INNOVAS TECHNOLOGIES™

George Mason University

AN INNOVAS TECHNOLOGIES® CASE STUDY

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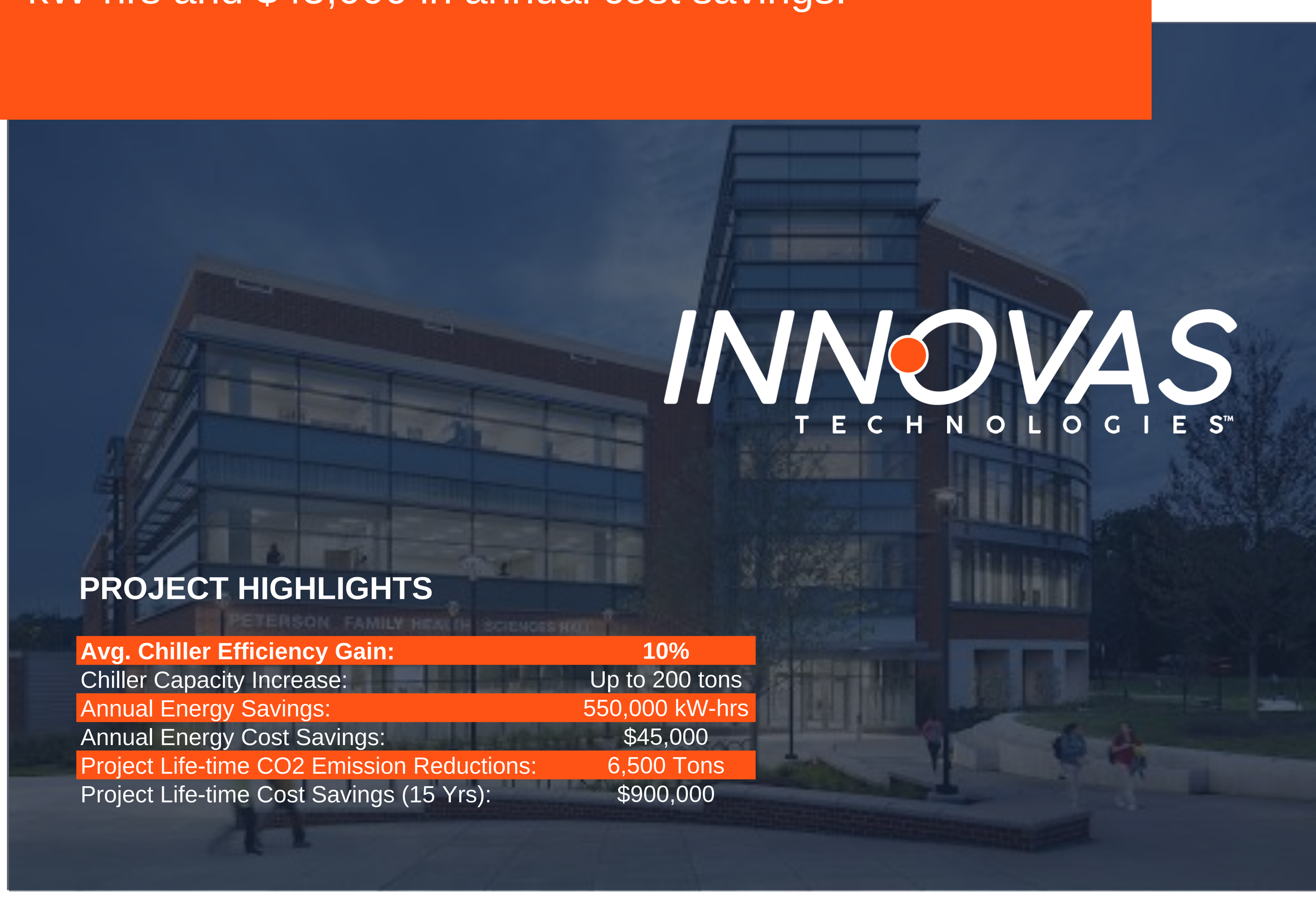
George Mason University's facilities team realized that Helios represented a significant tool to reduce Mason's energy usage and carbon footprint. The result was an annual energy reduction of 550,000 kW-hrs and $45,000 in annual cost savings.



PROJECT HIGHLIGHTS

Avg. Chiller Efficiency Gain:	**10%**
Chiller Capacity Increase:	Up to 200 tons
Annual Energy Savings:	550,000 kW-hrs
Annual Energy Cost Savings:	$45,000
Project Life-time CO2 Emission Reductions:	6,500 Tons
Project Life-time Cost Savings (15 Yrs):	$900,000

USE CASE & BACKGROUND

Management executed a plan to test Helios® at their central plant.

George Mason University (Mason) is a public research university that was originally founded in 1949. Mason's enrollment exceeds 35,000 students on 5 campuses with 4 located in Virginia and 1 campus located in South Korea.

Mason's Fairfax campus resides on 677 acres just outside Fairfax Virginia and 20 miles outside of Washington D.C. Notable buildings on the Fairfax campus include a 320,000 square foot student union facility, a 180,000 square foot engineering building and a new 88,900 square foot art and design building.

Mason is quite active in exploring opportunities to enhance the efficiency of their central plant cooling operations. Related to chiller efficiency, in the years prior to 2017 Mason managed chiller cleanliness via annual manual tube cleaning.

Once management discovered the Helios Tube Cleaning System® (Helios) operating at the University of Virginia, they executed a plan to test the Helios at their central plant.

The first Helios was installed and operated for the 2017 cooling season on Chiller 10, and chiller performance was evaluated against an identical chiller, Chiller 9, utilizing shared water headers. In 2018, Chiller 9 was retrofitted with a Helios and performance evaluated for a total study duration of two years.

THE CHALLENGE

Fouling - related chiller inefficiency is a common problem for many in the D.C. area, mainly due to poor-quality source water. Subsequently, its well understood in the area that tube fouling is a costly variable in cooling operations - but finding viable solutions is difficult.

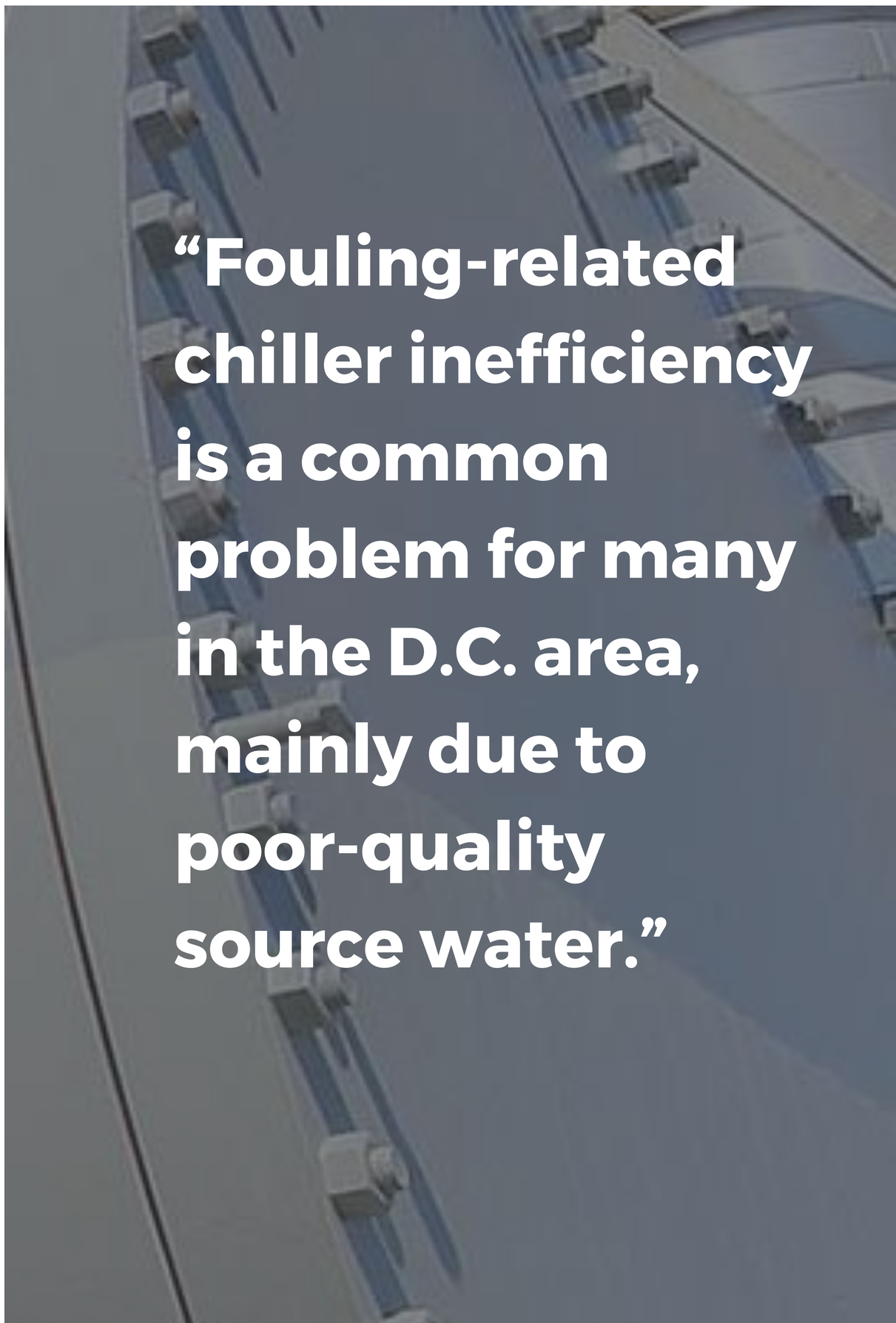
Once Mason leadership became aware of the Helios ® they moved to gain buy-in from all the stakeholders involved. The challenge was to get all concerned parties to agree on trying this disruptive technology, and then align on the best method of implementation and results measurement.

Like most large organizations, Mason has an established method for adopting new technology so that it best utilizes the resources allotted.

THE SOLUTION

George Mason University's Facilities Team realized the Helios system represented a significant tool to reduce the Mason's energy usage and carbon footprint, while also reducing maintenance hours required for chiller tube cleaning. They conducted extensive research, including significant discussions with current Helios operators.

Once the effectiveness of the technology became clear to the team, they developed an internal case for the system to be employed in the Central Heating and Cooling Plant.



LESSONS LEARNED

The chiller equipped with the Helios system provided greater cooling capacity and reliability.

Often, in established organizations there is strong inertia to adhere to the status quo related to current operations.

To address efficiency improvement mandates, organizations often invest in making the status quo more manageable—leading to an even further-entrenched status quo. In buildings, chillers are often the biggest consumers of electricity, yet most organizations address fouling-related inefficiency through periodic manual tube cleaning.

This case study highlights how ineffective manual chiller tube cleaning is when compared to continuous cleaning with the Helios system.

Most people agree that tube fouling leads to inefficient chiller operation, but most are not aware of the magnitude of the loss.

This case, like others, demonstrates clearly the very substantial improvement to chiller efficiency and productivity via adoption of Helios technology.

Increased cooling capacity.

Tube fouling significantly inhibits performance.. Helios equipped chillers saw an average efficiency gain of 10%.

Greater reliability.

Helios-equipped chillers have operated over 14,000 hours during the last two years with no process interruption.

RESULTS

Helios enabled operation with a 0.5˚F condenser full-load approach temperature for the entire cooling season.

After Helios installation in 2017, Chiller 10 showed immediate results. As demonstrated in **Figure 1**, in 2017 Chiller 10 operated with a 0.5˚F condenser full-load approach temperature for the entire cooling season. It never changed.

Conversely, Chiller 9 started the 2017 season at a 2˚F full-load approach temperature but without a Helios approach temperatures climbed progressively higher through the season, topping out above 6˚F before tubes could be manually cleaned.

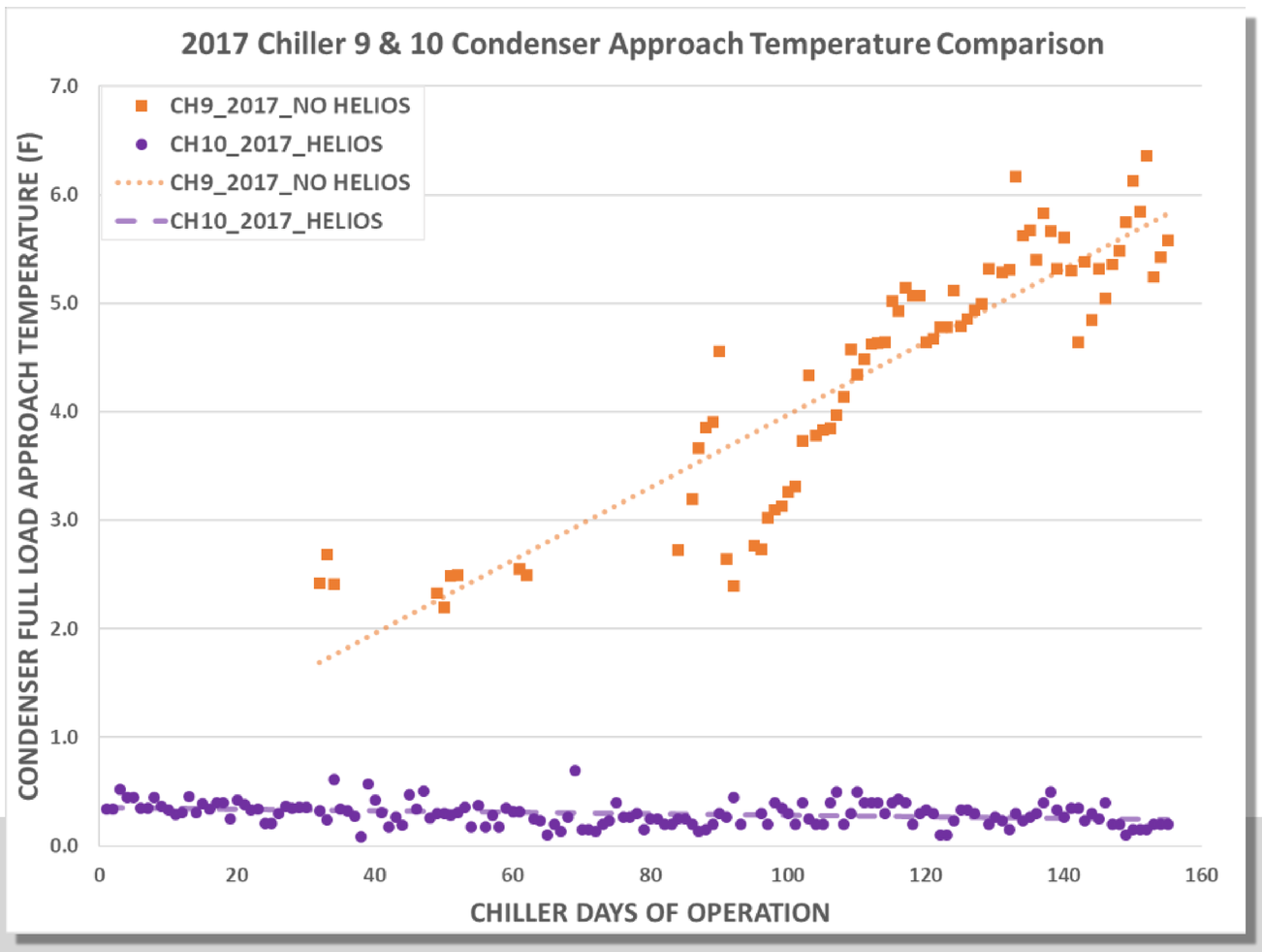


Fig 1. 2017 Chiller 9 & 10 condenser approach temperature comparison.

Chiller 10 Approach Temperature Maintained at 0.5 Degree F with Helios Tube Cleaning System® while Chiller 9 Approach Temperature Increases Due to Tube Fouling.

STUDY RESULTS

Convinced, Mason installed a Helios system on Chiller 9 for the 2018 season in order to further validate the Helios impact. **Figure 2** shows that Chiller 9 started 2018 at its clean operating state of 2˚F condenser approach temperature and it stayed there, flatlined, through the entire season.

In 2018, Chiller 10 again operated with a flatlined 0.5˚F approach temperature **(Figure 3)** for a second straight cooling season with no manual tube cleaning. It's a result seen by Helios operators again and again as the Helios continues to prove its effectiveness in eliminating tube fouling and improving chiller efficiency.

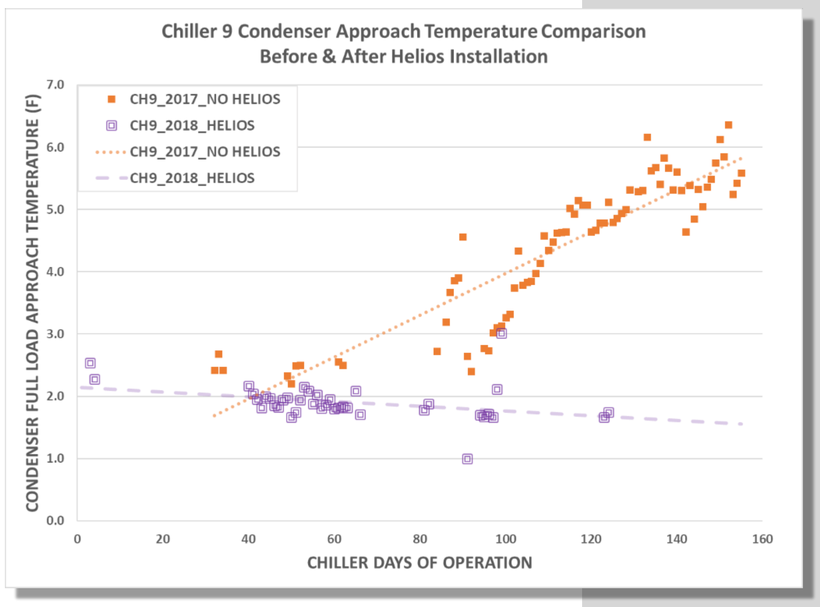


Fig 2.

Fig 2. Chiller 9 Approach Temperature Flatlines After Helios Tube Cleaning System® Installation.

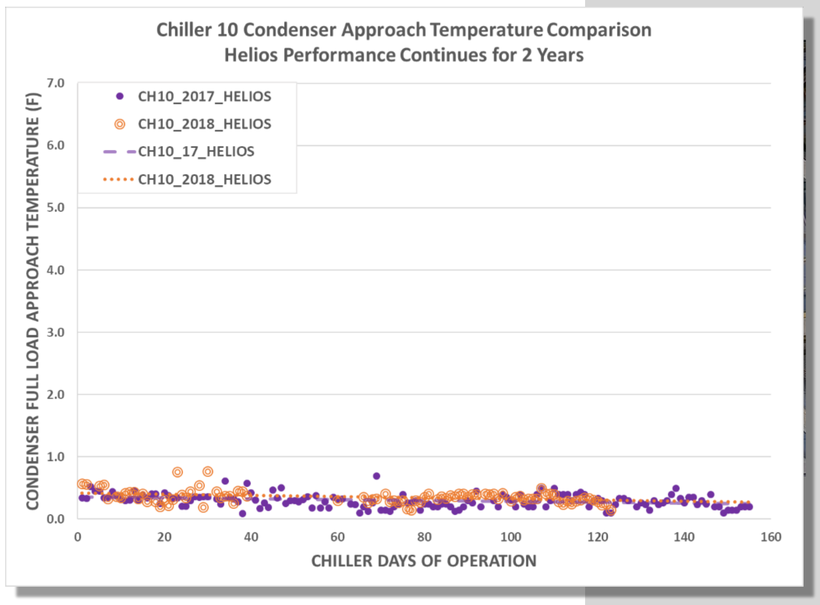


Fig 3.

Fig 3. Chiller 10 Approach Temperature Maintained at 0.5 Degree F for 2 Years due to Helios Tube Cleaning System®.

SUMMARY

Cost savings & improved sustainability.

Ultimately, Mason succeeded in the adoption of the Helios Tube Cleaning System®, resulting in significant cost savings and improved sustainability for the university. As is true with other Helios integrations, benefits include energy cost savings, reduced greenhouse gas emissions, and elimination of workload associated with tube fouling in the Central Heating and Cooling Plant chillers. Chiller tube-fouling inefficiency is often well-hidden and addressed by largely ineffective manual mitigation measures. Mason, after in-depth analysis, changed the status quo and significantly improved their central plant efficiency by integrating the Helios Tube Cleaning System®.

George Mason University Case Study Summary of Results	
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Fig 4. Summarized Efficiency Effects of Helios TCS at George Mason University

The Helios® Cleaning Cycle

The Helios cycle is fully automatic and controlled by a programmable controller.

1. Between cycles, the sponge balls are stored in the Collector and all valves are closed.
2. At programmed intervals, the Controller commands the injection valves to open and pump to start, and the balls are injected into the heat exchanger inlet line.
3. Normal cooling water flow transports the balls through the heat exchanger tubes and into the Ball Trap.
4. The Controller then prompts the collection valves to open and pump to start, and the balls are returned to the Collector, where they are held until the next injection/collection cycle starts.

View the Helios TCS Operation in action at innovastechnologies.com

Prevents scale.

Prevents scale, fouling, biological life and corrosion in heat exchanger tubes.

Reduces maintenance costs.

Reduces maintenance and downtime costs by eliminating manual or chemical tube cleaning.

Extends service life.

Extends the service life of heat transfer equipment.

The Helios Tube Cleaning System®

The Helios Tube Cleaning System® from Innovas improves the energy efficiency of cooling systems.

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See Helios in Action.