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Industry:

Digester Systems Project
Developer

Project Type:

Anaerobic digester project located on the 350-cow dairy in Rutland, MA. The digester uses a blend of 25% manure and 75% food waste to produce electricity, heat, bedding and crop fertilizer.

Project Goal:

The main goal was to highlight three key concepts:

- The digester produces enough biogas to generate electricity for the farm and the community.
- The digester system generates approximately \$200 per cow per year in revenue and cost savings to the dairy.
- Jordan Dairy Farms is an example of how a digester is helping Massachusetts solve food waste recycling mandates in the state.

Study Prepared by:

Jerry Bingold, VP Energy & Business Development

Date of Case Study:

January 22, 2018

Small Farm Digester – A Sustainable, Closed-Loop Business Model

Jordan Dairy Farms, Rutland, Mass.

OVERVIEW

Jordan Dairy Farms, located in Rutland, Mass., was the first dairy in the Massachusetts to use anaerobic digester technology to blend farm manure, food scraps, and food processing by-products to produce biogas that is converted into power. The digester system, owned and operated by Vanguard Renewables, has been in operation since 2011 and uses approximately 25 percent manure from 350 cows and 75 percent organic food waste.

Food waste is delivered daily to the farm at no cost to the dairyman. The digester generates approximately \$200 per cow per year in revenue and cost savings for the dairy from power, heat, bedding, and fertilizer that increased crop yield.

BACKGROUND

Collaboration and third-party investment can deliver profitability to a small farm digester despite challenges.

Although some large dairy farms have been utilizing digesters for several years, the expertise, time, and financial requirements of a digester project can be burdensome for smaller farms. That’s why Jordan Dairy Farms collaborated with Vanguard Renewables to

build and operate the Farm Powered™ anaerobic digester. Vanguard Renewables partners with area food processors and users to supply the food waste needed for the digester. “The farmers can’t do it on their own,” says Gerald Palano, alternative energy specialist at the Massachusetts Department of Agricultural Resources. “The dairies need to partner with companies that specialize in financing, building, and operating farm-based digesters, such as Wellesley-based Vanguard Renewables...” *CommonWealth Magazine 1/9/18*

Vanguard Renewables Closed-Loop Farm Powered™ Process

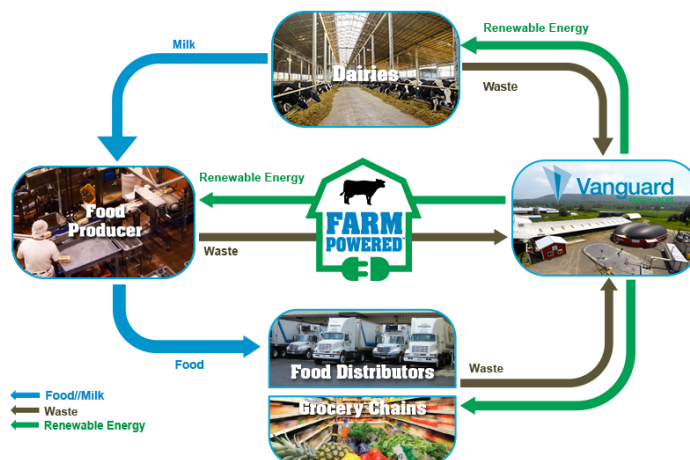


Image courtesy of Vanguard Renewables.

Jordan Dairy Farms recognized that a manure-only anaerobic digester was not economically feasible and sustainable. Without additional revenue from tipping fees and an increase in the amount of daily food waste, the project was not viable. To address this problem, Jordan Farms partnered with what is now Vanguard Renewables to move the project forward, gain the benefit of adding food waste to the digester recipe for a profitable operation. In 2014 when Massachusetts became the first US state to require organic food waste be handled via a method other than landfill deposition, the alternative of sending food waste to an on-farm digester became increasingly appealing. This shift resulted in the availability of enough food waste to assure profitability of the digester while also eliminating landfill use, and reducing greenhouse gas (GHG) emissions, odors, and chemical fertilizer application.

KEY LEARNINGS

The Jordan Farms digester is an example of collaboration and third-party investment that delivers results despite challenges.

Key points resulting in a successful food waste/manure digester project:

- A long-term agreement for adequate supply of organic food waste from food processors.
- An attractive power purchase arrangement through the electrical utility.
- Performance guarantees from the digester technology provider.
- Professional management so the dairy producers can farm and leave the management of the digester project to a professional owner/operator.

KEY BENEFITS

Power savings/Production — Vanguard Renewables owns and operates the AD system located on Jordan Dairy Farms. The digester system supplies the total electricity needs of the farm. Because the entire farm’s power is supplied by the digester, the farm no longer pays the utility for electricity.

Electricity sales — The digester is producing enough electricity to power the farm and provides energy via net metering credits to area businesses. Polar Beverages and Wachusett Brewing Company purchase all of the electricity produced at the farm.

Environmental benefits — Food manufacturers and users can comply with the Massachusetts organic food waste ban by sending food waste to the digester that would have previously gone to a landfill. They can also purchase power from the Farm Powered digester via net metering credits. These sustainability initiatives can be important to meet corporate sustainability goals and appeal to sustainably-conscious customers.

Sustainability benefits — By incorporating the Farm Powered anaerobic digester, the dairy reduces greenhouse emissions, farm odors, and phosphorus and nitrogen soil loading and runoff, as well as the farm’s dependence on synthetic fertilizer.

Economic benefits — The added revenue and cost reductions from the digester operation provide income to help sustain the dairy:

- Manure is processed by the digester significantly reducing the dairy’s manure management costs.
- The dairy saves on fertilizer costs and reduces the use of chemical fertilizer since the digester’s effluent is higher quality than most chemical fertilizers.
- Combining manure and food waste allows the digester to produce more electricity than needed by the dairy. The excess power is uploaded to the grid and sold via net metering credits.

RESULTS

More than 20,000 tons of food waste annually from food processors and users is combined with more than 9,000 tons of manure a year from the farm in a 500,000-gallon digestion tank. Manure and food waste are mixed and microorganisms convert sugars, fats, and other compounds into biogas annually producing more than 7,008 MWh of renewable energy and odor-free, organic, liquid fertilizer to increase crop yields. The anaerobic digester has revolutionized how the farm gets power, while fitting seamlessly into this New England dairy farm.

Key Benefits & Results:

- Jordan Farms is a unique partnership between the dairy, third-party developer and technology suppliers.
- It is an effective business plan for large and small dairies to pay back initial capital investments from gross receipts from electricity, bedding fiber, tipping fees and environmental credits.
- The digester annually produces 7,008 MWh of renewable energy, which is equivalent to the annual energy needs of 1,600 homes while offsetting 19,779 lbs. of CO2 emissions daily.
- The system improves manure management, reduces odors and produces fertilizer to increasing crop yields.



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CONCLUSION

Since becoming the state's first farm to co-digest food and manure in 2011, Jordan Farms has been successful enough to increase digester biogas production and its electric generator size from 300 kilowatts to 800 kilowatts. Randy Jordan, who runs the fifth-generation family farm with his brother

Brian, plans to add a one-megawatt system on another farm they own in nearby Spencer. "People ask if we're successful. And the way I describe success is that the doors are still open," says Jordan. "We're still making milk and we're still making electricity."

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Jordan Dairy Farms Digester is a Sustainability Success Story



Jordan Dairy Farms' anaerobic digester.



Jordan Dairy Farms' anaerobic digester adds approximately \$200 per cow per year to the dairy operation.

Photos courtesy of Vanguard Renewables.

Organizations Involved:

Farm or facility

Jordan Dairy Farms

Electrical Utility

National Grid

Engineers

Quasar Energy Group

Contractor

Vanguard Renewables

Developers

Vanguard Renewables

Funding and Assistance:

1603 Investment

Tax Credit program

Bank or Lender

Farm Credit

Equipment and Technology:

Manure collection

Scraped from slat barn into pit and pumped to digester

Preprocessing

Food waste receiving, testing and manure mixing tanks

Energy systems

Martin Energy Group



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JORDAN DAIRY FARMS DIGESTER PROJECT BY THE NUMBERS

Location type	Located in Rutland, MA Jordan Dairy Farms, Inc. is a 5th Generation Dairy Farm run by brothers Randy and Brian Jordan. Jordan Dairy Farms, Inc. is home to 800 head of Holsteins, milking 300 cows three times per day. The farm utilizes 950 acres of fields planted with corn or hay.
Number of animals	350 milking head
Type of bedding	Manure fiber
Manure collection	Scraped from slat barn into pit and pumped to digester
Daily flow	Complete mix designed to process 65,000 gallons/day of 25% cow manure and 75% food waste
System designed by	Vanguard Renewables, LLC and Quasar Energy Group
Date operational	June 2011
Energy Produced/required	Parasitic load of approximately
Biogas production	200,000 standard cubic feet/day
Installed electrical generation	800 kW
Products produced	Electricity, fertilizer, bedding, compost, heat
Residual materials	Separated solids and liquids
Residual storage	Lagoons
Residual use	Crop application that reduces fertilizer purchases
Electric utility	National Grid
Engine brand	Martin Machinery
Feedstock	Food waste and manure
Products/by-products	Electricity/fertilizer/bedding/compost
Ownership structure	Vanguard Renewables (developer owned and operated)

For more information about Vanguard Renewables, email John Hanselman, Executive Chairman at jhanselman@vanguardrenewables.com, or to join our mailing list, email info@newtrientllc.com.

Newtrient’s mission is to help all dairy farmers reduce the environmental footprint of manure while enhancing their economic opportunities and their social license to operate. The information contained in this case study was developed with the cooperation of the organizations involved and Newtrient has endeavoured to make sure it is accurate and complete as possible.



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