



# Anaerobic Digestion



## Biogas News

### PREMIERE EDITION

*Welcome! To the first edition of Biogas News*

In light of the nationally growing desire for an environmentally safe and sustainable energy supply, on-farm anaerobic digestion is positioned to significantly contribute to reducing dependence on fossil fuels and emissions of greenhouse gases. The abundance of dairy farms in New York State and the Northeast makes this region a prime focus for on-farm anaerobic digestion implementation. Anaerobic digestion is also effective in reducing odor and optimizing manure nutrient availability. Thus, benefits extend beyond the farm and into the community. Additional work is needed on local and national levels to optimize digester systems and achieve full benefits. *Biogas News* is devoted to providing up-to-date information for producers, industry professionals, academia and the general public. Topics such as funding, safety, performance evaluations, farm lessons learned and current research will be covered. *Biogas News* will be published quarterly and distributed at no charge.

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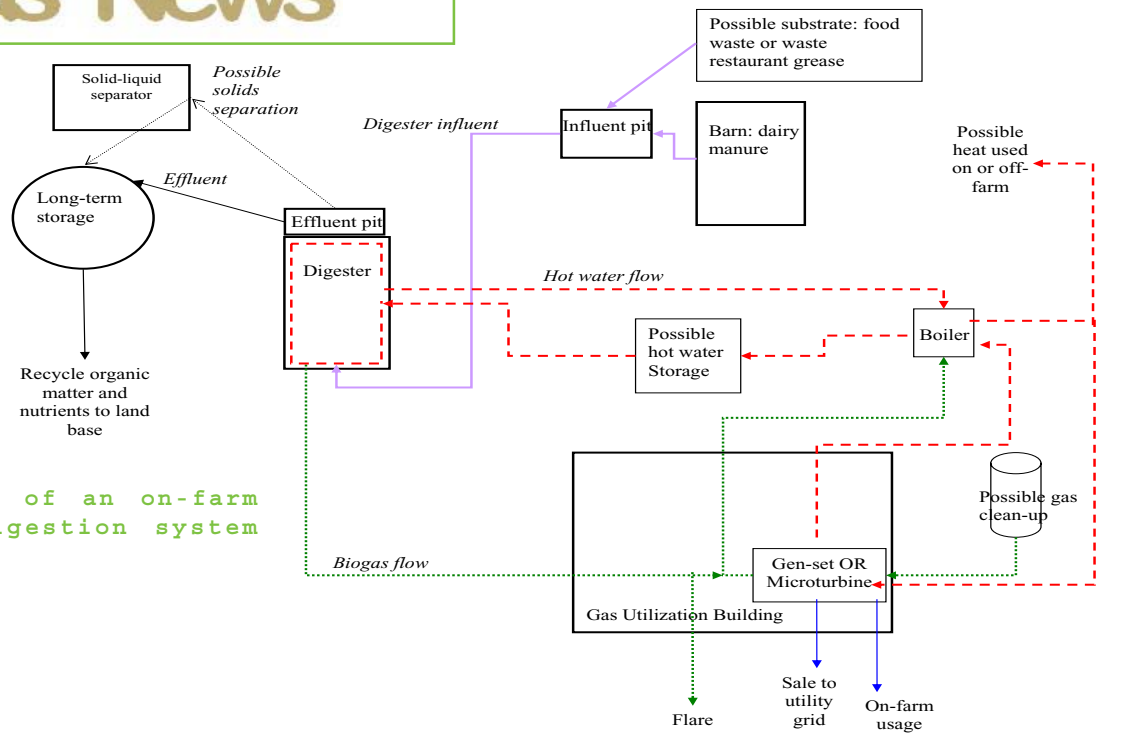
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*The goal of this newsletter is to provide valuable and effective information. Please send your suggestions, comments and submissions to the contact information on the back page. Your ideas are highly welcome.*

Dairy producers are seeking to increase implementation of environmentally responsible practices, such as anaerobic digestion, to meet the demand for "green" market products and energy. *Biogas News* is a forum to exchange ideas of furthering implementation of these systems.



Flow diagram of an on-farm anaerobic digestion system



## News and Events

3/2008: NYSERDA holds Innovations in Agriculture conference in Liverpool, NY.

11/2007: NYSERDA offers RPS incentives, on a first-come first-served basis for new digester construction, and for maintenance of previously installed systems, including the purchase of new equipment.

9/2007: Sheland Farms powers-up engine-generator set using biogas produced in newly constructed vertical plug-flow digester.

8/2007: We were reminded that manure gases can be deadly, when five family members were overcome with manure gas in Virginia.

2/2007: Morrisville anaerobic digester commissioned; engine-generator set begins producing power.

1/2007: The ASERTTI protocol was released to standardize the process of evaluating on-farm anaerobic digesters.

## UPCOMING EVENTS

Spring 2008 Manure/Nutrient/Renewable Energy Workshops to be held in New York State.

4/1: Schuylerville American Legion

4/2: Miner Institute, Chazy, NY

Two other locations (CNY, WNY) sites and dates to be determined. For more information contact us.

## CU Professor Jewell Retires



After leading a large Dept. Of Energy sponsored program in the 1970's to develop economic digester systems for small farms, Bill led an involved effort to investigate the use of energy crops for biogas production. His most recent work focuses on cost-effective digestion and by-product recovery to minimize dairy waste effluents. He intends to continue research and innovative commercial work in the field after retiring from Cornell University.

## Twin Birch Farm

Twin Birch Farm, a 1,200-cow dairy located in Skaneateles, N.Y., is *Biogas News* premier edition's featured on-farm anaerobic digester system.

Dirk Young, Twin Birch Farm owner, had a goal in 2000 to construct a manure-fed anaerobic digester and use biogas to fire microturbines. Dirk reached his goal last year after overcoming several project-threatening hurdles. He successfully commissioned the digester in the fall of 2006 and began firing four Capstone 30-kW microturbines with biogas in January 2007. Dirk chose microturbines over internal combustion engines, as they appeared to be cheaper and easier to operate in the long run. He also wanted to demonstrate biogas could be used to fire them.

At the onset of the project, Twin Birch hired a designer to engineer and construct the digester. As the construction phase ended and the system commissioning phase began, major problems surfaced demonstrating flaws in the design. When the water table rose, the below-grade cast-in-place digester vessel temporarily rose above-grade. The design phase did not consider subsurface drainage. The dairy installed tile drainage to correct the problem.

Another notable issue was the inability of the concrete top to retain biogas in the digester biogas headspace. Leaking biogas proved fatal to the mechanical and electrical equipment mounted on the concrete top. It also resulted in extensive odor emissions. Multiple attempts were made to seal cracks but in the end, the farm relocated the equipment to a building constructed adjacent to the digester. A blower now conveys biogas from the digester to the biogas utilization building, and leaking biogas has been reduced.

Dirk's daily log of digester performance shows metered biogas production for January 2008 averaged 115,000 ft<sup>3</sup> per day with a manure source of 1,995 animals (cows, heifers, and steers) or 58 ft<sup>3</sup>/animal-day. The calculated biogas methane concentration was 58%.



Above: De-watering and compressor equipment in foreground; Capstone microturbines in background

Another notable achievement was the successful introduction of Rumensin<sup>®</sup>-laden manure to the digester. Rumensin<sup>®</sup>, a cow feed additive, can negatively affect a digester's operative microbes. By incrementally adding Rumensin<sup>®</sup> to the cows' diet, the digester was able to adjust and maintain biogas production.

Dirk's commitment to making the system work and preventing it from becoming a white elephant, resulted in success.

"This is the most frustrating project we have ever pursued on the farm," said Dirk in 2004. Earlier this year Dirk announced, "The digester system is now working well and overall was worth the frustration. It is the right thing to be doing."

## Monitoring Update

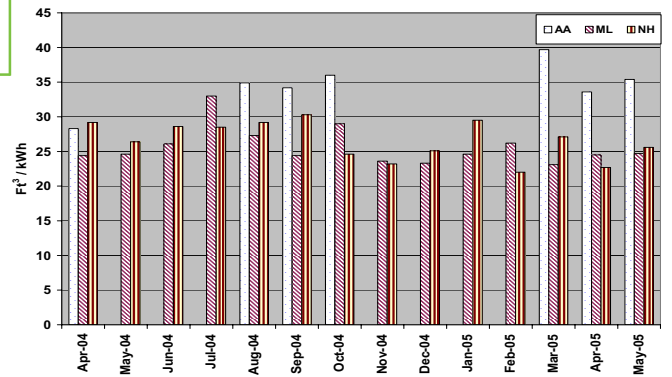
Seven of 11 New York State farms employing anaerobic digestion are in the initial stages of monitoring following the Association of State Energy Research and Technology Transfer Institutions (ASERTTI) protocol. Samples of digester influent and effluent, and when applicable, samples of food waste(s), are being collected in conjunction with biogas samples and farm data. Sample collection will continue over a 12-month period on a bi-weekly basis.

Equipment is now being procured, such as temperature and pressure compensated meters to measure biogas flow to each piece of gas utilization equipment.

Digester influent pump calibration tests have been performed for 4 of the 7 farms, to determine pump efficiency, which is used in conjunction with operating records to determine the mass of digester influent.

Engine-generator set data will be used to assess the performance of converting biogas to electrical power.

Capital costs and other data will be used to determine the economic viability of each AD system.



Biogas volume (ft<sup>3</sup>) utilized at AA, ML and NH for each kWh generated from 4/2004 to 5/2005

## Big-5 Interim Report

Under a project funded by NYSERDA, Cornell has been working with several NYS dairy farms using anaerobic digesters, to assess key items such as:

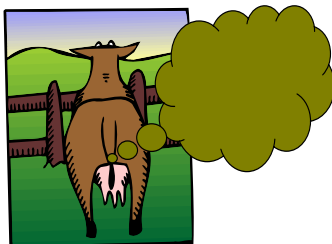
- Waste stabilization performance
- Effect on manure nutrient composition
- Waste-to-energy conversion
- Biogas utilization equipment efficiencies

An interim project report is available on-line at

[www.manuremanagement.cornell.edu](http://www.manuremanagement.cornell.edu)

Interesting findings include:

- Average VS reduction of 26% for plug-flow digesters
- A complete mix system with imported food wastes had a VS reduction of 70%
- 3 of the 5 farms monitored use biogas to fire engine-generator sets. Average electrical energy generated per month was: 27,883, 52,922, and 92,934 kWh.
- Volume of biogas needed to generate a unit of energy was, on average: 36.1, 25.1, 26.6 ft<sup>3</sup> of biogas per kWh of energy.



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