PROJECTS
System Profiles

COMMERCIAL SOLAR THERMAL POOL SYSTEM:
College of Marin, Physical Education Center

Overview

DESIGN SERVICES: SunWater Solar, sunwatersolar.com; Tipping Mar & Associates, structural engineering, tippingmar.com; Rumsey Engineers, mechanical engineering, rumseyengineers.com

LEAD INSTALLER: Adrian Dyer, foreman, SunWater Solar

DATE COMMISSIONED: July 2009

INSTALLATION TIMEFRAME: 60 days

LOCATION: Kentfield, CA, 37°N

SOLAR RESOURCE: 5.17 kWh/m²/day, system yield is approximately 3.1 kWh/m²/day at 60% system efficiency

ANNUAL HEATING DEGREE DAYS: 2,567, base 65°F

RECORD LOW TEMPERATURE: 20°F

COLLECTOR AREA: 3,560 sq. ft.

AVERAGE ANNUAL PRODUCTION: 375 MWh

Equipment Specifications

COLLECTORS: 89 Heliodyne Gobi 410, 40 sq. ft. each

ARRAY: 19 subarrays total: 15 five-collector, 2 four-collector, 2 three-collector

STORAGE: 150,000-gallon dive pool and 145,000-gallon lap pool

shawnschreiner.com

Kentfield, California, is located in a beautiful valley that butts up against Mt. Tamalpais near the Pacific Coast, in Marin County. Wind gusts off the Pacific frequently top 50 mph at the site. Add to this the location of the pool heating system on a public building that is near the San Andreas seismic fault, and you have a project with perhaps the most stringent design criteria in the US.

The most difficult aspect of the project was engineering a racking system that would conform to the required design criteria, span 12 feet and add less than 5% of the roof's original weight. In California, exceeding this 5% limit typically requires a seismic retrofit for the entire building. To meet the criteria, 0.125-inch square-tube steel—the thinnest that can be hot-dip galvanized—was specified for the racking substructure, and the collectors were located away from the edge of the roof to minimize wind loading. The final design was only a few hundred pounds under the maximum allowable weight. To verify this, the structural engineer had to calculate the weight of every bolt in the racking system.

Beyond the structural design, the system also needed to be aesthetically pleasing and maintain a 34° collector tilt. Heliodyne's rack-mount system proved to be a relatively low profile and light mounting solution.

The overall project consists of two separate systems: a 65-collector array for heating a large lap pool and a 24-collector array for a dive pool. The collectors were placed on a narrow 300-foot long building with a curved center ridge. The array needed to be segmented into 19 separate subarrays. As a result, a detailed piping design was required for system optimization. One objective of this design was to create even flow through the arrays with limited use of balancing valves, which can be problematic and should be used only as

Courtesy sunwatersolar.com (4)

a last resort. Another objective was to account for the large amount of expansion and contraction that occurs in long pipe runs that may be subjected to temperature swings of +/- 250°F. The longest direct pipe run is a 3-inch copper return line for the lap pool system that runs the entire length of the building. To accommodate this movement, several large expansion joints were installed throughout the piping system.

The college's controls contractor designed the custom-built system controls that integrate the thermal systems with the primary building management system. The solar heating systems can be monitored and controlled along with the building's other mechanical and electrical components. This allows for communication between the thermal system and the pool controls. For instance, set priorities can disable the pool heaters when the solar system is active at certain times. Solar priority is a common feature with residential pool controls, but it is not included in most commercial approaches.

> "One significant advantage to having the thermal system fully integrated with the facility's 'main brain' is that system malfunctions can be detected immediately. For example, if one of the solar pumps goes down, an alert can be sent to the maintenance staff via cell phone or email. The problem can be dealt with quickly, minimizing energy loss and potential further damage to the system."
> *—Justin Weil, president, SunWater Solar*

Equipment Specifications

CONTINUED

HEAT EXCHANGERS: Three Young Cupronickel shell and tube, model F-604-AY-1P-CNT-B

PUMPS: 1.5 hp and 3 hp Bell and Gossett, 1510 Series

CONTROLS: Custom, integrated with building management system

FREEZE CONTROL: Closed-loop glycol

COLLECTOR INSTALLATION: Flat roof, modified bituminous membrane, Heliodyne rack-mount on custom fabricated steel substructure, 180° azimuth, 34° tilt

SYSTEM MONITORING: Two BTU monitors integrated with building management system and Heliodyne Web based monitoring system