

## Biogas Digesters

If you have livestock, you also have a great deal of organic matter being produced. Instead of thinking of livestock manure only as fertilizer, think of it as a means of producing fuel. When bacteria naturally break down livestock manure, biogas is produced. Biogas contains about 60 percent methane, 40 percent carbon dioxide, and small amounts of hydrogen sulfide (a highly toxic gas), water vapor, and other gases. Methane is a flammable gas suitable for cooking, lighting, and fueling some combustion engines.

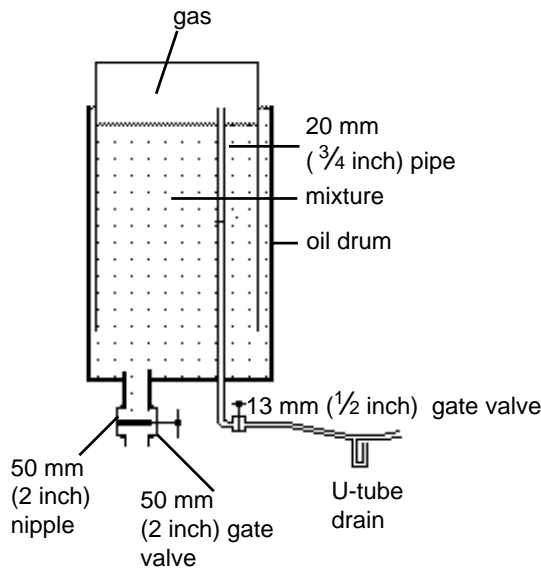
To produce and collect biogas, an airtight tank (“digester”) is used to break down the manure in an enclosed system. Just as the intestines of all

animals naturally house bacteria, a biogas digester can be viewed simply as a suitable growing area for bacteria. Biogas digesters yield three products: biogas, liquid effluent, and a semi-solid sludge. The biogas can be used for productive purposes, such as firing an animal food cooker or heating water. The sludge retains most of the initial phosphorous and potassium. The digester products have a lot less odor than raw manure.

### How does it work?

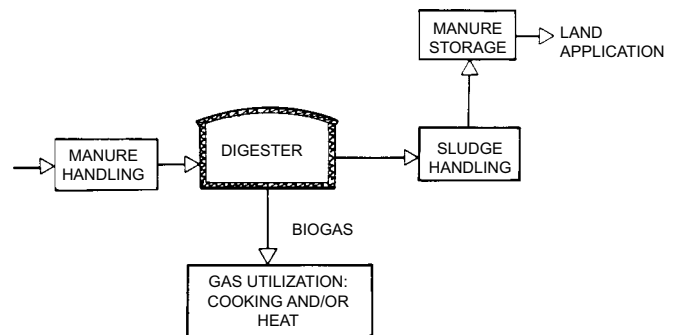
Organic wastes, such as livestock manure, are put into the digester. The manure normally contains the bacteria needed for breaking it down or digestion. The first step is the decomposition of the livestock wastes by breaking the organic material down into molecules such as sugar. The second step is the conversion of decomposed matter into organic acids. Finally, the acids are converted to biogas.

Operation of a biogas digester can be effective with simple daily management. Tanks can be mixed, unmixed, continuously filled or heated in a variety of combinations. All designs incorporate the same basic components: a pre-mixing area or



**A simple oil drum biogas digester**

Matthews, E.G. *Biogas for Overseas Volunteers: The Oil Drum Digester*. 2001. Wimborne Energy Consultancy. September 20, 2002. <[www.angelfire.com/mac/egmatthews/biogas/biogas.html](http://www.angelfire.com/mac/egmatthews/biogas/biogas.html)>



**Components of an on-farm biogas system**

tank, a digester tank(s), a system for using the biogas, and a system for distributing or spreading the liquids and the sludge (the remaining digested material).

### Benefits of a biogas digester

Benefits of treating livestock manure in a biogas digester include:

- Energy is produced that can be used for heating or cooking.
- Nutrients are recycled; the sludge makes an excellent soil conditioner for trees and grass.
- Liquids from the digester can be used on crops, although they are low in nutrients.
- Odors are reduced.

*Never apply fresh swine wastes to crops, such as leafy vegetables, that are eaten raw.*

### Biogas digester considerations

Safety and other issues to be considered when working with a biogas digester include:

- Gas explosions can occur if mixtures are near flames, power tools, or static electricity.
- Hands should be thoroughly washed after working with wastes.
- Asphyxiation (death or unconsciousness by inadequate oxygen, presence of noxious agents, or other obstruction to normal breathing) is possible if biogas accumulates and oxygen is removed.
- Never go into a biogas tank. Methane and carbon dioxide are odorless. Hydrogen sulfide smells like rotten eggs at low levels but is odorless at high levels and highly toxic.
- Biogas cannot be easily compressed and stored, so it is best used every day.

- Depending on the design used and the availability of materials, cost may be high to install a biogas system.
- Experience is required to operate and maintain a digester and biogas system.
- Attempts to use biogas to produce mechanical or electric power generally fail due to high capital and maintenance costs.

For additional resources and publications, refer to ADAP fact sheet 2003-11 on *Additional Information for Swine Waste Management*.

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