U.S. DEPARTMENT of ENERGY | Office of Energy Efficiency and Renewable Energy
Geothermal Technologies Office

GEOTHERMAL HEAT PUMP CASE STUDY:

Delta Electronics

Photo from Delta Electronics

Name: Delta Electronics

Location: Fremont, California

Site Type: Manufacturing Facility

Size:

- 175,000-square-foot building
- 12,000 gallons of water circulating through more than 20 miles of underground piping
- Piping averages 22 feet beneath the building
- Serves building's 580 tons of dominant cooling load
- Integrated with 1.1 megawatts of photovoltaic (PV) solar, 500-kW dual-side PV on a carport, and a 125-kW battery storage system

Unique Features:

- Uses company's own power electronic hardware, including controls, sensors, and air blowers for the heat pump system
- Horizontal piping system

Efficiency Results:

- Provides 80% of heating and cooling at facility, remaining covered by heat strips and refrigerant system
- Leadership in Energy and Environmental Design (LEED) certified

Energy Use: Facility uses 15,500 Btu per square foot per year, 70% less than average LEED building

Funding Sources:

- Delta Electronics

A Rock-Solid Heat Pump in Silty NorCal

At Delta Electronics' headquarters in Fremont, California, geothermal heating and cooling just makes the most sense. Situated over an East Bay estuary in comfortably mild climates, the Fremont facility is an ideal site to showcase and sharpen Delta's own geothermal products while reducing costs.

In 2015, the Taiwan-based electronics manufacturer decided its new U.S. center of operations would be a beacon of building efficiency, and that geothermal would be a cornerstone.

A Unique System Design

Delta leadership selected a design in which pipes are laid horizontally across a wide area at a shallow depth. On the surface, Delta acquired over 2,000 solar panels to power the geothermal heat pumps (GHPs) and other electric loads.

Numerous smart devices and automated energy savers—many manufactured by Delta—were also integrated with the heat pump system, creating the perfect environment for Delta to observe and optimize its energy efficiency.

Less Energy Use

Ninety-two miles of pipes pump fluid around Delta's Fremont facility. The facility is situated with wetlands on one side, mountains on the other, and an active fault zone beneath. *Photo from Delta Electronics*

Performance Over a Decade

The heat pump system has not faltered or failed since deployment. Daytime temperatures rarely exceed the pump's capacity to cool, and it operates silently even at max output. Delta proudly displays the system's design and efficiency metrics on a 100-inch screen at the entrance to its facility, showing visitors how subterranean energy can achieve efficient operations.

More Than a Heat Pump for Delta

Geothermal heat pumps are not always the least expensive option, but Delta leadership saw a special investment in their system: It would become a showcase of Delta technologies and a pilot site to improve the company's products. Delta added its water pumps, air blowers, drives, compressors, controls, and sensors to the heat pump system, and Delta engineers collect performance data at every opportunity.

The facility is fully automated by a Delta supervisory control and data acquisition system. At 4 a.m., it commands the heat pump to turn on, cooling the building by 8 a.m.. As cool air ventilates the rooms and radiates through the floor, the rest of the building comes alive with responsive lighting and windows.

Every day, the company logs new data to improve products and better understand the geothermal heat pump technology. When customers visit the facility for their own geothermal project, Delta representatives show the same products in action.

> We are a power electronics company and energy efficiency is important to us. We want to walk what we talk—to save energy every day and improve the overall efficiency of the building. Because of all of this, the best decision was geothermal, and it's been excellent.
>
> Dave Morse, VP of Industrial & Automation at Delta Electronics America

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Visit the Case Studies page to see more examples of geothermal heat pumps in action.

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For more information, visit:
www.energy.gov/eere/geothermal/geothermal-heat-pump-case-studies

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