



CHP  
TECHNICAL ASSISTANCE  
PARTNERSHIPS

# Forest Glen Oaks Dairy Dayton, Oregon

## 370-kW Digester Biogas-Fueled Engine



### Quick Facts

**LOCATION:** Dayton, Oregon  
**MARKET SECTOR:** Agriculture—Dairy Farm  
**FACILITY SIZE:** 2,125 milking and dry cows  
**EQUIPMENT:** 1-370 kW 2G Cenergy MAN reciprocating engine  
**FUEL:** Anaerobic digester biogas-fired  
**USE OF THERMAL ENERGY:** Digester heating  
**TOTAL PROJECT COST:** \$2.2 million  
**YEARLY ENERGY GENERATION:** 3.1 million kWh  
**CHP IN OPERATION SINCE:** 2010

### Site Description

Located about 40 miles southwest of Portland, the 704 acre Forest Glen Oaks dairy consists of dairy farm facilities, with hay and pasture lands that produce forage for the livestock. The dairy produces certified organic milk from 1,850 registered Jersey milking cows. The dairy also hosts about 275 dry cows, 175 heifers, 525 calves, and 40 bulls. Related lines of business include breeding prized Jersey bulls, and, with the installation of an anaerobic digester biogas-fueled combined heat and power project, producing and selling electrical energy derived from dairy wastes to local utility Portland General Electric.

### Reasons for CHP

The dairy waste-to-energy operation was viewed as an important step in upgrading the farm's sustainability and in optimally managing its resources. Manure, bedding, and wasted feed from the barn alleyways are scraped to an underground liquid collection tank. Wastewater from the herd holding bin and milking facility is similarly transferred to the underground liquid storage tank by gravity flow through underground pipelines. The waste slurry is then pumped to anaerobic digesters for treatment.

Two anaerobic digesters process 100,000 gallons of dairy wastes per day into biogas and stabilized sludge. The process begins by collecting and pumping the waste slurry into two digester tanks. The liquid is heated and maintained at a temperature of 70°F to 75°F in an oxygen-free environment, where anaerobic bacteria in the tanks digest the manure and produce a methane-rich renewable biogas. The biogas is cleaned of water vapor and impurities and then used to fuel a 370 kW combined heat and power system. Waste heat is used to heat the digesters, while the annual electrical energy production of 3.1 million kWh per year is sold to Portland General Electric. The project produces enough electrical energy to power nearly 300 average Oregon homes.

## CHP Equipment & Configuration

The CHP project includes a biogas treatment train to remove water vapor and other impurities. The biogas is then compressed and used as fuel in a 370 kW 2G Patruus MAN reciprocating engine. The engine produces up to 1.6 MMBtu/hour of recoverable thermal energy. An enclosed flare system and vapor combustor is also available to burn the methane-rich biogas when the engine/generator is off-line.

## Secondary Benefits of the CHP Project

Collecting and processing the dairy wastes help protect water quality in local watersheds, while combustion of the biogas naturally produced in many waste decomposition processes keeps methane —a potent greenhouse gas—from entering the atmosphere. The nutrient-rich digester product liquid is used on-site as a fertilizer to grow feed for the cows and the process also produces an inert fiber through composting for use as clean bedding material for the dairy cows. Excess fiber is sold to nearby vineyards to be used as mulch around the base of grape vines.



## Biogas Treatment Requirements

The biogas treatment system includes refrigerated dehumidification, re-heating, and hydrogen sulfide (H<sub>2</sub>S) removal steps. Ammonia in the biogas is also reduced during the refrigerated drying process steps, precipitating in other condensates. The enhanced gas cleanup reduces contamination of engine oil and saves operating costs as it extends the lubricating oil change out intervals. Gas drying also optimizes the combustion process in the engine, resulting in increased engine efficiency and increased electrical energy generating capacity due to a lower biogas consumption rate.

## Project Ownership and Incentives Provided

Revolution Energy Solutions owns and operates the biogas-fueled CHP plant located at the Forest Glen Oaks dairy. The digestion technology that they selected can operate at relatively low temperatures and handle very high loads of nitrogen and ammonia. The renewable energy project qualified for a \$441,660 cash incentive from the Energy Trust of Oregon and received a \$400,000 Oregon Business Energy Tax Credit. The project is also eligible for Oregon biomass producer/collection tax credits.

## For More Information

[U.S. DOE NORTHWEST CHP TECHNICAL ASSISTANCE PARTNERSHIP \(CHP TAP\)](#)

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**Jamie Bansen**  
Co-Owner and Manager  
Forest Glen Oaks Dairy  
(503) 472-6342

*"We're an organic farm so can't use commercial fertilizers. We used to spread manure on pastures after they were grazed. The pastures bounce back much faster when treated with digester liquid, because the Nitrogen is in a form that is more readily available to crops."*

*---Jamie Bansen, co-owner, Forest Glen Oaks Dairy*

This Project Profile largely draws from information presented in the Energy Trust of Oregon's Success Story "Dairy Cows Help Power the Grid" and 2G Cenergy's Forest Glen Oaks Project Gallery.