



CASTELANELLI BROS. DAIRY – LODI, CA

SYSTEM DESIGN

For more than 80 years, the Castelanelli Brothers Dairy has produced high quality dairy products. Today, the California farm not only produces more than 13,000 gallons of milk per day, but it also produces more than 4,000 kWh/day of electricity from methane captured in a covered anaerobic lagoon. Prior to the installation of a biogas utilization system, manure was stored in two uncovered anaerobic lagoons that were sources of odors and methane emissions. Since the covered lagoon began operating in September 2004, odor has been reduced significantly and the captured methane is used to generate electricity. The electricity is used for on-farm needs, with excess provided to the local utility.

The dairy's milking herd is generally between 1,500 and 1,600 cows, along with 400 to 450 dry cows and 1,200 to 1,400 heifers. The milking herd and dry cows are housed in open-sided free-stall barns with sand used as bedding, while the heifers are confined in open lots with free-stalls with digested solids used as bedding. Because the cows also have free access to an unpaved corral during the dry season, not all the manure is collected for digestion. Manure from the free-stall alleys is flushed to a 2.75-acre covered anaerobic lagoon. The two pre-existing lagoons store the covered lagoon effluent and are the source of flush water. A high density polyethylene (HDPE) cover captures biogas, which fuels a 300 kW engine-generator set. The engine-generator uses about 65 percent of the biogas generated and the remainder is flared.

PROJECT BENEFITS

A 2008 AgSTAR study, "[An Evaluation of a Covered Anaerobic Lagoon for Flushed Dairy Cattle Manure Stabilization and Biogas Production](#)" documented the following benefits of this project:

- If an appropriate net metering agreement were in place, revenue from the sale of electricity could be adequate to recover the capital investment in a reasonable time and generate long-term income.
- Substantial water quality protection (i.e., reduced oxygen demand and reduced pathogens in lagoon effluent).

- Reduced odor and greenhouse gas emissions (19,000 tons per year CO₂ equivalent basis).

The project was funded in part by California's Dairy Power Production program, which is administered for the California Energy Commission by Western United Resource Development, Inc. Other funding included USDA's Rural Business Cooperative Service through their Renewable and Energy Efficiency Grants Program and the California Public Utilities Commission's Self Generation Incentive Program, which is administered by PG&E.



Photo: Castelanelli Bros.

- **Population Feeding Digester:** 3,200
- **Baseline System:** Storage Lagoon
- **Digester Type:** Covered Lagoon
- **System Designer:** RCM International, LLC; Cover installed by Environmental Fabrics, Inc.
- **Biogas Generation:** 89,148 ft³/day
- **Biogas Use:** Electricity
- **Generating Capacity:** 300 kW
- **Receiving Utility:** Pacific Gas & Electric Company
- **Project Funding:** USDA