

University Science Building saves \$1.2 million in annual energy costs while maintaining environmental safety ventilation requirements

Overview



This university Science and Engineering Building (SEB)* is a 130,000 square foot state-of-the-art nanotechnology research facility. It houses class-10, class-100, and class-1,000 cleanrooms, offices and classrooms.

** Due to confidentiality agreements, we are not able to provide the client name. We will refer to the building as SEB throughout this case study.*

The Challenge

The University has a goal to reduce its greenhouse gas emissions by 30% below 2006 levels, by employing energy conservation measures in its buildings across campus.

From its beginnings, SEB was designed with future flexibility in mind. As a result of this flexibility, the building was operating at greater than \$35 per square foot for utilities, with significant excess HVAC capacity. The University wanted to reduce energy consumption at SEB while maintaining safety. This is consistent with the overall campus sustainability vision of improving energy efficiency to provide for a healthier environment for students, staff, and surrounding communities.

Cimetrics' Solution

Cimetrics was selected to provide its Analytika Pro solution for SEB. Cimetrics collaborated with Siemens, SEB's building automation system provider, to connect to and collect sensor and actuator data from almost 3,500 physical points. Data was collected continuously, 24 hours a day, and 365 days a year, totaling over 330,000 data samples per day.

The following systems were monitored: 8 air handling units, 18 chilled water and hot water pumps, 4 steam-to-hot-water heat exchangers, 192 terminal units, 25 recirculating air handling units, and 106 fan coil units.

Over 1,000 Analytika software algorithms continuously analyzed the data to identify opportunities to reduce energy consumption, improve comfort, and reduce operations and maintenance costs.

Experienced Cimetrics engineers leveraged Analytika software to identify opportunities, determine root cause, and calculate annual savings impact. Actionable recommendations were documented and provided to the client both through online and offline channels. Cimetrics' role did not end with providing recommendations; Cimetrics engineers engaged with the client team on a regular basis to help answer questions, coordinate implementation, and provide regular feedback on progress.

Results Achieved

- Financial summary
 - Total energy savings: \$1.2 million/year (25% of annual cost)
 - Operating cost reduction of \$9 per square foot
 - Simple payback: <6 months
 - Net present value: \$4.2 million
- Operational benefits
 - Sustainability and environmental stewardship: Achieved 3,200 metric tons in annual CO₂ emissions reduction, which is the equivalent of taking almost 700 cars off the road.
 - Vendor management: Verified that optimum sequence of operations were programmed into the building automation system (BAS) by outsourced facilities management vendors.
 - Utility Incentive: Identified eligible measures under the local utility's Pay for Performance program.

Example of Fault Detection and Diagnostics: Simultaneous Heating and Cooling

The humidifier steam jacket in a large air handling unit (AHU) had a significant leak, resulting in excess heating in the air handling unit. As a result, the cooling coil valve opened to maintain discharge air temperature and relative humidity.

This fault was not detected on-site because the AHU was still providing the required humidity and temperature in the zones. However, the AHU was using a substantial amount of excess energy as a result of the leak.

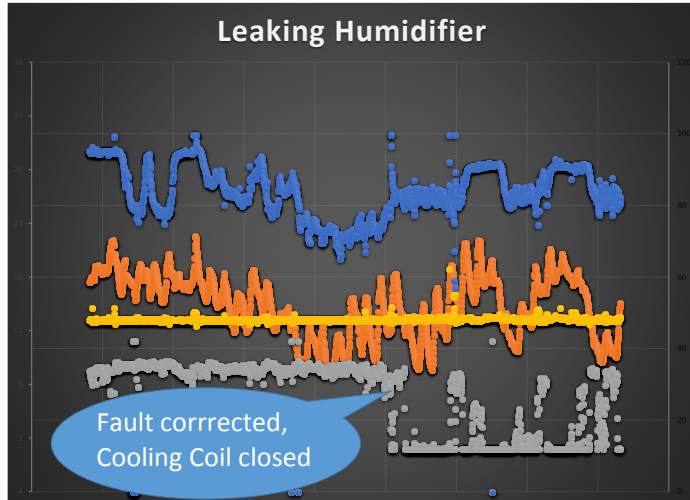


Figure 1: Leaking Humidifier

Solution

Cimetrics worked with SEB staff and their controls vendor to fix the leak and verify the savings.

Annual energy savings achieved: **\$59,204**

Annual carbon emissions reduction: **114 metric tons**

Example of Optimization: Air Change per Hour (ACH) Reduction

Zones in SEB were operating at a much higher than necessary air change rate based on the original design.

Implementing a strategy to reduce air changes per hour can have a significant impact on energy and greenhouse gas savings without impacting safety.

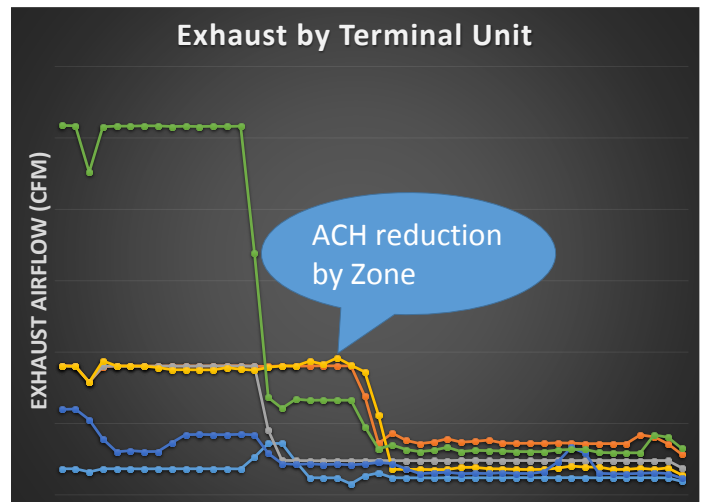


Figure 2: Floor 4 exhaust terminal units

Solution

Cimetrics worked with SEB facilities personnel and Environmental Health & Safety personnel to define and implement a strategy to reduce ACH at the zone level to maximize savings and maintain adequate ventilation in the spaces.

Annual energy savings achieved: **\$216,105**

Annual carbon emissions reduction: **169 metric tons**

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