Cooling Tower Case Study

Century High School

Case Study No. 11

"We are very satisfied with the decision to specify Tower Tech cooling towers for this project. Ease of installation in an existing facility was a key factor in this choice. The level and quality of the cooling tower and technical support provided by Tower Tech is excellent."

-- I. Ray Cranston, P.E., Principal
F.T. Andrews Engineers

TOWER TECH
Cooling Towers for Discerning Users ™

Project Overview

The best advertising is word-of-mouth endorsements from satisfied customers. **Jeff Hackett**, HVAC Technician for **Century High School** in Santa Ana, California, has taken that idea a step farther. The high school's new central cooling system, installed in 2007, has become a touch point for area companies looking at installing new cooling systems of their own. Hackett's success in finding and acquiring the very best cooling system for the high school is garnering lots of attention.

Hackett was committed to replacing the high school's antiquated ice harvesting system with a new innovative system that would minimize the potential for system failure and downtime, and maximize savings through smart design. Hackett's research led him to conclude that a new central cooling system was the best fit for Century High School's needs. However, with more than two decades of experience under his belt Hackett knew that not all systems are created equal. To find and piece together a new system that would be an ideal fit for the school, Hackett used vacation time and personal funds to visit several U.S. equipment manufacturers and attend industry trade shows. His goal was a new system that would be sustainable, environmentally friendly, and functionally ideal for Santa Ana Unified School District. It would also be reliable and have built-in redundancy so school operations would not be interrupted.

The high school, built in 1991, is a two-story facility in the heart of Orange County, California. A thermal energy storage system was specified for its economic incentives and to take advantage of shifting loads and off-peak electric rates. However, by 2007 that system's feasibility was anything but certain as the volatility of energy markets increased and electricity prices escalated. And while studies showed thermal

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FTA
F.T. Andrews, Inc.
Consulting Engineers
A Division of IDS
1 Peters Canyon Road, Suite 150
Irvine, CA 92606
(714) 263-0341
FAX (714) 263-0348
www.FTAndrews.com

RE: Santa Ana Unified School District
Santa Ana, CA

Project: Century High School
Central Plant Upgrade

To Whom It May Concern:

We are very satisfied with the decision to specify Tower Tech for this project. Ease of installation in an existing facility was a key factor in this choice. The level and quality of the cooling tower and technical support by Tower Tech is excellent.

Very truly yours,

F. T. ANDREWS, INC.
I. Ray Cranston Jr., P.E.
Principal

elmco duddy

15070 Proctor Avenue • City of Industry, CA 91746
(626) 333-9942 • www.elmcoduddy.com

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Cutaway View
of a Tower Tech TTXL Series
Moduler Cooling Tower

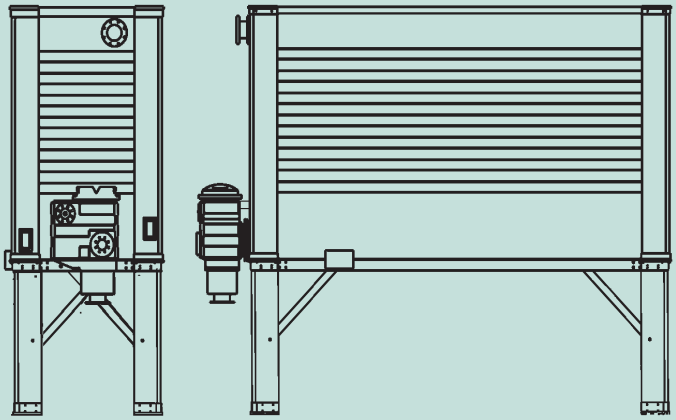
storage to be a viable method of conserving energy, it was not the best solution in terms of sustainability or environmental friendliness.

A balanced thermal energy system operates during off-peak hours. On-peak time of use is from noon to six o'clock p.m., and off-peak time of use is from six o'clock to eleven o'clock p.m., and eight o'clock a.m. to noon. Typical full-storage ice plants are sized to run from eleven fifteen p.m. to seven forty-five a.m. to avoid both the mid-peak and on-peak charges. The system, run by electrical power, freezes water at night and then produces cold water by thawing the ice during the day. The original design at Century High School called for three 100-ton units. At some point during original construction it was decided to settle for two 100-ton units and include space for another 100-ton unit which could be added in the future. This reduction in the original design became problematic as the intricate machinery aged, became imbalanced and lost some capability. Over time, the equipment had to be run longer to meet the school's need. Before long, the system was running full time. Savings and rebates that were factored into the system's value at the outset were contingent on off-peak usage, but that value

Cooling Tower Specifications:

Tower Tech Modular Cooling Tower™ Model TTXE-031975, 2 Units

- Tower Tech 1' High FRP Sub-structure
- Tower Tech Rotary Spray Nozzles with 3:1 Turndown Capability
- Tower Tech Fan Motor Control Panels with Temperature Controller (2)
- Danfoss Variable-Frequency Drives (2)
- U.S. Electrical Motors, TEAO, 460V, 215T Frame, Inverter-Duty, Class "F" Insulation, L_{10} Sealed Bearings
- Multi-Wing Fans, Direct-Drive, Model 9-X, 6 Blades
- Individual Rotary Disconnects UL-Rated, NEMA 4X
- Factory Pre-wired, Quantum Shielded 12-4 AWG Oil Resistant Flexible Cable
- Tower Tech Stainless Steel Fan Motor Supports
- Brentwood Industries CF-1900 Fill Media
- Brentwood Industries CDX 80 High Efficiency Drift Eliminators



Cooling Tower Design Conditions:

- Flow Rate (GPM): 880 GPM (199.8 M^3/H)
- Entering Water Temperature (HWT): 89.4° F (31.9° C)
- Leaving Water Temperature (CWT): 80° F (26.7° C)
- Entering Wet Bulb Temperature (WBT): 74° F (23.3° C)

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diminished as full-daytime operation required the use of electricity at peak prices. Costly repairs and the use of environmentally unfriendly substances also made the old system less attractive, and the threat of system failure was a growing concern. If the old system failed the school would quickly become inhabitable and school operations would be interrupted as the system was being repaired. Interruptions are costly to the school district and create additional problems such as the loss of educational hours required to meet school board educational time mandates, erosion of the school's reputation in the community, reduction of student supervision, and ongoing overhead expense related to staff and faculty during unproductive hours. The current system was not designed to handle any failure gracefully.

A new system would need to be environmentally sustainable and offer improved mechanical reliability, built-in redundancy, and reduced life-cycle costs. This led to the selection of a Tower Tech Modular Cooling Tower in part because its innovative design with multiple small direct-drive fans offers the ultimate in tower redundancy. The two cooling tower modules that Hackett selected each contain three 7.5 horsepower motors with direct-drive fans. If a motor or fan were to fail, only a small fraction of the tower's thermal capability would be lost and the school's maintenance department could replace the motor or fan in an hour's time. Advantages of the Tower Tech design did not end there: Hackett appreciated the tower for its high-velocity Flow-Thru Basin™ that keeps solids in suspension, blocks sunlight, and virtually eliminates the propagation of algae inside the tower.

The considerations in system design and equipment selection were basic. As a public entity, Hackett felt the school should exhibit good environmental practices by installing a system that uses no glycol and little or no biocides. Too, the new system should be more self-sufficient and have built-in redundancy to guard against system failure. And smart design innovations should be used to promote sustainability.

Project Implementation

After deciding on specific brands, models and sizes of equipment, Hackett assembled the elements of his plan on paper using the original cooling system drawings that had been created by Orange County-based engineering firm **F.T. Andrews, Inc**. Hackett told FT Andrews' principal **I. Ray Cranston, P.E**. his ideas for the new cooling system which would use the same load calculations as the old system. He showed Cranston his preliminary drawings with the locations and physical dimensions of the new equipment. To reduce costs, his drawings included the existing concrete housekeeping pads and some of the existing equipment.

Hackett views energy management system monitor supplied by McQuay International

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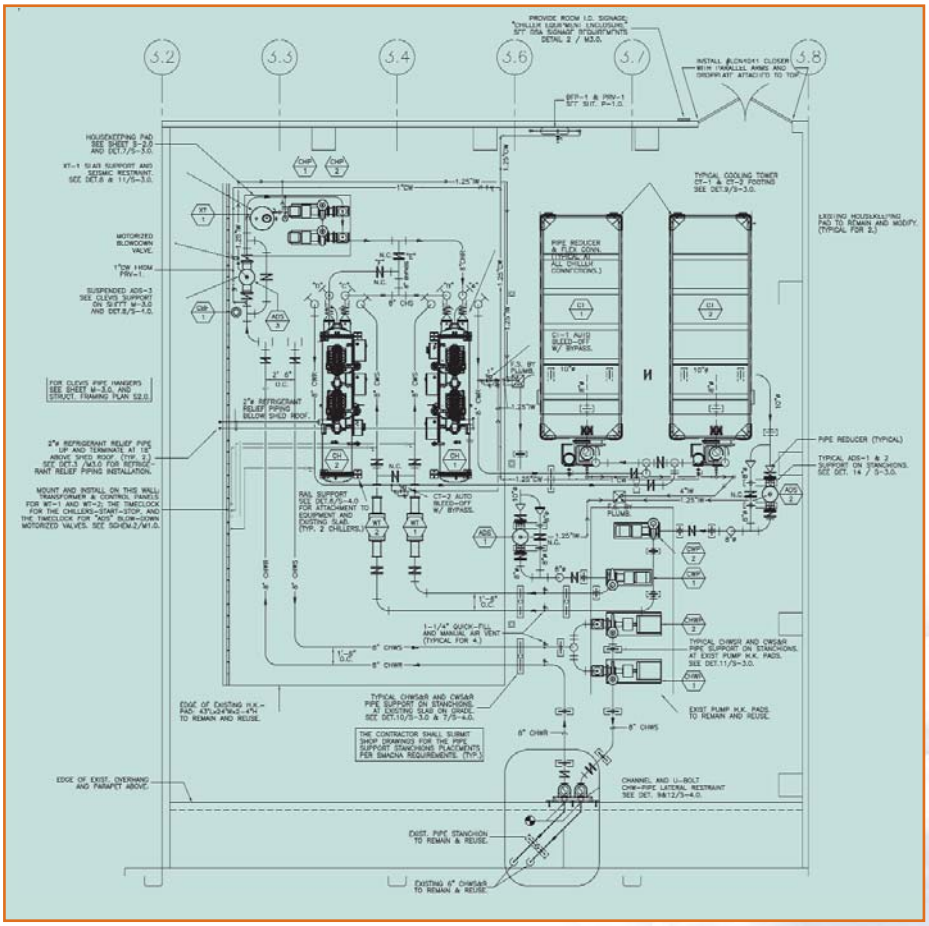

Hackett and an F.T. Andrews design engineer spent three days discussing the proposed plan, and from their collaboration the design engineer was able to create conceptual design documents. Hackett was then prepared to propose the new system to his supervisor and help shepherd the project through the school district's approval process.

As a result of Hackett's legwork a new central cooling system was installed at Century High School in 2007 by **Los Angeles Air Conditioning** (La Verne, California). According to Hackett, he was "pleasantly surprised by the strong customer service support from **Elmco/Duddy** sales engineer **Bruce Lasken** and Tower Tech. Their constant support was instrumental to our project's success. I was particularly impressed when **California's Department of State Architect** imposed some stringent requirements, and Elmco/Duddy and Tower Tech went above and beyond the call of duty to ensure my vision was realized."

Today, Hackett is frequently found leading other prospective customers on tours of Century High School's new central cooling system while boasting of its efficiency and effectiveness. Some of those customers who have decided to install similar systems in their own facilities have credited Hackett as a driving factor in their buying decisions.

The cooling towers selected for Century High School were manufactured by Tower Tech. The focus in selecting the towers was on energy savings, using the tower's innovative water distribution system to achieve variable flow control and uniform wetting of the tower fill media.

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