CLEAResult®

Design Build Solutions

Complex retrofits possible with zero interruption

A medical manufacturing facility's integrated retrofit and retrocommissioning chiller plant project resulted in increased energy savings and improved resiliency

The Challenge

A Fortune 500 global medical device technology company wanted to improve mechanical cooling reliability and efficiency at one of its medical device manufacturing facilities in the western desert of the United States. The drive for energy savings was motivated by both the potential operational benefits and the company's 2020 corporate sustainability goals.

The facility was operating 13 chillers in eight decentralized chilled water plants serving process and space conditioning loads, with additional direct expansion (DX) AC units supporting small individual loads. This resulted in poor collective system performance, with the majority of the plant's chillers operating at low part loads for most of the year. Because the plants were decentralized, extra capacity from individual plants could not be used to address critical plant failure elsewhere. The facility was only one multiple-chiller failure away from a possible process shutdown and damaging revenue losses.

The age of the existing plant's chillers—and the fact that many had glycol in their water loops—created painful maintenance and environmental management cost burdens.

Our Solution

The facility engineering staff determined that interconnecting the plants on a common chilled water loop (creating a single chilled water system) would solve their resiliency challenge. CLEAResult was brought in to predict post-interconnection performance and to propose optimization recommendations, including adding a new high-efficiency chilled water plant with water-side economization to meet the entire facility base load. This eliminated the need to use less efficient existing chillers, leaving capacity at a full n+1 redundancy.

The company's executive management group engaged CLEAResult's Design Build Solutions team to fully develop and implement a turnkey, integrated energy optimization project that included:

- A high-efficiency, containerized chiller module was built off-site, with an 800-ton water-cooled chiller with variable-speed compressor and an integrated low-approach plate and frame heat exchanger, using CLEAResult's water-side economizer design
- High-efficiency condenser water system pumps for variable-flow pumping
- Pre-wired, integrated chiller plant controls to interface with the manufacturing plant's existing building control system
- Prefabricated, pre-installed, and pre-tested mechanical piping, pumps, and electrical wiring
- A new high-efficiency, 4° F approach cooling tower installed on top of the chiller container
- An extremely lightweight polypropylene plastic pipe chiller interconnect loop, fabricated and installed on the container roof to address structural loading design challenges

Facility Type:

Medical device manufacturing

Project by the numbers

$102,000
annual energy cost savings

1.7M kWh
annual energy savings

$300,000
utility incentive received

70%
reduction in annual cooling plant energy use

5,400 gallons
glycol removed

04. kW/ton
annualized chiller plant system performance

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- Connection of the new, containerized chiller plant to the interconnect runaround loop and design and implementation of the pumping sequence of operation
- System start-up, control integration, commissioning, utility incentive liaison, and performance documentation

The entire project was executed with zero interruption to the existing chilled water plants or the manufacturing process output.

Our Results

CLEAResult's approach met project goals:

GOALS	SOLUTION	BENEFIT
Resiliency	Interconnect existing chillers with runaround loop, add new chilled water plant	• Provides chilled water redundancy to all process areas • Offers additional chilled water capacity for future growth without having to install additional systems
Increased Operating Efficiencies	Create the ability to deliver process cooling to the entire facility from one central high-efficiency plant	• Works even at low flows and low loads • Maximizes free cooling
CapEx flexibilitiy	Interconnect new plant to all legacy plants, providing needed redundancy allowing for corporate capital management options	• Increased flexibility in when and how to replace and maintain legacy, back-up plant equipment
Environmental Impact	The new plant-loop design and freeze protection sequence of operation allows for the removal of 5,400 gallons of glycol from the legacy plants	• Permanently eliminates the associated environmental risk, management, and costs • Annual kWh reduction equivalent to 5,000 metric tons of avoided CO2 emissions

The full project scope developed and implemented by CLEAResult's Design Build Solutions team brought this facility…

- Annual energy savings of **1.7 million kWh** and **$102,000 per year**
- **$300,000** in utility incentives
- Reduced annualized plant efficiency from a baseline of 1.3 kW/ton of cooling down to 0.4 kw/ton—a **70 percent reduction in central plant energy use**
- A **0.09 kW/ton operating efficiency** when in full water-side economization mode

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