

CAL STATE UNIVERSITY REACHES NEW LEVELS IN ENERGY CONSERVATION THROUGH EFFECTIVE VENTILATION MANAGEMENT

Just like laboratory buildings on college campuses everywhere, the Chapman Science and Academic Center (SAC) on the campus of California State University, Monterey Bay used much more energy per square foot to heat, cool and ventilate its laboratory space than any other building on campus. As is the norm in many lab buildings, the ventilation system at the SAC was designed to use large quantities of 100% outside air to dilute any potentially harmful compounds that might be released outside of the labs' fume hoods.



The design ventilation to the labs was set to maintain 10 air changes per hour at all times as a means to keep air fouling resulting from spills or rogue emissions from lab procedures in check. The reality was that spills and rogue emissions rarely occurred. Additionally, lab spaces were not uniformly utilized throughout the occupied hours of the building and over-conditioning was occurring. The building's environmental control system was essentially set at one speed with no way of knowing when it was possible to reduce the high ventilation rates. Worse yet, the high air change rates combined with Monterey's temperate climate led to very high levels of reheat energy usage.

Using lower air change rates would no doubt save energy, but what if lower ventilation rates didn't match with the activities in the space? This first priority of safety couldn't be compromised.

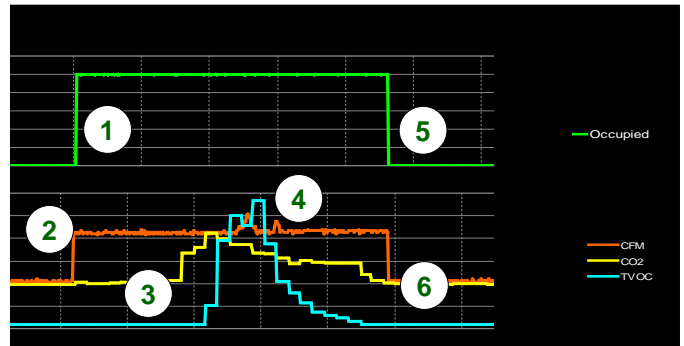
Achieving energy savings without safety compromise was possible by installing the OptiNet™ system from Aircuity®. This upgrade gave the environmental control system the ability to sense the actual environment in the labs and react appropriately. By monitoring the levels of Total Volatile Organic Compounds (TVOCs), Particles, Dewpoint and CO₂, the labs now safely operate at OSHA minimums of 4 Air Changes Per Hour (ACH) when occupied. By incorporating occupancy detection as part of the system, additional savings were achieved by reducing ventilation rates to 2 ACH when labs are unoccupied. If an increase in any of the monitored variables is sensed at any time, the ventilation system increases to maximum possible flow in the affected lab. Maximum ventilation is only delivered to the space where it's need for dilution, while all other labs remain at either 4 or 2 ACH.

The OptiNet system provides a means to measure the variables of concern, without installing a large number of discrete sensors in every lab space. Optinet takes air samples from each lab and delivers them to centrally located sets of laboratory grade instruments that are "shared" between multiple labs. Samples are transported through a specially developed MicroDuct™, which incorporates the latest in nano-technology to provide a chemically inert and electrically conductive path for the air samples to follow as they move from the labs to the instruments used for analysis.

Integration into the University's environmental controls network will be achieved via a BacNet interface to the Campus building automation system.

The following data taken from one of the labs at the University provides a visual perspective on how the savings are achieved. The sequence of events is as follows:

1. Teacher arrives to prepare for upcoming laboratory. Motion detector senses occupancy. (Green line.)
2. Ventilation increases from 2 to 4 ACH. (Red line).
3. Class begins to arrive. CO₂ levels increase. (Yellow line)
4. TVOC levels are generated in the lab procedure (blue line), and ventilation increases above 4 ACH to dilute them. Once the procedure is over the TVOC levels drop. Ventilation returns to 4 ACH
5. Occupancy sensor determines class is empty.
6. Ventilation reduced to 2 ACH.

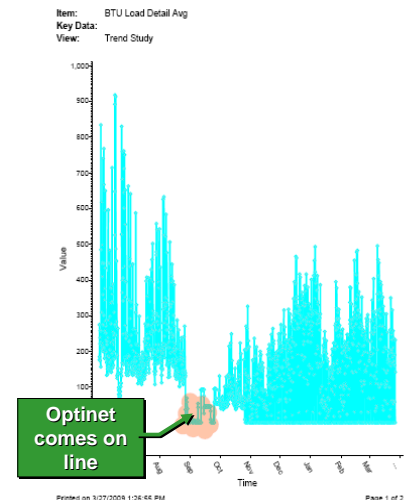


The Project also qualified for funding through the UC/CSU/IOU Energy Efficiency Partnership which incentivizes energy efficiency projects on UC and CSU campuses. The Partnership makes funding for energy saving projects available to UC and CSU campuses. In order to determine the incentive level possible the campus worked with Aircuity and the Partnership's due diligence reviewer EMCOR Energy Services to analyze and compare the current operations to a model of operations under the proposed system. This model predicted significant savings, and preliminary indications are they will be exceeded.

Square Feet of Lab Space	18,550
Estimated KWH Reduction	236,282 KWH
Estimated Gas reduction	38,497 Therms
Estimated demand reduction	84 KW
Payback Expected, cost to savings	Less than 1 year
Payback Expected, including incentives	Instantaneous

The graph at right demonstrates the magnitude of the savings. It shows total heating hot water BTUs during the three months leading up to the Optinet installation, and afterwards. Optinet was brought on line in the middle of September.

In addition to exceptional energy savings, the system offers significant life cycle cost savings as the use of centralized components greatly simplifies ongoing maintenance and calibration. The University contracted for services that calibrates all Aircuity components semi-annually in a NIST traceable environment. This ensures continued optimum performance as time goes on, without the need for the University to dedicate staff resources to calibration of multiple sensors located throughout the building.



The installation of Optinet has brought financial, environmental, and life cycle benefits to the University.