

Frequently asked questions about  
**Anaerobic Digesters** (ADs)



*Operation Advantages  
and Funding Opportunities*

Partners:  
Michigan Department of Agriculture  
Michigan Department of Environmental Quality  
Michigan Milk Producers Association  
Michigan Agriculture Environmental Assurance Program  
Michigan Farm Bureau

## What is an Anaerobic Digester (AD)?

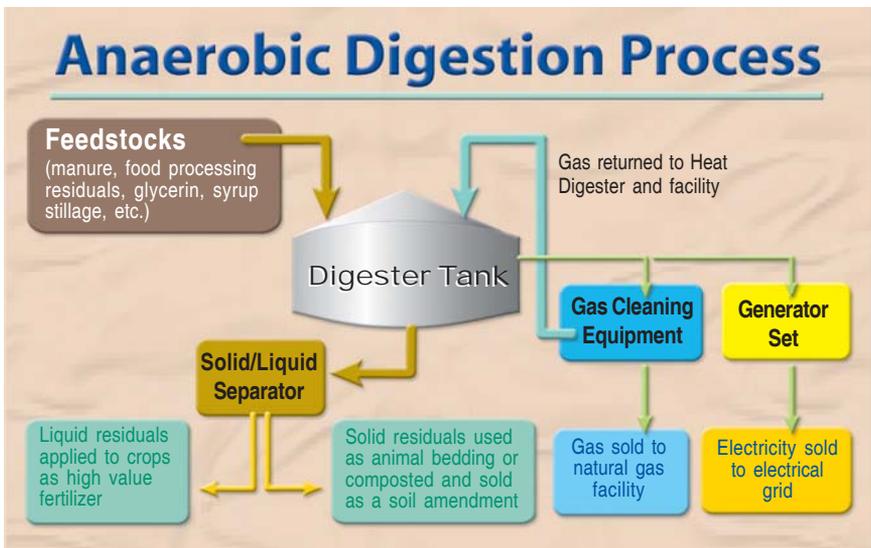
Anaerobic digestion is a process that decomposes manure, food waste, or any organic material to produce and collect biogas. Biogas, consisting of approximately 50-70 percent methane and 30-40 percent carbon dioxide and trace gasses, is generated when organic material degrades in the



absence of oxygen. Since biogas is a mixture of methane (also known as natural gas or CH<sub>4</sub>) and carbon dioxide it is a **renewable** fuel produced from waste materials and is part of a **sustainable** residuals management system.

## How does an AD work?

An AD is an enclosed vessel that naturally decomposes organic materials to produce biogas. They work similarly to the natural decomposition that occurs in the stomach. The organic material is collected in an enclosed tank where it is degraded in the absence of oxygen by acid formers into fatty



acids. Methane formers convert those fatty acids into biogas. There are several types of ADs including, complete mix, plug flow and heated-fixed film. These three types are the most feasible types for Michigan's climate. Maintaining the system at a steady temperature is critical to its success. For technical standards in the design and construction of ADs consult the Natural Resource Conservation Services (NRCS-Michigan) Field Operations Technical Guide (FOTG) Anaerobic Digesters – Controlled Temperature (No. 366).

## Why install an AD?

- The methane produced can provide an **energy source** for the user to generate heat, hot water or electricity, which can reduce their reliance on fossil fuels like coal, natural gas, propane and fuel oil; with possible revenue from both the sale of energy in the form of gas and electricity and the sale of carbon credits.
- AD's provide significant **odor reduction** when operated properly. ADs can also help **protect the environment** by improving air and water quality and **reducing greenhouse gas** emissions! An investment in odor reduction and environmental protection may result in improved community relations.
- Because ADs reduce ammonia losses, the digested manure and/or food waste contains more of the valuable nutrients such as nitrogen that can be used for a high-value **fertilizer**. After digestion, these nutrients are in a form which is much more readily available for plant uptake. The increased plant uptake also reduces the possibility of nutrient run-off into surface waters.

*ADs can reduce odors and greenhouse gas emissions!*

- The separated manure can be easily land-applied. The liquid portion has less phosphorous making land application easier and more environmentally friendly.
- The biofiber in the digested material can be used for animal bedding or composted and sold as a high-quality soil amendment. The biofiber can also be used to create composite building materials.
- Pathogens such as fecal coliform bacteria are significantly reduced in the digested material.
- Waste streams from other processes can be used to increase methane production (ex. glycerin generated as a by-product of biodiesel production increases methane).

## What are the benefits?

- Revenue may be generated from selling electricity back to the grid and selling methane, with gas clean-up technology, directly into the pipeline. Contact your local utility for price information and for information on green power credits.
- Revenue can also be generated from selling greenhouse gas emission credits on the Chicago Climate Exchange. Information on selling greenhouse gas emission credits can be found at **[www.michiganclimate.org](http://www.michiganclimate.org)**.
- For every 100 lactating cows, 200 to 300 kilowatt hours per day of electricity can be generated, which is sufficient energy to power 15 houses per day.



- Potential revenue is available from the sale of liquid fertilizer, soil amendment, or for use in composite building materials.
- Savings can be realized from the reduction in purchasing and hauling animal bedding and commercially-made fertilizers.
- A reduced cost on your electrical, natural gas and heating costs may be obtained.
- Reduces odor and nuisance complaints when operated properly.
- Provides expanded residual management options.



## What permits are needed?

For farms operating under an NPDES Permit, the digester must be included as part of the Comprehensive Nutrient Management Plan. An air permit may be required from the DEQ Air Quality Division depending on how the biogas is to be utilized.

For additional information on permitting and regulatory requirements, please review the guidance document titled “Environmental Regulations Affecting Anaerobic Digesters”



which can be accessed at [www.michigan.gov/mda](http://www.michigan.gov/mda).

## How much does an AD cost?

- The cost of an AD can vary greatly, depending upon the vendors, equipment suppliers, engineers used and the farm or food processors specific issues. Depending upon the system selected the initial costs can range from \$150 to \$500 per dairy cow or \$80 to \$300 per swine. For additional information, please reference the US EPA AgStar website at **[www.epa.gov/agstar](http://www.epa.gov/agstar)**.
- NRCS indicates that annual operation costs can range from \$11,000-\$51,000 for items such as replacement parts, and for a qualified system operator.

*For additional information on cost/benefits of ADs, see the AgSTAR “Ag Biogas Casebook 2004 Update” which can be accessed at [www.epa.gov/agstar/resources.html](http://www.epa.gov/agstar/resources.html).*

## Additional considerations

- Good management is critical to the success of the AD. The system will require more mechanical maintenance than traditional storage and land application, especially during the first year of operation. Once the system is installed, it has been estimated to take approximately ½ hour to 1 hour per day to maintain.
- The operators need to be aware that there is no noticeable reduction in biological nitrogen and phosphorous in the digested material. The volume of material will remain basically the same and adequate storage must still be provided.
- The system will require heating in cold temperatures with an increased potential for corrosive gases.
- MDA’s Operator Training Program provides training courses and on-site operator and facility certification.

## Funding opportunities

There are several funding opportunities available. Grants and loans are available and have been awarded for the construction of ADs from several different agencies. Contact the agencies below for information on potential funding opportunities available in Michigan:

- MDA Agricultural Innovation Grant Program  
Mike DiBernardo: 517-373-9144  
**[www.michigan.gov/mda](http://www.michigan.gov/mda)**.
- USDA Renewable Energy and E2 Program  
Rick Vanderbeek: 517-324-5218  
**[www.rurdev.usda.gov/rbs/farbill](http://www.rurdev.usda.gov/rbs/farbill)**.
- MDEQ Pollution Prevention Small Business Loans  
Karen Edlin: 800-662-9278 or [edlink@michigan.gov](mailto:edlink@michigan.gov).
- Michigan Department of Labor and Economic Growth  
Shauna Tonsor: 517-241-6223 or [tonsors@michigan.gov](mailto:tonsors@michigan.gov).
- Department of Energy Loans for Projects that Employ Innovative Technologies in Support of the Advanced Energy Initiative  
202-586-8336 or [lgprogram@hq.doe.gov](mailto:lgprogram@hq.doe.gov)  
**[www.lgprogram.energy.gov](http://www.lgprogram.energy.gov)**.
- Federal Alternative Energy Grants  
**[www.grants.gov](http://www.grants.gov)**.
- Public Act 550 of 2006 allows for property tax exemptions on ADs and methane electric generating systems provided certain conditions are met. For information, contact the Michigan Department of Treasury **[www.michigan.gov/treasury](http://www.michigan.gov/treasury)** or Michigan Department of Agriculture **[www.michigan.gov/mda](http://www.michigan.gov/mda)**.



For additional information:

MDA Environmental Stewardship Division  
Michelle Crook: 517-335-2487  
[www.michigan.gov/mda](http://www.michigan.gov/mda)

MSU-Extension Office  
517-355-2308  
[www.msue.edu](http://www.msue.edu)

MDEQ Environmental Science and Services Division Office  
800-662-9278, [www.michigan.gov/deq/essd](http://www.michigan.gov/deq/essd)

AgSTAR Office  
800-952-4782, [www.epa.gov/agstar](http://www.epa.gov/agstar)



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