

Anaerobic Digestion at Roach Dairy: Case Study

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Anaerobic digestion overview

Digester type	Complete mixed
Digester designer	RCM International
Date Commissioned`	Planned: January 2010
Influent	Raw manure
Stall bedding material	Separated manure solids (switched from shredded paper)
Number of cows	1,350 dairy cows
Rumensin[®] usage	Yes
Vessel dimensions (dia. x ht.)	120' x 18'
Cover material	Floating Insulated HDPE Cover
Design temperature	100°F
Estimated total loading rate	52,300 gallons per day
Treatment volume	1,501,900 gallons
Estimated hydraulic retention time	28 days
Solid-liquid separator	Yes; separated manure solids used for bedding
Biogas utilization	450-kW engine-generator set
Carbon credits sold/accumulated	Plans to in future
Monitoring results to date	No

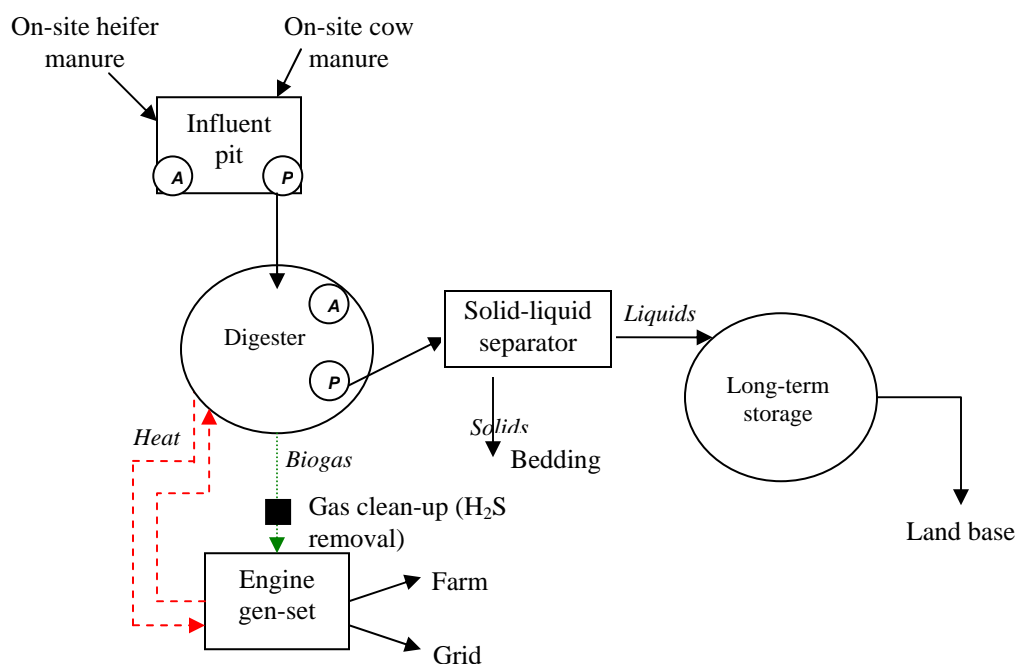
Farm overview

- Roach Dairy (Scipio Center, NY) is located in Cayuga County
- The farm is owned and operated by Tom and Diane Roach
- The farm has 1,350 milking cows and 1,400 replacement stock.
- Digester yet to be commissioned

Why the digester?

The farm decided to install the digester system for several reasons, one of which was to reduce odor emissions from some fields when manure was land-applied. In addition, the farm feels that dairies are going to transition to anaerobic digestion as a typical manure management strategy. The farm expects to realize savings on bedding and electricity costs, and to position the digester as an income source for the farm. The farm plans to pursue sale of electricity from the digester system.

Digester System



System and process description

A 1,501,888-gallon, mixed, mesophilic digester with a design hydraulic retention time of approximately 28 days, was designed by RCM International of Berkeley, California. Manure from 1,350 on-farm milking cows and heifer manure, is pre-blended prior to being pumped to the digester. The digester vessel is a circular above-ground concrete tank 120' in diameter and 18' in height with the liquid level at 16'. The digester tank has an in-tank heating system and 4" of extruded foam insulation surrounding the tank. Five mixers are inserted through the top of the digester tank.

Liquids and solids process description

Manure will be collected pre-digestion in a digester influent holding pit, and transferred to the digester using a chopper pump located in the influent pit. After digestion, the effluent will be separated using a solid-liquid separator (SLS) and liquids will be transferred to an existing long-term storage lagoon and then subsequently land applied; the solids will be used for stall bedding.

The farm currently uses shredded paper bedding, but will be switching to post-digested separated solids as the digester begins operating and solids are collected.

Heat and electricity generation

The farm has purchased a 450-kW Gauscor engine procured from Martin Machinery. Generated power is used on-farm and excess is sold to the grid under the provisions of the New York State net metering law.

Economics

USDA provided grant funding. The farm applied and was accepted to participate in the NYSEDA Renewable Portfolio Standard (RPS) program, which provides a performance based incentive of 10 cents per kWh produced by the engine over 3 years. The farm also plans to trade carbon credits and will receive some revenue in doing so.

Benefits and Considerations

Benefits	Considerations
<ul style="list-style-type: none"> • Odor control • Offset of current electric costs. • Potential revenue from: <ul style="list-style-type: none"> • Sale of excess electricity • Sale of Carbon Credits • Nutrient conversion, allowing use by plants as a natural fertilizer, if effluent is spread at an appropriate time • Pathogen reduction • Improved manure management and flow 	<ul style="list-style-type: none"> • Possible high initial capital and/or high operating costs • Costs to upgrade utility system • Careful attention to equipment maintenance and safety issues due to the characteristics of raw biogas

Lessons Learned

The farm reported the following lessons learned to date as a result of engaging in an anaerobic digester project.

- Discuss your project with your local utility company representative prior to spending any money or signing any agreements. Determine estimated costs for utility upgrades and interconnection as one of the first aspects of a project.

- When calculating revenue, utilize experienced NYS Electrical P.E. to calculate revenue from the sale of electricity and to calculate cost savings from using digester electricity for on-farm electric needs.
- When developing the project budget, include all costs, especially any labor costs provided by your farm.
- Carefully assess the terms and conditions of all contracts. Consult with legal counsel as to the legal definition of certain words and phrases before signing any contracts.
- Enter into an agreement with an engineering firm to design and provide detailed drawings and specifications which can be sent to General Contractors to obtain competitive quotes. Specifications should be performance-based specs with a submittal process to engineer for approval of specified equipment and materials. Ensure the engineer of record is licensed in the State of New York. Keep the purchasing of equipment and materials as competitive as possible to ensure a substantial savings.
- Understand the limitations and restrictions placed on you if you sign an agreement with an engineer which requires purchase of equipment and materials from that engineer.
- Hire the engineer to perform construction inspections on a regular, as need basis to ensure the engineered design is being followed and quality construction techniques are in place. Do not allow any deviations from the design unless approved in writing by the engineer of record. Require the design engineer to complete final sign-off on approval of the system and successful start up.

Who to Contact

- Tom and Diane Roach. Roach Dairy's owner. Phone: 315-729-3558
- Curt Gooch, Manure Treatment Specialist, PRO-DAIRY Program, Cornell University. Phone: 607-255-2088, Fax: 607-255-4080, Email: cag26@cornell.edu

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