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Project Profile

St. Francis Medical Center

The energy crisis has caused problems for many businesses in the state of California – even more uniquely for a special non-profit healthcare institution in Los Angeles County that was faced with increasing costs and a continuing greater demand on its systems.

Established in 1945, St. Francis Medical Center (SFMC) is the only comprehensive non-profit healthcare institution serving Southeast Los Angeles. The hospital is located in one of the most densely populated communities in Southern California, serving the communities of Lynwood, South Gate, Downey, Huntington Park, Bell, Cudahy, Bell Gardens, Maywood, Compton and Southeast Los Angeles. SFMC operates a 384-bed acute care hospital and the largest and busiest private emergency trauma center in Los

Case Study Summary

Benefits

- Entire facility could now be cooled using thermal storage (TES) system during peak rate periods
- $60,000/month in energy savings
- Potential savings of millions of energy dollars over a period of years

Challenges

- Existing TES system has been inoperable since 1995 and manufacturer went out of business shortly after installation
- Documentation and critical knowledge of system no longer available
- Summer on-peak rate structure created a need for system to be operational in five weeks time

Solutions

- New Teletrol system and Ensemble controls software
- Replacement of non-functional temperature sensors, flow meters, pressure sensors, and control valves
- Sequencing of TES system to correlate with building's energy savings requirements

Angeles County, providing a full range of diagnostic and treatment services for the nearly 700,000 adults and 300,000 children. The mission of St. Francis Medical Center is serving the sick poor. No ill or injured man, woman, or child is ever turned away because of the inability to pay for needed care. SFMC is dedicated to nurturing healthy children and families, fostering self-sufficiency, and achieving excellence in facilities and technology with the ultimate goal of enhancing the health of its community.

PROBLEM

In most states, demand for electrical power peaks during summer. Air-conditioning is the main reason, in some areas accounting for as much as 50% of power drawn during the hot midday hours when electricity is most expensive. But during the night, utilities have electricity to spare, and this "off-peak" electricity is much cheaper.

In a warm climate like Southern California and with energy prices continually on the rise, St. Francis Medical Center began to look for ways to reduce peak electric energy consumption – or at least keep it as low as possible – in 1995. Kilowatt usage during peak hours is charged at a premium rate, both in Kwh and KW demand charges. One way to reduce usage during peak hours is to install what is referred to as a thermal energy storage (TES) system.

Cool thermal energy storage has become one of the primary solutions to the electrical power imbalance between daytime need and nighttime abundance. Although "cool thermal energy" sounds like a contradiction, the phrase "thermal energy storage" is widely used to describe storage of both heating and cooling energy.

Cool TES uses off-peak power to provide cooling capacity by extracting heat from a storage medium, such as ice, chilled water, or "phase-change materials." Typically, a cool storage system uses refrigeration equipment at night to create a reservoir of cold material. During the day, the reservoir is tapped to provide cooling capacity. By using off-peak electricity to store energy for use during peak hours, daytime power consumption is reduced.

Concerned with saving energy dollars, as well as the possibility of losing a chiller in the summer months and thus being unable to maintain chilled water supply temperatures necessary to cool the buildings, SFMC unveiled a plan to solve both problems. Knowing the benefits provided by thermal storage, St. Francis installed a 12,000-ton hour Transphase Thermal Energy Storage System sized for additional load from a proposed eight-story medical tower, which in effect doubled the maximum peak cooling capacity of the central plant. The TES system would then provide on peak, as well as supplemental cooling capacity.

Shortly after installation, Transphase Systems Inc. went out of business. Many attempts were made to make the TES system operational, including the replacement of the original TES system controls with Honeywell, with no success. Exacerbating the problem, SFMC's Chief Plant Engineer and key TES operator had since passed away and with him his critical knowledge of the TES system. These problems, coupled with other written information lost, resulted in the hospital's anticipated annual energy savings of $250,000 never being realized.

St. Francis Medical Center officials contacted their electric utility provider for assistance with their thermal energy storage system dilemma. Through their Southern California Edison representative, SFMC contacted Enviro Engineering of San Clemente, CA, a specialist in the Transphase TES system. Enviro Engineering in turn teamed up with Teletrol System's Integrator Energy Technologies Int'l. of Claremont, CA, to provide a solution for the operation and control of the hospital's TES system.

SOLUTION

Since the system had not been operational for sometime, many of the components had failed due

to inactivity and/or incorrect operation during its brief period of use in 1995. Problems such as water leakage through blown seals in valves, inoperative sensors, non-functioning air controls, and excessive moisture that had deteriorated the pump motors and starters in the underground pump vault (due to flooding at one point in time) rendered the system inoperable. Enviro Engineering was faced with the challenge of getting the system up and running before the summer peak electric rates went into effect – giving them less than 5 weeks to restore a TES system that had lain dormant for over seven years and never operated properly to begin with.

The Enviro Engineering/Energy Technologies' solution was to install a new Teletrol Integrator 486 controller and Teletrol's Ensemble software to control and interface with the TES system. In addition, this solution would also provide vital information, alarming, and an operator interface to the TES system. The Integrator 486 was chosen due to its flexibility in the I/O configuration and expansion ability, since the existing field devices consisted of various signal protocols. Replacement of some existing temperature sensors, flow meters, pressure sensors, and control valves was necessary. New pump motors for the TES system were installed, as well as temperature sensors, flow meters, pressure sensor and control valves, all to be controlled by the new Teletrol control system. Once complete, all data collection and monitoring of the various sensors and meters was also transferred over to the new Teletrol system.

Energy Technologies' controls engineer, Dan Portillo, provided the programming code for operation and sequencing of the TES system to correlate with the building's chilled water requirements, Southern California Edison rate schedules and St. Francis Medical Center objectives.

"The Teletrol System was key in the operation of the system," says Don Gascoigne of Enviro. "Once in place with all systems go, the control system operated the TES to the point where the staff did not have to do anything but shut off the chillers before 12 noon and turn them back on at 9 pm. The Teletrol System also allowed Energy Technologies to remotely monitor and adjust water temperatures, pressures, and flow rates through a series of valves. The operation would not have been possible without the automation provided by Teletrol."

RESULTS

The project resulted in St. Francis Medical Center cooling their entire facility using the thermal energy storage system during the on peak Edison rate period (12-6 pm, M-F, June – October). As a result, the hospital was not required to run a chiller during on-peak hours in months of August and September, typically the hottest months of the year, thereby generating approximately $60,000/month in energy savings.

Each summer, peak rate period in the future will be covered by the TES system, which is charged with off-peak cooling capacity, potentially saving St. Francis Medical Center millions of energy dollars over a period of years.

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