

CASE STUDY / CENTRAL PLANT OPTIMIZATION

Hospital for the University of Pennsylvania

Optimization unearths savings in a state-of-the-art chiller plant that appeared to already be operating at peak efficiency.

LOCATION
Philadelphia,
Pennsylvania

FACILITY
Penn Medicine
Lead
& Lag Chiller Plants

ENGAGEMENT
Continuous
Optimization

SOLUTIONS
OptimumLOOP® +
OptiCx®

ENERGY SAVINGS

4.4

GWh per year

Annual electrical energy
savings

ANNUAL SAVINGS

\$288K

per year

Annual operations cost
savings, exceeding
projected figures

CO2 REDUCTION

7.84M

lbs per year

Annual carbon emissions
reduction

Overview

Kathleen Morlang, Energy Manager of the Hospital for the University of Pennsylvania in Philadelphia, has one goal: reduce the energy used by the University of Pennsylvania's research hospital while ensuring a stable, comfortable environment for patients. To that end, she worked with Johnson Controls and Optimum Energy to turn Penn Medicine's modern chiller systems into an ultra-efficient, ultra-reliable cooling plant.

Prior to optimization, the lead chiller plant was already operating at high efficiency. After commissioning, the plant was running at 0.511 kW/ton, an improvement of about 27% and an unheard-of level for systems without water-side free cooling. The plant has seen annual energy savings of 4.4 GWh/year and carbon emission cuts of 7.8 million pounds.

The Challenge: Squeeze Additional Efficiency From a High-Performance Plant at Today's Standards

On paper, Penn Medicine's central facility appeared to be operating at peak efficiency prior to the project. Penn Medicine is one of the biggest hospitals in Pennsylvania, with 749 beds and 1,843,828 square feet of cooled space, maintaining specific temperatures around the clock for patient comfort and safety.

Because her department competes for funding with lifesaving medical equipment, Morlang needed a solution that could provide quantifiable savings and a quick payback.

The Solution: OptimumLOOP® Applied to Existing Equipment With OptiCx® for Continuous Monitoring

Morlang deployed the solution in partnership with Johnson Controls, integrating with the facility's existing JCI Metasys building automation system to monitor plant conditions continuously and automatically calculate the most efficient operations in real time.

OptiCx® adds cloud-based analytics and engineering support, ensuring the plant runs at maximum efficiency and reliability, and monitoring for conditions that could indicate system failure before they become real downtime events.

- Lead Plant: 4,500 tons (3 × 1,500-ton VSD chillers, VSD CW and condenser pumps)
- Lag Plant: 6,000 tons (4 × 1,500-ton constant-speed chillers)
- Johnson Controls Metasys BAS, no mechanical changes to lead plant required

Results

Penn Medicine's chiller plant improved from 0.699 kW/ton to 0.511 kW/ton. Since deploying the optimization solution, the hospital is seeing annual savings of over 4.4 million kWh, 7.8 million pounds of CO2, and \$288,250.

DETAILS

Penn Medicine

One of the largest hospitals in Pennsylvania, with 749 beds and 1,843,828 sq ft of cooled space that must maintain specific temperatures 24/7 for patient safety, with a winter base load exceeding 2,000 tons.

PLANT DETAILS

- Lead Plant: 4,500 tons, 3 × 1,500-ton VSD chillers
- 3 VSD CW pumps, 3 VSD condenser pumps, 6 VSD cooling towers
- Lag Plant: 6,000 tons, 4 × 1,500-ton constant-speed chillers
- Johnson Controls Metasys BAS
- OptimumLOOP® real-time optimization
- OptiCx® daily monitoring and advisory

PERFORMANCE RESULTS (ANNUAL)

Pre-Optimization Efficiency	0.699 kW/ton
Post-Optimization Efficiency	0.511 kW/ton
Energy Savings	4,434,618 kWh/yr (4.4 GWh)
CO2 Reduction	7.84M lbs/yr
Water Savings	1.8M+ gallons/yr

FINANCIAL RESULTS

Annual Operations Savings	\$288,250
Utility Rebate	\$221,731 (one-time)
ROI	1.6 years

"We can see the immediate, quantifiable impact. The savings are verifiable, we know that our money is being quickly recovered and that the investment is helping patients."

— Kathleen Morlang, Energy Manager, Penn Medicine

Annual savings are verified measurement-and-verification results from OptimumLOOP® deployment. Lead plant required no mechanical changes prior to optimization, all savings are from software applied to existing equipment. Utility rebate reflects a one-time incentive from the facility's electric utility.