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## UC Davis light-adjustment research seeks to cut energy use, costs

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Sometime in the near future, you'll be strolling through your favorite big box store and probably not notice the lights overhead are adjusting themselves to changing natural light streaming through skylights and windows.

The abundant warm light will give you a boost, while the lighting control system that runs it all helps the store reap big savings on energy.

Researchers at the University of California, Davis, have pioneered fully automated "daylight harvesting systems" that they hope will soon be applied in the real world.

Engineers at UC Davis' California Lighting Technology Center recently signed licensing agreements with Santa Clara-based Watt Stopper/Legrand and Axis Technologies, headquartered in Lincoln, Neb.

Wal-Mart also has approached UC Davis researchers to perfect cost-cutting systems for its stores. And the U.S. Navy and SMUD have expressed interest in the school's lighting technology.

"It has potential," said Watt Stopper product manager Daniel Trevino. "The asset of this technology is the auto-calibration process. That's what I think will be an advantage for our customers."

The company is now huddling with UC Davis researchers, refining the technology.

But automated lighting systems are already at work in stores and office buildings. And anyone can adjust lights with just the flip of a switch. So why is this advanced technology needed?

Today's automated systems aren't cheap. Often they require hiring a "commissioning" agent to painstakingly calibrate lights based on particular surroundings.

On Tuesday at UC Davis' California Lighting Technology Center, engineer Theresa Pistochini tested a prototype light sensor that resembles a smoke detector, mounted to the ceiling.

Black fabric hung from two walls, altering the reflective quality of light that poured through a wall of windows. Pistochini set up additional sensors throughout the room and wired them to a computer, tracking light levels as the control panel adjusted to changing daylight.

"We're looking to see the units of light recorded," she said. "What time do the lights go off and on? How many hours have we saved?"

The one-sensor system is meant to adjust to daylight entering from the side of a building. It turns lights off in mid-morning, and on again in late afternoon, saving about six hours of lighting per day, she said.

Depending on the hours of daylight, that could potentially shave up to 50 percent from lighting costs, according to Dr. Konstantinos Papamichael, associate director of the lighting technology center.

"In the real world, people don't notice," Papamichael said. "If there's plenty of light, more than what I need, I don't think, 'Let me cut off the lights to save energy.' "

In another room, Papamichael demonstrated a two-sensor lighting control system, combining a downward-facing sensor and one facing a skylight. The dual-sensor system more reliably measures daylight and allows for gradual dimming of the lights.

People are more comfortable when lights are dimmed gradually, he said.

The light advances are an example of the academic-commercial collaborations fostered by UC Davis researchers.

"(The research) is very applied, very design-oriented and ... close to market," said Meg Arnold, director of business development for UC Davis InnovationAccess, a technology transfer office that files patents and negotiates with licensees on behalf of university inventors.

The university has 800 available, unlicensed inventions, she said.

"We refuse to start projects without end-user partners. At the end of the project, we want a commercial product," Papamichael said.

Papamichael said the lighting technology center hopes to have about 50 to 100 commercial system prototypes field-tested this summer or fall.

Trevino of Watt Stopper is more conservative.

"It's not that easy. ... First we need to finish the testing and then prepare everything necessary to launch the product," he said.

A green building boom has spurred demand for innovative and energy-efficient lighting control systems. State building codes require big box stores – with at least 25,000 square feet and 15-foot ceilings – to be built with skylights and day lighting controls, according to UC Davis experts. Smaller stores with 15-foot ceilings could face similar mandates later this year, Papamichael said.

Pistochini, of the lighting technology center, said the center's research isn't just rethinking lighting in greener buildings. It's also questioning how much light is needed in the first place.

Pistochini recalled shopping during a recent power outage at a grocery store.

"It was dark, but I could still see what I was buying," she said. "I thought it was pleasant."

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