

Anaerobic Digesters

Key Considerations in Feasibility Milton Geiger, UW Extension April 14, 2014

Workshop Objectives

- Understand how anaerobic digestion works
- Assess key elements that determine feasibility of anaerobic digestion systems







What is Anaerobic Digestion?

- Biological Process
- Applicable for high organic content waste
- In absence of oxygen, carbon is converted to methane
- Works best at 35°C (about 95°F)



Source: Renewable Energy Association



Anaerobic Digestion



Near Complete Pathogen Removoal





Uses for Methane





Potential Benefits of Anaerobic Digesters (Region-Dependant)

Environmental

- Production
 - Soil management
 - Manure management
 - Biogas production
- Reduces environmental pollution
 - Water
 - Green house gases
 - Ammonia

Economic and Social

- On-farm energy generation (avoid electricity purchases)
- May sell energy to utilities
- Savings on bedding
- Sale of composted solids
- Carbon credits available
- Renewable energy certificates
- Odor control
- Lawsuit mitigation

How do I know if anaerobic digestion will work on my farm?



Credit: Northern Rocky Mountain RC&D





Remember – This is a cold climate



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Question 1:

Are you willing to invest in learning about anaerobic digestion?

Reasons:

- Companies tend to sell and specialize in one technology you need to know what will work for you in order to select a provider.
- There are some companies/technologies that have been used for years. Others are new or untested for agricultural applications. It is a buyer-beware market.
- Digesters are expensive. You will need to assess your risk and financial opportunities as you select a technology and installer.





Classic Lagoon Waste Management









Covered Lagoon – Not an Option



- Simple form of anaerobic digestion
- Problematic in arid West
 - Cold temperatures
 - Requires low (<1%)
 waste solids
 content





Plug Flow

Rocks and sand will settle and build up



- Slow, requires high retention time
- Typically loaded in batches on farm



Complete Mix

- Well mixed environment
 - Slightly faster rate of digestion than plug flow
 - High solids materials cannot be mixed as sand/rocks are detrimental to moving parts





Upflow Sludge Blanket and Fixed Film Reactors



Figures developed by Lucas Loetscher, Colorado State University

Question 2:

Is the primary method of manure collection on concrete (not scraping a dry lot)?

- Digesters require a low solids waste content (below 17%).
- Dry lot scraping can have solids content as high as 90%



Question 3:

Is the primary manure at your facility primarily free of rocks, sand and soil after collection?

- Rocks and soils cause major operational problems for digesters and must be removed before waste is processed
- Sand or straw in bedding can cause problems
- Higher organic content increase digestion



Question 4:

Is there a nearby source of wastewater that you may be able to combine with your manure?



If you do have high waste solids, co-digestion (combining your waste with another supply of wastewater) can make digestion feasible





Question 5:

Are you willing to perform additional maintenance for operation of an anaerobic digester?

- Anaerobic digesters require more on-going maintenance than many other manure management systems
- Operations need to budget for maintenance, employee and repair expenses



Question 6:

Do one or more of the following apply to you?

Average energy costs of at least \$5,000 per month?

- Frequent and/or credible complaints about odor?
- Poultry or swine operation?
- Potential for codigestion?



Potential Costs of Anaerobic Digesters

- Cost of the digester:
 - Approximately \$1 million
 - Average life: (15 yrs.
 Range: 10-20)
- Cost of the solids separator:
 - Approximately \$75,000
 (Key to raising profitability)
- Opportunity cost
 - Cost of your next best alternative





Are Ag-Related Digesters Profitable?

"Yes..."

- Several models show profitability
 - Measured in cash flows associated with the investment
- Critical to use a solids separator
 - Use the solids as a co-product
 - Bedding is a high economic use
- Larger herds lead to economies of scale: 2,000 dairy cows
- Key element to profitability: Containing costs

"Yes, But..."

- Majority of studies conducted in the East
- Profitability relies on carbon credits
 - \$0.10 per metric tonne of CO_2
- "Net positive gain" may include a net gain to the environment (not necessarily a net gain to the farmer/rancher)
- Key variables identified for profitability: lawsuit mitigation, electricity prices, carbon, water prices, cost containment



Thank You for Attending



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