risk. Prices can vary considerably, so be sure to look at the most likely and the worst-case scenarios.

References

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