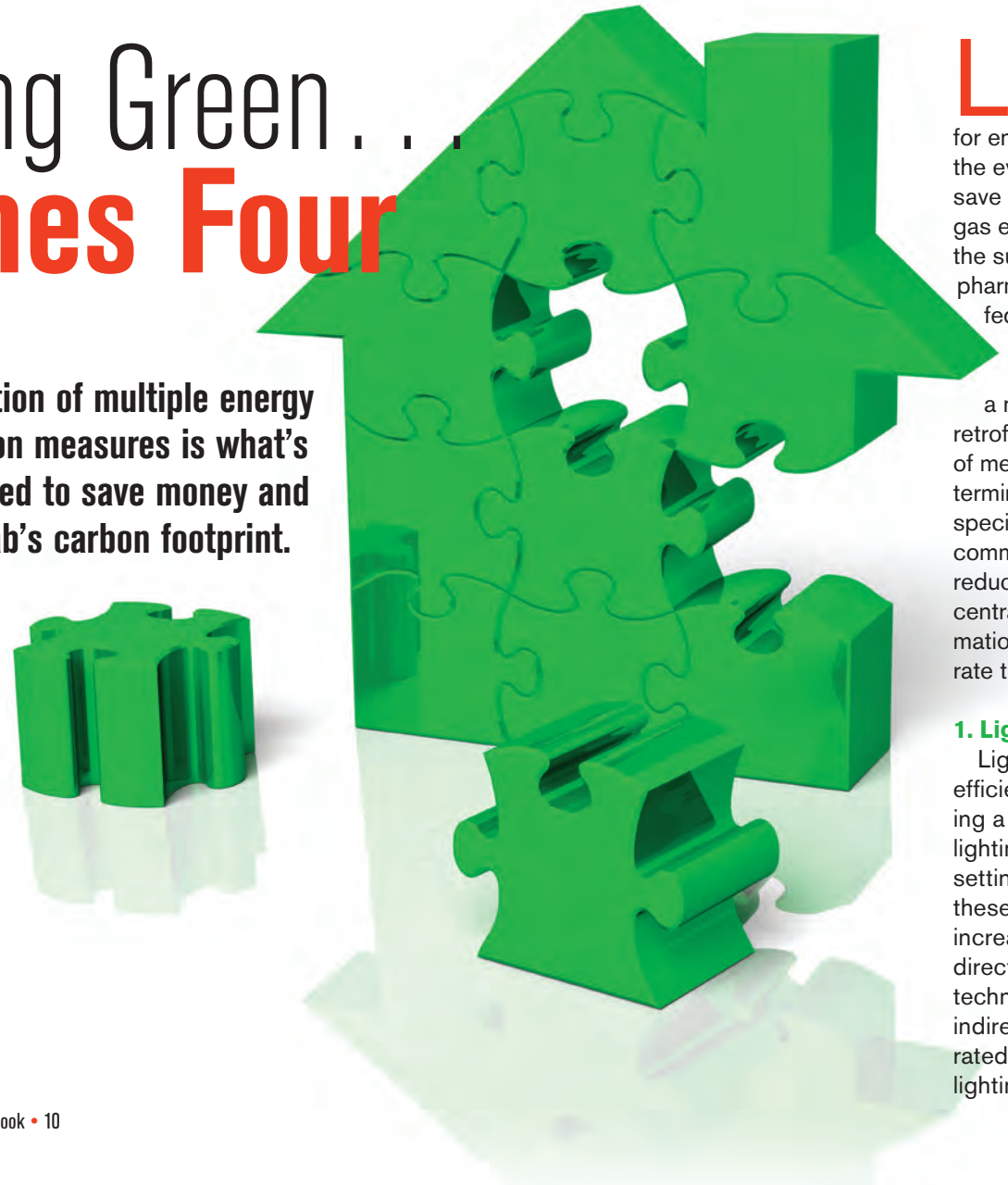
Going Green . . . Times Four

A combination of multiple energy conservation measures is what's really needed to save money and reduce a lab's carbon footprint.



Laboratories have long been recognized as huge consumers of energy, but they were often regarded as poor candidates for energy efficiency initiatives. However, with the ever-increasing need to reduce energy to save operational funds and lower greenhouse gas emissions, labs are taking center stage in the sustainability action plans of universities, pharmaceutical and life science companies and federal research organizations. In order to achieve maximum energy savings, a holistic approach must be taken when designing a new laboratory or conducting an energy retrofit in an existing facility. There are a variety of measures that should be considered, and determining the right combination is based on the specific lab being evaluated. Some of the more commonly combined measures for significant reductions in energy include lighting upgrades, centralized demand controlled ventilation, information management and a reduction in the flow rate through exhaust stacks.

1. Lighting

Lighting is generally one of the first energy efficiency measures considered when designing a lab. There are several different types of lighting measures that can be combined in a lab setting to produce energy savings. The first of these is daylight harvesting. Sunlight is free, but increased thermal demand and glare can make direct sunlight a problem, not a solution. Using techniques such as adding light shelves to indirectly distribute light in the space, and perforated blinds, which take advantage of natural lighting without the glare, will maximize the use

of natural light without introducing secondary issues. Many labs are also instituting lighting control systems that adjust the amount of lighting depending on the level of natural light. Occupancy sensors that only turn the lighting on partially are also a good way to reduce energy use. With these lighting controls, the sensor is programmed to only turn the lights on halfway with the user being responsible for manually turning on the lights to full power. Most times, the daylighting techniques and task lighting more than compensate for the residual power reduction in overhead lighting. For specific areas that need more task lighting, magnetic LED lighting is ideal, as it can illuminate individual bench work spaces and be easily moved from one area to another for maximum flexibility.

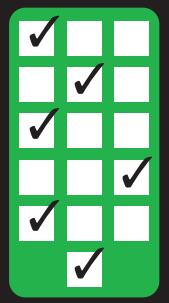
2. Ventilation

While lighting is often the first conservation measure considered, the largest energy saving opportunity in a lab centers on optimizing ventilation rates. Centralized demand controlled ventilation (CDCV) is a common technique used to vary ventilation rates based on the actual conditions of each lab area. CDCV employs a multiplexed sampling system that captures air samples from each lab area and delivers them to a centralized sensing suite that analyzes each sample on a variety of conditions. When lab air is clean, ventilation rates are reduced. If the lab air is not clean, ventilation rates are increased to help flush out the odors or particulates. Additionally, all of the data about the lab air conditions are stored, analyzed and made available to lab operators via a secure web interface. Because labs have been found to be "clean" most of the time, the reduction in air change rates usually results in a significant energy savings between 40 to 60 percent, while EH&S professionals get the benefit of 24/7 monitoring information about the indoor environmental air quality of their labs. This level of savings makes CDCV a good foundation for most lab energy efficiency projects.

3. Information

Implementing centralized demand controlled ventilation also creates an opportunity to use information management to drive behavior change. The information collected by the centralized demand controlled ventilation system is analyzed and delivered in different ways to meet the needs of energy managers, EH&S professionals and lab occupants. EH&S professionals will want to examine indoor environmental quality and building performance data, while energy managers will likely be more interested in monthly savings and identifying issues that may be impacting those

DIGITAL EXTRA

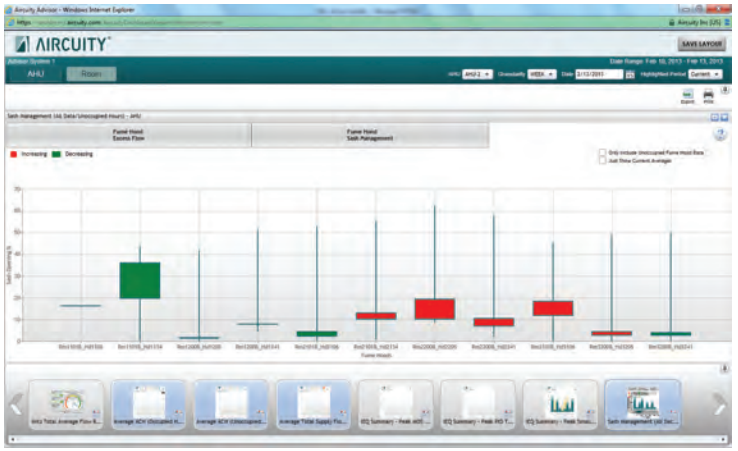


USGBC's App Lab

The U.S. Green Building Council (USGBC) has launched an App Lab as part of its LEED Automation Program. The lab is a searchable catalog of third-party apps that are integrated with LEED data. Each app is a fully functional software tool that can provide LEED project teams and administrators integration with LEED Online and address the LEED certification process. The lab currently includes these apps: Greengrade LEED Management Software, GreenWizard, LEED EBOM Document Management, LoraxPro Mobile, PlantLog, SCIwatch and SeriousEnergy Manager.

http://new.usgbc.name/apps

savings. One of the commonly used reports to help drive behavior change in the lab is the sash management graph. This graph looks at fume hood flow, sash position and fume hood occupancy, then provides a graphical representation of sash position both when the hood is occupied and unoccupied. Sustainability professionals and lab managers can use this information to quickly identify fume hoods that may be left open unnecessarily, which is a huge energy waste.



This candle-stick chart displays the minimum, maximum and average sash opening for each fume hood served by the selected air handling unit over the selected weekly time period.

4. Exhaust flows

Another large consumer of energy in lab facilities is not in the lab itself–it's on the roof. A tremendous amount of energy is spent exhausting lab air high enough that it does not get drawn back into the air intake system of any nearby building. There are several ways to reduce this exhaust energy. The simplest method is to raise the physical height of the exhaust stack itself, although this is often met with architectural/aesthetic opposition. Demand controlled ventilation can be deployed to monitor contaminants within the exhaust plenum and adjust exhaust velocities based on the presence or absence of pollutants. Another option uses an anemometer to sense the current wind conditions and adjust exhaust flows. When the wind increases, the velocity is also increased to ensure all fumes are exhausted safely from the area, and when conditions subside again, velocities can be reduced to energy-saving levels. A wind tunnel study is almost always required to determine which of these measures are right for the building.

Reducing the energy consumption in a lab is not only possible, but it is a critical step in achieving real savings and reducing an organization's carbon footprint. Sustainable lab designs today include a combination of measures, and determining which are best is heavily dependant upon the lab facility itself and its use. Many of the new technologies available allow for not only a significant carbon emissions reduction, but a better space for researchers to work as well. ●

Sarah Callahan, Marketing Manager, Aircuity, Inc.