

California Street Thermal Energy Plant Omaha, Nebraska



Project Cost
N/A

Completion Date
2006

Client Reference
Energy Systems Company

New Construction

When Energy Systems Company (ESC) of Omaha decided to expand their capabilities to provide district energy to downtown Omaha, they turned to Farris Engineering to design a system that would meet their current and future needs for years to come. The current phase, which was recently completed, included the addition of a second Thermal Energy Plant located at 13th & California Streets in downtown Omaha and an underground utility extension. This new plant works in unison with ESC's Howard Street Energy Plant as well as with Creighton University's Energy Plant, which is also operated by ESC.

When ESC acquired nearly 150,000 sf of warehouse space Farris Engineering began design on a Thermal Energy Plant that will eventually accommodate 22,000 tons of total chilled water capacity, 160,000 lbs/hour of steam capacity. The project included modifications to an existing building structure to integrate boiler plant systems, chiller plant systems as well as to integrate burner equipment to support low Nox burner controls, metering and heat recovery systems. The project also included electrical switchgear, motor control centers, variable frequency drives, control and power wiring, on-site electrical power generation equipment and all auxiliaries. These auxiliaries included:

- Water treatment softeners
- Deaeration
- Surge condensate storage
- Fuel system dual gas/oil
- Boiler feed system
- Condensate transfer system
- Electrical support systems
- Flue gas economizer system
- Boiler breeching and stack
- Water circulating pumps
- Chemical feed systems
- Reverse osmosis filtration and storage
- Makeup air/pre-heating combustion air

The first phase of the plant -- of which construction was finished in mid-2003 included two Carrier chillers, each producing 2,500 tons of chilled water supplied at 38°F. In addition, the design accommodates a total of 44,000 gallons per minute of condenser water. A Marley cooling tower was chosen to supply the first 10,000 gallons per minute of capacity and was placed on the roof of the energy plant. This required a significant amount of structural analysis of the current building and also took into account the many aesthetic factors that had to be evaluated in choosing an initial location for the new cooling tower. The owner was highly concerned with how the cooling tower would appear from the view of the new Qwest Convention Center and Arena as well as the surrounding high-rise buildings, since most of the surrounding buildings are clients of the owner. Lastly, Farris Engineering's design included three 2 megawatt diesel powered Caterpillar generator sets to provide back-up and peak load power. These Caterpillar generators are backed by two 30,000 gallon underground fuel tanks which feed the generators via variable speed fuel transfer pumps.

Considerations unique to the project include:

- Dual fuel conversion during operation
- Variable fuel transfer capability
- Ability to export treated water to other boiler plants connected to the district distribution system
- Standby electrical power to operate during normal power interruption
- Addition of future boiler with minimal, if any, disruption of steam plant operation
- Minimal operator control intervention with remote plant monitoring of system setpoints at main energy plant control center
- Drum heater for quicker operation of standby service mode
- Use of stainless steel and fiberglass piping to preserve treated water quality and minimize blowdown, thus saving energy
- Energy recovery of waste and steam trap discharge during idle modes of operation

Other facets of the project included pre-purchase of major pieces of equipment including the boiler, deaerator, surge tank, water softeners, reverse osmosis filtration, pumps and meters to assure that the installation schedule would be met

Architectural and structural analysis provided for proper placement within the structure while exceeding requirements established by the Owner. Stack design location and heights issues were coordinated with the environmental sub-consultant to achieve environmental regulations as well as maintain the esthetics of the plant due to its location to the high profile arena/convention center

The underground utility extension included over 7,000 lineal feet of piping for chilled water supply and return as well as for high pressure steam and condensate return piping. Chilled water mains varied in size from 24-36 inches and steam/condensate mains were 12-16 inches and 6-8 inches, respectively

The entire project -- which was coordinated closely with city officials and local landowners was completed on time and within budget. The next phase of the project will include additional steam producing capabilities to the new Thermal Energy Plant at 13th & California Streets.