FLUKE®

Energy savings make the case for an HVAC upgrade

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Mike Klingler,
Ser vice Manager for
Farber Corporation

Case Study

Energy Waste

AT A GLANCE:

SITUATION

- Farber Corporation
- HVAC
- Columbus, Ohio
- Mike Klingler, Service Manager

CHALLENGE

Reduce HVAC energy usage without increasing the temperature

SOLUTION

- Installed a heat exchanger
- Shut down a 200-ton chiller during winter

TOOLS USED

- Fluke 1735 Three Phrase Power Logger
- Fluke 975 AirMeter

RESULTS

Reduce bill by 87.5 percent, for an annual energy saving of $9,954

Cool it: There must be a better way

Mike Klingler, service manager for Farber Corporation, an HVAC/R contractor in Columbus, Ohio, faced a challenge: prove that a major HVAC system upgrade would pay for itself in energy savings, without compromising occupant comfort or indoor air quality (IAQ).

The subject was an older six-story building at a Columbus-area law school.

Klingler noticed that one of the facility's 200-ton capacity chillers was kept running to supply cold water for the system, even in winter.

Klingler says, "When we get down to 50–52 °F and below, we can just draw that outside air in and use it for free cooling. But because of the setup of the law school building, they had to run one of the chillers even when it was 20–25 °F outside. Because of the duct distribution system we couldn't rely on outside air in certain areas of the building."

As a result, one chiller kept running to supply water chilled to 45 °F to the air handling units and keep the building's occupied spaces comfortable. A solution would have to deliver acceptable indoor air quality. Klingler had a plan, and the return on investment (ROI) for his system optimization program would hinge on energy savings.

Finding the ideal balance between energy consumption and indoor air quality involves multiple factors. Klingler said, "Decreasing ventilation rates may reduce overall energy consumption and reduce operating costs, but at the same time we have to maintain good indoor air quality standards too. There's usually a very tight ventilation standard that the service provider has to control in order to reduce energy costs and maintain quality indoor air conditions."

Klingler measured multiple IAQ factors before the upgrade, then checked afterward to ensure air quality was not compromised, using the Fluke 975 AirMeter™ test tool. He logged actual kWh consumption at the chiller over multiple 12-hour cycles, using a beta test version of the new Fluke 1735 Power Logger.

Klingler said, "The Fluke 1735 will measure and monitor over time and tell me the real power consumption of that equipment. You can see what your real power consumption is for any equipment in your building, and then equate that to real dollars."

Proving in the payback

Klingler's measurements with the Fluke 1735 showed that the big chiller averaged 790 kWh of power consumption over a 12-hour period. He computed a total power consumption over the four cold-weather months

of 189,600 kWh. At a cost of six cents per kWh, running that chiller was costing the law school $11,376 every winter. Klingler figured his alternate approach would cut that bill by 87.5 percent, for an annual energy saving of $9,954.

He estimated that installing the heat exchanger, piping, valves and controls would cost $46,000. That meant the payback period for the project would be just 4.62 years. And that estimate did not include possible savings from reduced wear and tear on the chiller unit.

"With the 975 AirMeter, the service company can go right into the air handler and take those readings and it will tell us, based on temperature or carbon dioxide. It's a very quick, easy, labor-saving tool."

On the power quality side, the Power Logger measures voltage on three phases and current on three phases and neutral. It records multiple parameters that can help determine system load, including voltage, current, frequency, real power (kW), apparent power (kVA), reactive power (kVAR), power factor, and energy (kWh). It can also perform power quality measurements. And the Fluke 1735 downloads to a PC and comes with software for creating reports.

A more savvy contractor

"The power logger makes it real easy for the contractor or engineering group to come in and measure power consumption on individual components in a building, a plant or an industrial facility," Klingler said. "When you start to look at the individual components, it allows you to think in terms of control strategies: how can I control this piece of equipment to reduce energy consumption? How much is it costing me and what can I do for savings?"

In addition to measuring power consumption, as Klingler did at the law school, the Fluke 1735 measures and logs voltage, amps, frequencies, waveforms, harmonics and power anomalies. "For maintenance and servicing, it's a troubleshooting tool," Klingler said.

"As a contractor, I would use it as a diagnostic tool, and it would be just as valuable to me in that regard as it is as a power consumption tool. I can use it both ways."

Tips for optimizing your HVAC system

1. **Measure airflow**
   Use duct traverses to measure air pressure, velocity and flow. If pressure is too high and/or airflow too low, check dirty coils, fans and filters that could be blocking the system.
2. **Check ventilation**
   Many buildings are either under-ventilated (bad IAQ) or over-ventilated (expensive). Readjust to ASHRAE standards.
3. **Add VFDs**
   Variable air volume systems use variable frequency drives (VFDs) to more efficiently regulate motors and pumps. An upfront installation cost in exchange for long term energy savings.

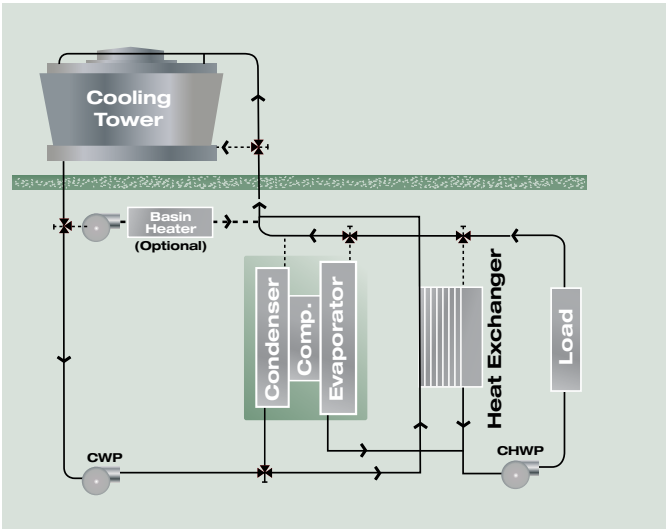

Figure 1. Proposed new system with heat exchanger.

ASHRAE 55 and 61

Guidelines for creating comfortable, affordable, indoor environments

ASHRAE Standard 55, "Thermal Environmental Conditions for Human Occupancy", explains how to create an indoor environment that satisfies 80 percent of a building's occupants. You do it with a combination six factors: air temperature, radiant temperature, air speed, humidity, metabolic rate, and clothing insulation.

Similarly, ASHRAE Standard 62, "Ventilation for Acceptable Indoor Air Quality", lists the minimum ventilation rates and air quality parameters that are acceptable to occupants. It also explains how to use ventilation to control air contaminants.

Combined, the two standards provide a set of thresholds for you to compare customer systems against. Optimize toward ASHRAE and you'll probably improve both air comfort and energy usage.

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