Case Study:

Aerospace Facility Reaps Benefits of Chiller Optimization

SMART energy OPS® OPERATIONS PERFORMANCE SERVICE

Hudson began working with a large $ 30 billion manufacturer and leader in Aerospace on chiller system optimization in 2013. The aerospace facility's chilled water system provides critical service for space cooling at a 900,000 square foot manufacturing plant in the Southwestern US. The site's central utility plant is managed by a national facility management firm, which is responsible for plant utility optimization. The chilled water system, with a cooling capacity of 3,700 tons, consumes an average of 6,000,000 kWh/yr, which accounts for 8% of the facility's electricity usage at an estimated operating cost of $420,000.

Hudson's SMARTenergy OPS® chiller optimization service was installed on two of the site's four chillers in 2013. Based on the proven success with the first two chillers, the site opted to extend SMARTenergy OPS® coverage to the site's two remaining chillers in November 2015.

As of August 2016, the site had realized $111,000 in verified savings and avoided a capital expenditure of $3 million for a system upgrade. Verified savings yielded a 1.2 year payback.

Challenge

In 2013 Hudson Technologies engineers joined the site's national facility management team to optimize the chilled water system. Prior to installation, the site did not have data on the electricity consumption of the chilled water system. Hudson's SMARTenergy OPS® chiller optimization service was installed on two of the four chillers (1,950 tons monitored out of a total of 3,700 tons) in 2013. The purpose of the installation was to measure and monitor the chiller system's efficiency in real time, detect faults and identify corrective actions, thus reducing operational costs. In addition, the site was considering the possibility of a chiller system replacement, a capital investment of more than $3 million.

The plant team, including the Hudson SMARTenergy OPS® engineers, took the engineering report and immediately went to work implementing near-term recommendations.

Solution

An integrated approach was developed for the site, which included installation of SMARTenergy OPS®.

The SMARTenergy OPS® integrated package included:

- **Highly accurate and calibrated sensors** to collect chiller operating data. Data are sent to Hudson's secure servers every 15 minutes.
- Simulation of the actual operating conditions of the four chillers and development of a **Calculated Part Load Value (CPLV)** of each chiller's efficiency. The difference between the actual operating kW/ton and CPLV sets the target for optimization and provides a lost opportunity cost.
- A comprehensive onsite **chilled water assessment**.
- **Verified energy and cost savings.**
- **Fault detection and diagnostics** of heat transfer issues, compressor performance, water flow issues, refrigerant stacking, system alarms and sensor errors.
- True lifetime **continuous commissioning**.
- **A tailored refrigerant, oil and water sampling program.** Samples are analyzed at the Hudson AHRI-certified lab, one of only three in the United States, and an engineering report prepared that highlights any issues with the fluids.
- Dedicated **engineering support**.

Results

Four projects were initially identified by SMARTenergy OPS® for near-term implementation. They included lowering the Entering Condenser Water Temperature; cleaning the chiller condensors; isolating a minimal process load and installing SMARTenergy OPS® on the remaining chillers. All of these have been implemented, which accounts for the $111,000 in savings with a 1.2 year payback.

Figure 1 provides an example of the diagnostics available on individual chillers. In July, SMARTenergy OPS® warned that condenser fouling and scaling had become a problem. After the condensor cleaning in December 2013, the warnings ended and chiller efficiency improved by 6 percent. SMARTenergy OPS® provides you with the data on performance and cost impact that can be needed to justify maintenance expenditures.

The SMARTenergy OPS® service also includes ongoing monthly reports on chiller operations, with recommendations for improvement from the Hudson engineer. The engineer supports the site to make ongoing adjustments in its operating practices. One example of the impact of a no-cost operational change is illustrated on Figure 2. Figure 2 depicts the efficiency penality for operating one of the chillers below its design flow (prior to Dec 2013). The average kW/ton was 0.651 in December and went down to 0.620 kW/ton in January 2014. This is a 4.5% improvement in efficiency, achieved with little or no cost.

Figure 1. Chiller Operation Before and After Tube Cleaning

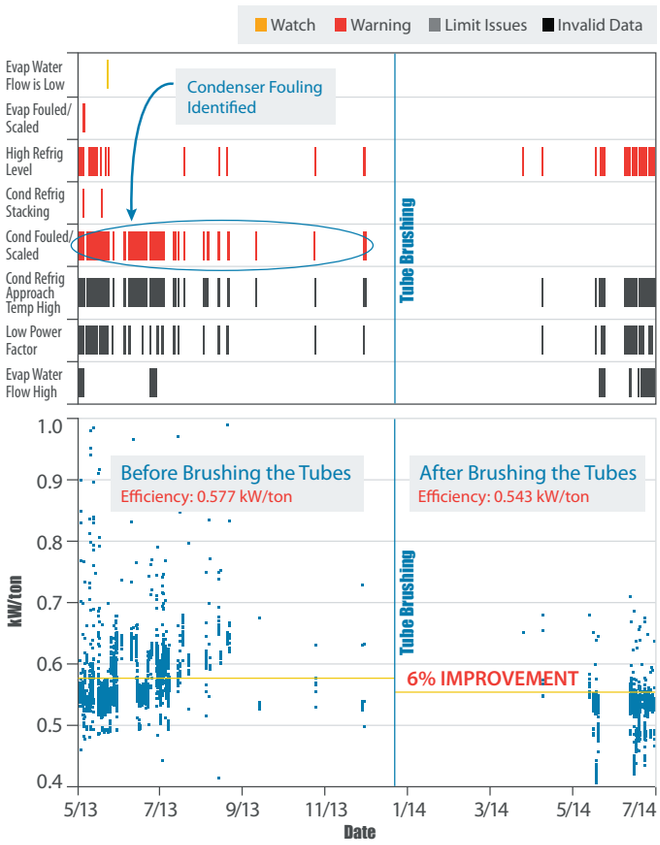
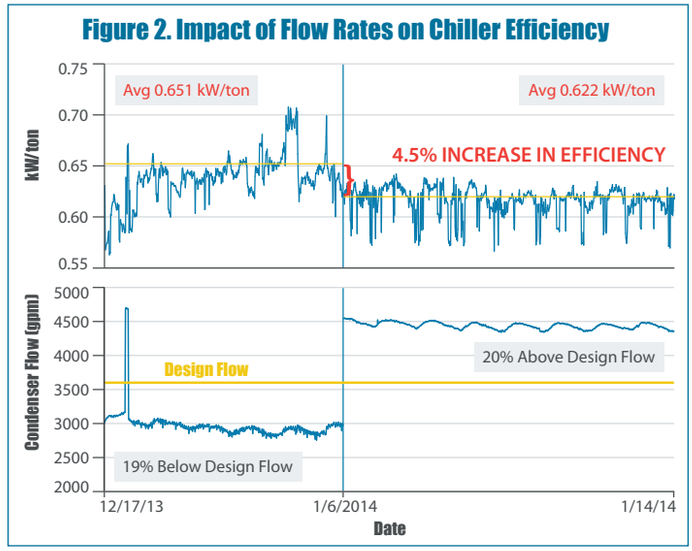


Figure 2. Impact of Flow Rates on Chiller Efficiency



Continuous commissioning of the chilled water system from 2013 to August 2016 using SMARTenergy OPS® **saved 1,600,000 kWh and $111,000, yielding a 1.2 year payback**.

As a result of improved analytics and Hudson's engineering expertise, the site avoided an **unnecessary capital investment of more than $3 million** for purchase of a new chiller system.

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