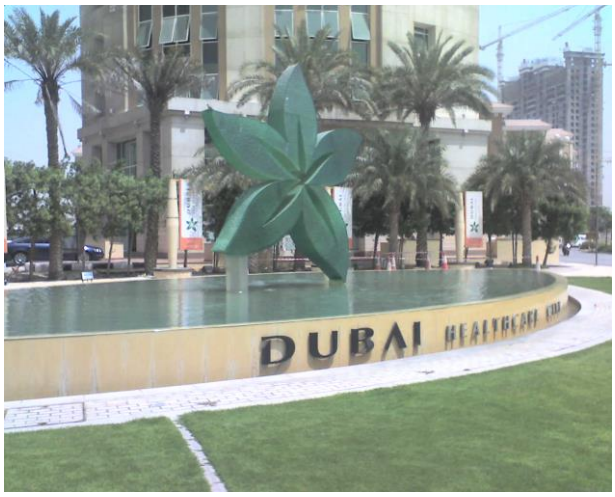
District Cooling Plant Automation and Optimization

Overview

A U.S. engineering firm was designing a new district cooling plant for Dubai Healthcare City in the United Arab Emirates. The plant provided 52,000 tons of cooling and the owner, Empower, wanted to provide the chilled water in the most efficient manner possible. The project used a local system integrator for the panel building and installation with EES control system design and chiller plant optimization



Owner Requirements

The district cooling plant was a new installation with twenty-six 2000 ton chillers. The owner wanted a seamless solution that would utilize the best-in-class hardware along with optimized control for both the electrical usage and water usage. Loss of water in the UAE through the cooling towers is a major cost for the owner so he wanted to run the towers using EES' chilled water system expertise. The facility consisted of the following:

- Twenty-six 2000 ton water cooled centrifugal chillers with a primary / secondary pumping arrangement.
- Associated cooling towers, condenser pumps, and filter systems.
- Electrical system integration to track the plant efficiency in real time.
- District decoupling heat exchangers to separate the buildings from the plant loop including secondary building control.
- Integration of various subsystems including tower makeup, filters, and chemical treatment.

Solution

Characteristics of the new control system:

- Monitors chiller operation and advises operator when to start and stop chillers to optimize chilled water delivery for least operational cost
- Takes evasive action in the event of pump and cooling tower failures.

- Communicates with the electrical switchgear and chillers to provide an actual plant efficiency in KW/Ton with real time electrical data.
- Installed an integrated HMI that displays and trends all points in the system so that operation can be analyzed effectively.
- Provide data and reports based on system diagnostics so that deviations from design operation can be analyzed and adjust plant operation automatically.
- Optimized control of the secondary water pumps based on pressure and load conditions.
- Optimized control of the cooling tower systems to maintain proper condenser water supply to the chillers.
- Performed all necessary start up and commissioning on the system as well as the mechanical system.
- Worked with local system integrator to coordinate activities and allow for a smooth start up.

Results

The new facility was up and running in an efficient manner thereby maximizing the payback through efficient district plant operation. The system calculates the cost of operations and provides diagnostics on the chillers to alert when inefficiencies arise so the operator can turn on other chillers. The load control was paramount to project success. The building heat exchanger control was accompplished through the central plant so chilled water setpoints were optimized based on load. Running a plant of this size in the most efficient manner translated to significant operational cost savings.