CASE STUDY

ensuring environmental integrity

Stauffer Laboratory, Stanford University, CA

Background

Constructed in 1959-60, the 28,000 square foot Stauffer I Building is a chemical research laboratory with wet and dry laboratories. The building also contains support space for researchers and administrators with offices, conference rooms and other non-laboratory space.

Stauffer Laboratory at Stanford University

The Situation

In 2002, the in-house energy group at Stanford University conducted a campus-wide study to identify buildings with significant potential for energy retrofit savings. The buildings were evaluated by site energy consumption as well as cost as a function of the building size. A total of 12 buildings were identified that represented roughly one-third of the total campus electrical consumption and accounted for a combined operating cost of $15.3 million annually. Stauffer I Laboratory Building was selected as one of the first projects due to its small size, high energy usage, and similarities to other campus buildings that were also candidates.

The Stauffer I building's HVAC system consisted of three central 100% outdoor air, constant volume air-handling units (AHUs) consuming a large amount of energy. In addition, both the supply and exhaust fans were operating at nearly full capacity and maintaining the correct relative room pressurizations was problematic.

The Solution

After further analysis, the energy group identified the following measures to be implemented in the building HVAC retrofit:

- Replacement of pneumatic zone controls with a direct digital control (DDC) system (Phoenix Controls Celeris® 2 system), which enabled supply air temperature reset in response to zone demand
- Conversion of all constant volume zones to Phoenix Controls variable air volume (VAV) zones by adding calibrated venturi valves to supply and exhaust ducts
- Conversion of the constant volume bypass air hoods to VAV hoods by installing blank-off plates over the existing bypass pathways
- Addition of Phoenix Controls Zone Presence Sensors® (also known as ZPS®) at the fume hoods to provide variable face velocity during hood "occupied" and "unoccupied" conditions
- Addition of differential pressure sensors across the supply valves, enabling dynamic reset of the supply fan duct pressure setpoint while ensuring adequate pressure for control of the supply valves
- Install of an Indoor Air Quality (IAQ) system to manage air change rates more efficiently

The Conclusion

Once the zones were converted to VAV, the airflows were allowed to reduce to the minimum required ventilation rates and the reheat was nearly eliminated for the warmest months. By dynamically controlling the space, the VAV system conversion was able to accurately address the two critical laboratory air quality safety concerns: room pressurization and reducing face velocity. The Celeris system was able to achieve that, plus it provided a tighter temperature control and operated at "less-than-design" airflows for most of the year.

In all, many changes were made to the Stauffer I building in order to meet the proposed 40% reduction in energy consumption. Together, changes to the chilled water, steam systems and airflow - the results exceed expectations and achieved a 46% reduction in energy, setting the standard for future capital budget planning.

Phoenix Controls 75 Discovery Way | Acton, MA 01720 | 978-795-1285 | www.phoenixcontrols.com