



## Biogas

Biogas digesters have captured many imaginations because they can turn organic wastes from our farms, factories and cities into a valuable source of renewable energy. In addition, the potential of this technology to reduce odors and other environmental concerns of feedlots has resulted in much recent interest from farmers. On-farm uses are not, however, the only digester options. Indeed, other industries have been reaping the benefits of digestion for years, particularly for wastewater treatment.<sup>1</sup>

**What is anaerobic manure digestion?** A biochemical process by which organic matter is decomposed by bacteria in the absence of oxygen, producing methane and other byproducts. The complete mixture of this gas is called biogas.<sup>2</sup>

**What types of digesters are used in livestock applications?** Plug flow, complete mix, fixed film, covered lagoon, temperature-phased anaerobic digestion, anaerobic sequence, batch Reactor.

**What is biogas?** A combustible gas derived from decomposing biological waste. Biogas normally consists of 50 to 60 percent methane. Methane gas is an odorless, colorless, flammable gas with the formula CH<sub>4</sub> that is the primary constituent of natural gas. The remaining portion of the gas is made up of primarily carbon dioxide and with trace amounts of hydrogen sulfide and nitrogen gas.

**What factors determine how much biogas will be produced?**

- Volatile solid content (amount of organic material in manure)
- Hydraulic retention time (amount of time manure is in digester)
- Temperature (thermophilic vs. mesophilic digesters)
- Management

**What are the environmental benefits?**

- Reduced pathogens in manure (ex. fecal coliform bacteria)
- Reduced odor and reduction of odor producing compounds (H<sub>2</sub>S)
- Manure stabilized and nitrogen more readily available to crop
- Reduced green house gas emissions
- Production of “green energy” and reduced dependence on fossil fuel

<sup>1</sup> Pawlisch, Melissa, Carl Nelson, Lola Schoenrich. 2003. *Designing A Clean Energy Future: A Resource Manual*. P. 45. Retrieved on February 8<sup>th</sup>, 2005, from: [www.cleanenergyresourceteams.org](http://www.cleanenergyresourceteams.org).

<sup>2</sup> All questions and answers listed come from the Minnesota Department of Agriculture’s Frequently Asked Questions link. Retrieved on February 8<sup>th</sup>, 2005, from: <http://www.mda.state.mn.us/feedlots/digesterfaqs.htm>.

## **What are the economic benefits?**

- Reduced electrical, natural gas, and heating costs
- Revenue stream from selling excess energy back to the grid
- Enhanced fertilizer value of the digested manure

## **What are the intangible benefits?**

- Improved neighbor relations because of reduced odors
- More flexibility on timing and location of manure application because of reduced odors
- Community leadership and recognition
- Manure digester can help the operator address air quality questions in the permitting process

## **What are the risks?**

- High initial capital costs may cause a financial burden for the operation
- Complications in operating and maintaining another biomechanical process in the farming operation
- Some safety issues with working with a flammable gas
- Availability of a utility that will buy back energy from the facility at a reasonable rate
- Availability of an engineer and/or contractor locally that can build and maintain a manure digester

## **What types of livestock operations can use this technology?**

Dairy, beef, poultry, and swine manure have all been used. For Minnesota, Dairy manure has a high potential for manure digestion because the ratio of liquids to solids is favorable for the efficient production of biogas.

### ***Links:***

Minnesota Project: [http://www.mnproject.org/programs/energy\\_sub/farmbasedenergy.htm](http://www.mnproject.org/programs/energy_sub/farmbasedenergy.htm).

Minnesota Department of Commerce: <http://www.state.mn.us/cgi-bin/portal/mn/jsp/content.do?subchannel=-536881511&id=-536881350&agency=Commerce>.

Clean Energy Resource Teams: <http://www.cleanenergyresourceteams.org/biogasdigesters.html>.

Waste2Profits: <http://www.waste2profits.com/digesterlinks.htm>.

An Introduction to Biogas: <http://www.ees.adelaide.edu.au/pharris/biogas/beginners.html>.

Minnesota Department of Agriculture: <http://www.mda.state.mn.us/feedlots/digesterfaqs.htm>.

U.S. Department of Energy: <http://www.eere.energy.gov/consumerinfo/factsheets/ab5.html>.

Agricultural Marketing Resource Center: <http://www.agmrc.org/biomass/anaerobicmain.html>.