

**ENGINEERING DESIGN SERVICES
CHILLER PLANT SEQUENCE
REDESIGN & VALIDATION
Philadelphia, PA**



PROJECT BACKGROUND

A major Philadelphia Telco switching facility underwent a chiller plant renovation in 2009. Free cooling (via water-side economizer) was intended to be implemented through plate and frame heat exchangers that were installed as part of the renovation. The free cooling has never been operational, primarily due to deficiencies in the design sequence of operation. In an effort to realize the energy savings that the water-side economizer offers, Telco asked Lutz Engineering to review the mechanical equipment, controls and sequences of operation to determine why free cooling has not been possible and what modifications would be necessary in order to take advantage of free cooling.

ISSUES PREVENTING FREE COOLING

Lutz Engineering conducted several site visits and a review of the building automation system and identified the following repairs and modifications necessary to implement plate & frame heat exchanger waterside economizer for chilled water:

- Restore operation of chilled water flow meters
- Modify the chilled water and condenser water isolation valves for optimal operation

- Repair linkages to chiller condenser bypass valves
- Repair tower basin heaters to allow reliable operation during cold weather
- Develop and implement a revised sequence of operation to eliminate chiller shutdown during mode transitions
- Conduct commissioning testing with equipment and control vendors present

PROJECT SUMMARY

- Diagnose chiller plant inability to utilize free cooling.
- Identify repairs and modifications to physical plant and Building Automation System necessary to enable free cooling.
- Draft revised sequence of operation for implementation by controls contractor.
- Conduct functional testing to ensure intended operation of chiller plant.
- Work with utility company to provide energy savings documentation and calculations to secure incentives.

**Preliminary Annual Savings
Calculation = \$40,486**

LUTZ ENGINEERING'S SCOPE OF WORK

- Prepare retro- commissioning documents for the plant to explore opportunities to increase the reliability of the plant, reduce the number of single points of failure, and improve equipment operation flexibility.
- Review the design drawings and Sequences of Operation against the control installation and programming.
- Review plant preventive maintenance documentation to identify equipment issues.
- Review equipment maintenance contracts, service tickets, spare parts inventory, etc.
- Prepare a flow diagram / decision tree of the BAS logic as an aid to identify areas that that could compromise system integrity and reliability.
- Prepare a final report including a summary of the work performed, the findings, and the recommendations for improvement of plant operations.

Working closely with the Telco's facility management and building operations teams and the facility's controls contractor, Lutz Engineering reviewed and modified the sequence of operation to enable the use of free cooling. The project was eligible for utility company incentives under a custom incentive program. Lutz Engineering assisted the Telco with the incentive application process, which required BAS trends to measure and verify energy savings.