The Helios® TCS

Case Study
Duke University

Project Overview

The project involved 17 chillers distributed throughout three different chiller plants providing 56,000 tons of district cooling for the Duke facilities infrastructure.

Applied Tonnage
56,000 Tons Cooling

Installed Chillers
17 Chillers

Plants Included
3

2020 was anything but a normal cooling season.

Duke University Case Study

17 chillers

Campus Utilities

The project commenced in the fall of 2019 involving 17 chillers distributed throughout three different chilled water plants.

56K tons of cooling

Facilities

The Central Chilled Water Plants involved provide 56,000 tons of district cooling for the Duke facilities infrastructure.

In late 2019 and early 2020, Innovas Technologies and Duke University entered a partnership to install Helios Tube Cleaning Systems on 17 chiller condensers in the Duke University central plants equaling 56,000 tons of cooling.

The project was complex because it involved time-sensitive, tightly-phased installation to prevent cooling outages during the then upcoming 2020 season. The problem was, 2020 was far from a "normal" cooling season.

University operators faced unprecedented challenges in limiting on campus access due to pandemic restrictions. As a manufacturer of commercial and industrial process efficiency equipment, Innovas Technologies was affected by supply chain disruptions with entire sectors of the economy at a standstill.

Despite these obstacles, the Duke and Innovas team pressed ahead to deliver this critical infrastructure project.

The Project

The Duke University project began several years prior as a result of presentations made by Innovas at the International District Energy Association, Campus Energy forum. The team at Duke evaluated other use cases and saw the value of clean tube efficiency as it related to their own expansive chiller operations. Specifically, they evaluated the Helios TCS from a total Life Cycle Value perspective including cost savings, chiller performance, system maintenance, and long-term reliability. After a thorough, multi-disciplined evaluation Duke went all in to integrate the system into chillers at multiple Central Chilled Water Plants (CCWP).

Central Chilled Water Plant

The Roadmap

1 Requirement Gathering, Specification & System Design

2 Manufacture, Installation & Requirements Coordination

3 Shipping, Delivery & Installation

4 Commissioning, System Integration & Training

5 Monitor, Support & Service

2019 – Project Beginning

The project, commenced in the fall of 2019 involved 17 chillers distributed throughout three different CCWP plants providing 56,000 tons of district cooling for the Duke facilities infrastructure.

Like most complex utility projects, planning begins during the exploration/proposal phase and this project was no different as each plant presented unique technical challenges.

Duke operates as a “Best Practice” organization and their processes, technical capability and management systems streamlined the process. Together, Duke Facilities and Innovas Technologies developed a project plan that included the involvement of key stakeholders (engineering consultants & mechanical contractors) who would guide the project to completion.

From concept to commissioning.

Manufacturing & Installation

Initial manufacturing began in the fall of 2019 and proceeded without issue. When the second phase of the project was released in the spring of 2020, manufacturing, in Iowa, became much more uncertain. Innovas had preordered inventory prior to the pandemic, so the needed materials were on hand.

Our fabrication shop maintained its operations throughout the period. The complete fabrication of the 17 systems proceeded at normal pace but required significantly more coordination due to the daily uncertainty of the pandemic. Additionally, very strict floor access and preventative procedures were employed to prevent Covid transmission to the best extent possible.

Shipping during the lock down period was more difficult. Amazingly, we were able to coordinate shipping per our schedule during the height of the lockdown. The trucking culture was notable by its willingness to keep moving during the time of greatest uncertainty. Its almost as if truck drivers were accepting the responsibility themselves to keep the country operating.

Built in the USA

Built in Cedar Rapids, Iowa, the Helios TCS has operated millions of hours with a demonstrated reliability rate exceeding 99.97%. The Helios system is designed to exceed the life of the equipment it serves.

Learn More

The team began commissioning the systems with a phased approach in May 2020 under Covid related limitations. The restrictions included operating with limited access, personnel and difficult travel conditions. Luckily, the Innovas Technologies commissioning team was able to divide duties and ensure adequate resources for start-up as required by the install team.

During commissioning, Innovas and Duke worked together to ensure all the Helios systems operated per specification. Part of this process included integrating the Helios controls into the Duke Facilities operating system. This connection, reaching across three central chilled water plants demonstrated the compatibility of the Helios TCS and both parties' teamwork.

Manufacturing

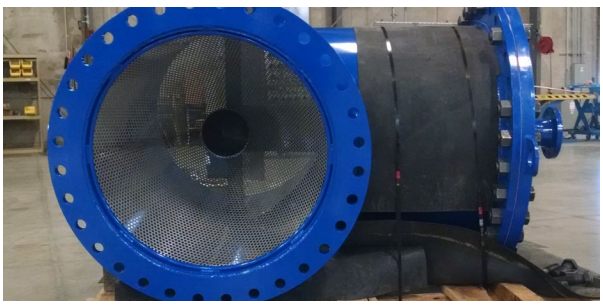
Custom Fabrication

The Innovas fabrication shop was able to build custom components in just two days for expedited shipping.

Shipping & Installation

Logistics

A Helios Ball Trap ready for shipment at the Innovas facility in Cedar Rapids, Iowa.



System Commissioning

Controls Integration

The process included integrating the Helios controls into the Duke Facilities operating system.

Mitigating unforeseen challenges.

Custom Fabrication

During commissioning of the seventeen systems, it was determined there was an unforeseen hydraulic profile relating to how the condenser water exited the condensers for four of the chillers. These four systems were installed uniquely due to physical space limitations, and the hydraulic issue caused operational problems within the four ball traps.

After instituting mitigation actions and thorough analysis, the system performance was still not up to Innovas' standards. This was particularly challenging because our engineering team could not be present onsite to evaluate all the potential variables affecting system performance.

Through numerous virtual meetings and evaluations over several days the Innovas engineering team was able to replicate the problem within the Innovas Technologies hydraulics laboratory. The Innovas engineering department then rapidly prototyped a design solution and the Innovas fabrication shop was able to build the modified equipment components in just two days for expedited shipping. So, in less than a week, under the restrictions of strict lockdowns, the repair prototype materials were designed, fabricated and shipped to site for installation and evaluation. Once installed it was immediately clear the fix was effective, and the remaining three affected Helios systems were modified within the next week.

This was a phenomenal effort given the restrictions to travel, workplace operations, and site access. In the end it represented the effectiveness of the Duke/Innovas Technologies team approach and demonstrates Innovas's engineering capabilities and ability to create a solutions specific to your needs.

Results

Ultimately, the success of any performing asset project is measured by how reliably it operates and how much savings (or earnings) it generates.

In Duke's case, the savings and reliability are exceptional as is expected from the Helios. Notably, the Helios system demonstrates a reliability rate exceeding 99.97% throughout its large installed base. The goal for the project was savings and the results demonstrate millions of dollars saved, thousands of maintenance manhours saved, breakout sustainability contributions measured, and the book written on large-scale chiller fouling elimination. The value stream of benefits for Duke by installing on all systems are summarized below.

Chiller Fouling Mitigated

Annual Energy Savings

Energy savings in the millions of dollars for the project life and a project payback of approximately 2 years.

Manual Cleaning Negated

Stopping all negative effects of chiller fouling

Replacing manual cleaning through automation improves heat transfer efficiency, prevents MIC corrosion and reduces fouling-related maintenance.

500 hours

Reduce Labor Costs

Approximately 500 labor hours eliminated annually by eliminating manual cleaning, freeing skilled technicians to focus on higher-level maintenance.

> “We would not consider having a chiller here without the Helios Tube Cleaning System.”
>
> **- Darin Smith, Utilities Operations & Maintenance Manager**

INNOVAS TECHNOLOGIES™

The Helios TCS®

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