BEST PRACTICES 2007

University of California, Davis Bathroom Vanity Lighting Retrofit

The new hybrid lighting system installed in the bathrooms of Webster Residence Hall use an occupancy sensor and LED nightlight to reduce the burn time of the overhead fixtures. These features eliminate three to four hours of use daily, and show great promise for helping students save energy.

Award Category

Lighting and Controls

Green Features

Automatic shutoff after 15-minute vacancy

One-watt LED nightlight

Backup battery enables LED to provide light in a power outage

Annual Energy Savings

50% reduction as metered by CLTC

8000 kWh

$1300

Scope

83 bathrooms in Webster Residence Hall

Cost

$30 per WattStopper wall switch

$175 per MetalOptics fixture

Completion Date

Summer 2006

The California Lighting Technology Center (CLTC) develops energy-efficient lighting solutions and works with manufacturers and electric utilities to bring these technologies to market. A CLTC program called the UC/CSU PIER Demonstration Project brings emerging lighting technologies directly to the UC and CSU systems. UC Davis partnered with the CLTC to test a new hybrid light fixture developed specifically for bathrooms.

The PIER Demonstration program teaches campus facilities staff about new energy-saving technologies, and generates valuable data from a field testing environment. CLTC researchers install and monitor a technology, and use the energy data and user satisfaction feedback to refine the product and its application. Campuses benefit from the program by gaining familiarity with next-generation technologies that can replace ineffective lighting systems and save money.

View of the MetalOptics fluorescent wall mount fixture. Photo: Mike Sheehan.

The CLTC and UC Davis' Student Housing Department tested the hybrid bathroom lighting system in Webster Hall, a suite-style residence hall with private bathrooms. The hybrid vanity fixture was developed by CLTC and MetalOptics specifically for application in dormitory and hotel bathrooms. An occupancy sensor and an LED nightlight are integrated into the high-efficiency fluorescent wall mount fixture. The CLTC also partnered with WattStopper to develop a wall switch that performs the same functions but is compatible with an existing fixture.

The bathroom vanity system saves energy by reducing the amount of time that the light is on. Occupants manually turn the light on and can turn it off manually as well. However, if occupants forget to turn it off, the fixture does so automatically after the space is vacant for 15 minutes. Both technologies use a passive infrared sensor to detect differences in temperature radiating from a moving person and the background space. The sensor guarantees that lights will not be left burning when students are in class or leave for extended holiday breaks.

The CLTC found that bathrooms in Webster Hall were unoccupied and lit for an average of five hours each day prior to the retrofit. That totals over 150,000 hours of lights burning unnecessarily each year in the bathrooms of just one residence hall.

Both the fixture and the wall switch are designed with a one-watt LED nightlight to save additional energy. The nightlight activates anytime the overhead wall mount is off. The unobtrusive amber light provides adequate illumination for navigating the bathroom in the dark, enabling students to grab an item from the countertop or hang a towel. Eliminating unnecessary use of the overhead fixture not only saves energy, but also extends lamp life by reducing the number of times the luminaire is turned on and off. Both products are equipped with a backup battery that makes it possible for the LED to provide safety lighting in the event of a power outage.

Seventy-one bathrooms in Webster Hall were retrofitted with the MetalOptics wall mount fixture, and the remaining 12 bathrooms were

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California Lighting Technology Center

UC Davis Student Housing

More Information

cltc.ucdavis.edu/content/view/96/162

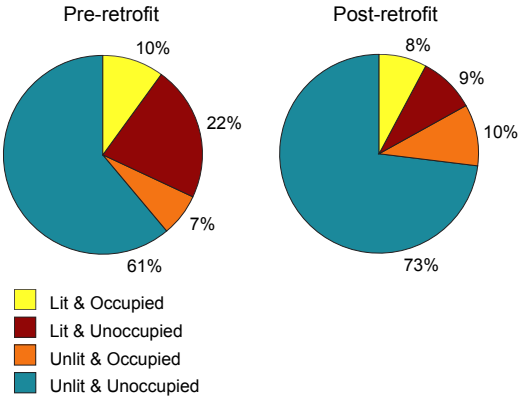
www.wattstopper.com/products/details.html?id=96

www.metaloptics.com

retrofitted with the WattStopper wall switch. This was done so that CLTC researchers could evaluate the performance of both technologies and determine if the two types of hybrid fixture achieved the same level of energy savings.

The CLTC used lighting loggers to record the occupancy and light usage patterns before and after the retrofit. Researchers found that the average amount of time that the luminaire was on while the room was vacant dropped 13 percent after the retrofit. They also found that the time the bathroom was unlit and occupied rose from 7 percent to 10 percent, showing that the LED nightlight was having a positive impact on energy use.

The data also revealed that bathrooms retrofitted with the wall switch saved the same amount of energy as those that received the hybrid fixture. Savings of 50 percent were achieved in both instances.



Pre- and post-retrofit data gathered with lighting loggers. Image: CLTC.

In addition to measuring the energy savings of new technologies in a field testing environment, PIER demonstrations are used to gather user feedback and gauge how well the technology is received. Students in Webster Hall responded positively to both the MetalOptics and WattStopper fixtures, citing better lighting quality and reduced eye strain. Students reported that the LED nightlight is a useful and pleasant alternative to turning the light on late at night. CLTC researchers also received feedback that the system is not entirely intuitive, and education for incoming occupants or signage would be useful.

UC Davis predicts that $100,000 worth of energy savings are available to the campus if all residence hall bathrooms are retrofitted with the hybrid vanity lighting system.

The successful partnership between Student Housing and the CLTC has inspired collaboration on several additional lighting retrofit projects. Student Housing plans to install the hybrid vanity lighting in Emerson Hall, a 500-bed residence hall. The department is also collaborating with the CLTC on a dining facility renovation and the lighting design for a new 500-bed residence hall.

LESSONS LEARNED

The average installation time was 45 minutes for the MetalOptics fixture, and 10 minutes for the WattStopper wall switch. Both technologies are designed to be straightforward to install, and CLTC researchers found that in-house electricians became proficient very quickly.

The time delay on the occupancy sensor can be set at 15 minutes, 30 minutes, 1 hour or 2 hours. After originally setting the fixture at 1 hour, CLTC researchers reduced the delay to 15 minutes. The energy savings noticeably increased with this adjustment, and occupants did not notice any difference between the two settings.

At just $30 per unit, the WattStopper wall switch is more cost-effective for bathroom retrofits than the hybrid fixture. The MetalOptics fixture does provide higher quality night-lighting for medium to large bathrooms, however, and should be considered for installation in new construction projects.

Best Practices is written and produced by the Green Building Research Center, at the University of California, Berkeley.

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