Energy Resources Center

Technical Education and Analysis for Community Hauling and Anaerobic Digesters

TEACH AD

Project Profile

Barstow's Longview Farm

Manure and Food Waste Co-Digestion

BACKGROUND

Barstow's Longview Farm is a 450-acre dairy farm located in Hadley, Massachusetts. In 2013, they formed a strategic partnership with Vanguard Renewables, Agri-Mark/Cabot Creamery Cooperative and others to install one of the first farm anaerobic digesters in New England. They expanded the digester in 2016 and have since been using it to treat manure generated on farm from their 600 cows (300 milking), as well as food waste from supermarkets and food manufacturers. They have feedstock supply agreements with partners and other food businesses like Geissler's Supermarkets, HP Hood, Garelick, Cabot Creamery/Agri-Mark Co-operative, Wind River, Cains, Amenico, and McDonald's. The farm produces about 15,000 pounds of milk daily and has also opened Barstow's Dairy Store and Bakery on the site. The digester is just one way the Barstow family is working to sustain the farm for future generations. In addition, they transitioned to no-till planting, allowing the soil to sequester more carbon than traditional moldboard plowing. They also use off-season cover cropping to help fix nitrogen in the soil and minimize erosion from wind and rain. The farm also uses robotic milkers so that cows can go in for milking whenever they want, improving their overall comfort and productivity. Before the robots the cows were producing about 7 gallons of milk per cow per day, after they produce about 10 gallons per cow per day.

HIGHLIGHTS

LOCATION: Hadley, Massachusetts

SECTOR: Agriculture

FEEDSTOCK PROCESSED: Manure: 9,125 tons per year; SSO and food waste: 24,000 tons per year

FOOD WASTE: Food production waste (e.g., from Agri-Mark/Cabot Creamery Cooperative) and source separated organics (e.g., from Geissler's Supermarkets)

DIGESTER TYPE: Complete Mix

BIOGAS YELD: 23,900,000 SCF/year

BIOGAS USE: Cogeneration (CHP)

CHP size: 800 kW

ELECTRICITY PRODUCTION: 7,000 MWh/year

IMPLEMENTATION COST: $6.3M (per Daily Hampshire Gazette article, 9/24/19)

THERMAL APPLICATION: Digester, buildings, water for barn cleaning

THE PROCESS: HOW IT WORKS

The farm receives 24,000 tons of food and beverage waste per year which they combine with over 9,000 tons of manure generated on farm and feed into their anaerobic digester. Delivered food waste is separated into pre-digestion mixing tanks sorted by energy content. The highest energy content tank is fitted with a biofilter for odor control. The digester, designed by Martin Construction Resource LLC, includes a 600,000 gallon tank. The project was developed and managed by Vanguard Renewables who also operates it for the farm as part of the Vanguard Renewables Farm Powered™ anaerobic digester partnership. Inside the digester's oxygen free environment, microorganisms convert sugars, fats and other

Aerial view of Barstow's Longview Farm.

compounds into biogas, carbon dioxide and other trace compounds. Feedstocks are treated in the digester between 25-30 days on average (hydraulic residence time). The digester tank is mostly underground and has a flexible cover. The biogas is cleaned with an iron sponge scrubber to remove hydrogen sulfide (H2S).

The biogas fuels two engine generator sets with a total generating capacity of 800kW. Together they produce between 5,100 and 7,000 MWh of renewable energy per year that powers the farm and partner Cabot Creamery, and the rest is fed into the Eversource grid. Recovered heat from the engine generator sets is used to heat the digester, and water used for barn cleaning, and heating on-site buildings and family homes. Liquid digestate is kept on farm and serves as a low-carbon, nutrient-dense fertilizer that is nearly odorless. This liquid is provided free of charge to the farm to spread on their fields lessening the farm's dependence on synthetic or traditional fertilizers. The Vanguard Renewables representative reports anecdotally that the farmers often see increased yields with the digestate over raw manure and commercial fertilizer. Solids are separated after digestion, and composted. Food waste Barstow's receives comes from a pre-processing site known as the Organics Recycling Area which is owned and operated by Vanguard Renewables. This facility de-packages and processes expired commercial goods, off-spec batches from producers, or unsafe to eat food and beverage products.

WHAT IS SIGNIFICANT ABOUT THIS PROJECT?

This project illustrates a closed-loop life cycle with an anaerobic digester at its heart. The digester processes manure and food industry organic wastes, including from the nearby creamery, into renewable energy and fertilizer. The digester system generates energy that powers the farm and the creamery, and feeds into the grid making it available to others. This project also demonstrates the feasibility of using a digester and food-waste co-digestion on a medium sized dairy. Another innovation is the Organics Processing Area, which in Barstow's case is off site, that tests and prepares feedstocks, eliminating the need for the farm to have extensive reception equipment. De-packaged and digester-ready food wastes are delivered regularly to the farm in known quantities and with known qualities. Finally, it also shows how state commitments to reducing food waste going to landfills and corporate commitments to reducing carbon footprints can promote farm-industry partnerships for renewable energy generation and carbon emissions reduction.

Food waste mixing tanks.

> ***"Our motto is 'Looking Forward since 1806' - We strive to consider the Earth and our community and to grow a more efficient and sustainable business."***
>
> ***Steven Barstow II, Barstow's Longview Farm***

BENEFITS FOR THE ENVIRONMENT/ECONOMY

- ✓ Avoided 20,000 tons of CO2 emissions annually
- ✓ Reduced carbon footprint of farm operations by 85 percent
- ✓ Improved local air quality
- ✓ Reduced use of chemical fertilizers by 90 percent
- ✓ Avoided landfilling of 24,000 tons of food waste per year
- ✓ Reduced nutrient runoff and reduced pathogens
- ✓ Reduced transport emissions through local use and re-use of nutrients

BENEFITS FOR THE FARM

- ✓ Reduced energy cost
- ✓ Produced 6-10 million gallons of liquid organic fertilizer
- ✓ Increased flexibility in land application of digestate
- ✓ Produced free heat
- ✓ Diversified income
- ✓ Reduced odor

FOR MORE INFORMATION

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