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Bright Ideas

New-and-improved technologies help companies save on energy costs, make work environments user-friendly, and reduce electrical grid loads.



Photo: @iStockphoto.com/Umbris

By Katherine Holden

Whether speaking of one-of-a-kind technological advances or the concept and process of “bundling” to address energy needs and savings, there’s a lot going on—hybrid daylighting, induction lighting, light-emitting diodes (LED) roaring down the pike, new ways to control the flow of voltage from older lamps, new lighting techniques that allow controlling to be from a computer anywhere in the world, and putting it all together in one bundle, from the photovoltaics on the roof to the smallest exit sign. Clearly, energy-efficient lighting is on a roll.

The Right Technology for the Right Problem

Energy-efficient lighting is what the California Lighting Technology Center (CLTC) on the University of California (UC) Davis campus is all about. Established through a joint effort of the California Energy Commission and UC Davis to stimulate the research, development, and application of energy-efficient lighting, CLTC is part of the Design Department in the College of Letters and Science. CLTC’s Director of Engineering, Bruce Pelton says, “We use the university and college system as a test bed. Right now, we’re using four parking lots on campus to test three lighting systems. Moving towards white light, we’ve conducted trials on bi-level metal hydrate, LED, and induction lamps. We’re technology neutral. The trick for us is finding the right technology for the right problem.”

According to Pelton, the State of California is looking at energy efficiency and “is outlawing low-efficient light sources. It will soon demand that outdoor fixtures are controllable.”

Working with local utilities, Pelton says they paid one-third of the cost for the roll out of the 1500 induction lamps for purchase and installation. “The utilities like the long-life property of the induction lamps with the energy reduction,” he adds. “It makes more sense to conserve and delay the need for new energy sources. The utilities are paid for what they produce and what they conserve. They will put a quarter-million dollars into this project.”

What’s being tested at UC Davis can easily extend to the 11 campuses in the UC system, state universities, community colleges,

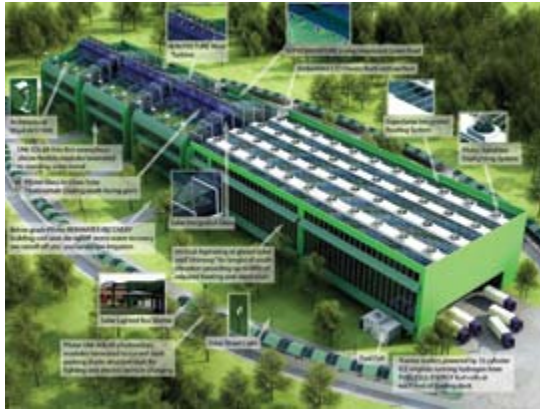


Photo: Pfister Energy Inc.
From hybrid daylighting, solar, and introduction lighting to photovoltaics, green roofs, and wind turbines, there's a lot going on in energy-efficient technology.

and state buildings. "The State of California is one of the largest landlords in the world," says Pelton.

And he loves the 100,000-hour life of induction lamps. "As they use 4,380 hours per year, that means in excess of 20 years," says Pelton. "We've never had to deal with anything that lasts this long."

He also loves how the lighting is intelligently controlled, and spoke of proximity detection—lighting at night in public places where an area with full brightness broadcasts that someone or something has been there. White light and proximity detection "effectively extends a police department's scene. So with induction lighting, we're enhancing security," says Pelton.

Although he sees a growing future for LED lamps, he says that out in the world at nighttime they are a problem because, with the efficiency of LED's, it's hard to control the distribution of the light. In addition, since induction lighting is currently one-third to one-half the cost of LED's, it makes sense for the University to move towards

induction lighting for exterior lighting.

For parking structure needs, Pelton is particularly pleased with induction lamps, and recently rolled out with 1500 EverLast 85-watt step-dimming fixtures from Full Spectrum Solutions Inc. of Jackson, MI. The campus and the utility are happy with the power offset—a 40% reduction in energy use. The new EverLast gives a lamp rating of 100,000 hours, and Full Spectrum Solutions claims energy savings can reach 60%. The EverLast fixtures have unlimited on/off cycles and instant restrike features, allowing for occupancy sensors or frequent switching with no effect on lamp life. With the long lamp life and lower ballast losses, Joelle Kolhagen, Full Spectrum's marketing director, says, "We see EverLast making the largest impact anywhere that the lifetime cost of lighting fixtures is considered."

Pelton adds that the switching is good, as is the transition from low to high levels of light. He says that the University is satisfied with the cost/value proposition of induction lighting. However, he doesn't recommend it for a retrofit project, especially when adding a proximity detector, as that demands even more wiring.

Response to Meet Demand

Just out in 2008 from Universal Lighting Technologies is Demand Control Lighting (DCL) Systems Controls with DEMANDflex ballasts. As Rick Lewis of Gish, Sherwood & Friends marketing company explains, "All the communication takes place on the circuit level. The DCL box talks to the ballast and can control each circuit individually, or all together. The system can control multiple buildings and can be controlled from anywhere in the world. With your permission, the utility company can access your lighting to lower it."

This new system has dominated Universal Lighting's research and development with beta testing ongoing for two years. "This is taking an entire intelligence system—manual or automatic—to manage an energy system at a very sophisticated level," says Lewis. Customers can retrofit existing ballast with the DEMANDflex ballast, then tune the ballast to the proper level during installation. "At that point, or at a later date, customers can install the DCL controls at the circuit level with no additional wiring, which can then control from one to 50% of the amount of power supplied to any of the circuits. This allows for precise continuous dimming to what is desired, say 37% or 42% instead of the traditional step dimming of 10 to 20 to 30%," says Lewis.



One of the first companies to use the new DCL control with the DEMANDflex ballasts was Ganahl Lumber, a family/employee-owned company in southern California dating back over 100 years. Brad Satterfield, General Manager at the Costa Mesa, CA, branch says, "Southern California Edison came to us and said, 'We're trying to get everyone smarter about electricity—lights and air conditioning. Let's go after the lighting first.' They gave me a list of two or three installers to work with."

Satterfield chose Energy Controls & Concepts (ECC), who "did a survey and needs plan and figured out the savings from rebates from Southern California Edison. During that process, the Universal Lighting DCL came out, and Edison supported it fully," he adds.

He began with a trial retrofit on his 3,000-square foot office. "I can't

Credit: These four products are by: Natural lighting Co. Natural Lighting's hybrid daylighting unit uses T-8 or T-5 fluorescent lamps and automated controls.



Roofing and installation of daylighting systems



Passive daylighting and T-5 4-lamp hybrid system with integrated lighting controls daylighting only.



Currently, a big market for the hybrid daylighting system is in schools.

tell if they're dimming the lights or not, but the quality of the lighting is much better," says Satterfield. "We needed new lights anyway. The biggest delay was waiting for Southern California Edison to decide about the rebate for our 20,000-square foot store. Edison gave a significant amount. I don't want to tell you how much—I think I was the very first to do the Demand Response Lighting. Now our Buena Park [CA] location has it, too."

Satterfield feels that Ganahl Lumber got "such a great rebate because I got involved at the right time. Even more, ECC pushed it through with Edison. They wouldn't have done the DCL on their own. ECC got it moving on the market; they were awesome, I must say. Our lighting costs are down about 25%, which is what they told me it would be. And I've got better lighting, so it's win-win.

"Edison can pull the lighting down to 80%," he continues. "Nothing tells me if the lights are down by 20%." There were no installation issues, and "the Demand Response Ballast are perfect," he says. "We used to have bulbs going out—now zero, at least so far—and the lighting is better. We did the office three years back, and the store a year and a half ago. I'm glad we did it. You do have to be patient with the installer to get the best rebate possible from the utility."

Controlling Consumption

From Robbinsville, NJ, comes the Lighting Voltage Controller "WattManager," from Magnetic & Transformer Technologies Corporation. The head engineer is Samir Fattohi. Born in Iraq and educated in Germany, he created and patented a simple one-step solution to controlling lighting energy consumption up to 28%, for use with high-intensity discharge (HID) and fluorescent lighting systems. "This is a huge market that has been completely ignored by energy saving retrofits until now," says Fattohi.

The WattManager is clever. HID lamps take from 10–18 minutes to warm up when first turned on. After that, the WattManager's circuitry lowers the voltage flowing from the lighting panel to individual fixtures. "When the lamp gets warm, we reduce the power, and customers save electricity," says Fattohi. "Then, after two or three hours, depending on the age of the lamp, it gains some of the lumens again. We say the brightness dims by 4% to 8%, but it could be 2% to 6%. It's all below the level of human perception. Another good thing is that some people have installed, let's say, a 250-watt lamp that is too big for their needs. With our unit, they can reduce the wattage without changing lamps."

The WattManager controls any ballast-based gaseous discharge lighting system. One WattManager can reduce the energy consumption of 1, 10, 100, or even 400 lighting fixtures, depending on the size of the appliance ordered. "You can measure the savings after 20 minutes from turning on the lights," says Fattohi. Running the lamps at a lower watt power reduces the operating temperature,

therefore prolonging the life of the lamps and the ballast "by up to 40%," claims Fattohi.

Fattohi first applied for a patent on his WattManager in May 2004, and he received it six months later. His WattManager works on older fluorescent lamps, such as T-8's and T-12's, but not on the new T-5's. "T-12's account for 80% of the US Market for the last 30 to 40 years, and the T-8 is less than 30 years old," says Fattohi. "In the United States, T-5's are only a few years old, and we're still having trouble with them. We don't have enough experience with them yet."

Vic Avila, Facilities Manager of Maintenance Services-Facilities for the City of Hayward, CA, has WattManagers in two different city parking garages. The first installation involved the retrofit of a 300-car parking garage. The second was part of new construction.

"We realized about a 10% to 12% savings in the retrofit," says Avila. "They said we'd have a 15%, but a 10% to 12%

savings is still a 10% to 12% savings. In 2007, we opened another parking lot with about 600,000 square feet that holds 360 cars. So, we have two different generations of WattManagers. I can't say what the savings are in the new lot, because it's always been there."

So far the system has worked perfectly, adds Avila. He doesn't recall reaping any rebates, but says, "it's likely that we would today." Learning that the WattManager works beautifully in offices with T-8 fluorescent lamps, Avila remarks, "I'm going to look into it when I get the time."

Bundling for the Future

Creating energy-efficient lighting can be seen as a "standalone" process, or, looking to the future, it may make the best sense to include it in what is called "bundling," or the integration of various technologies in an energy conservation program. Bruce Bilbrey, vice president of Natural Lighting Company, in Glendale, AZ, says, "Energy managers have realized that 'cherry picking' individual savings [for example, lighting retrofits] only serves to limit their ability to do more broad-based and long-range energy planning, and handcuffs them when they want to evaluate 'big ticket' items like photovoltaic [PV]."

Bundling is a process of including conservation measures with multiple technologies to provide the customer with a comprehensive solution for long-term savings. "An example would be to do lighting retrofits, energy management systems/controls, daylighting, and PV," says Bilbrey. "The lighting retrofits lowers the non-daylight energy usage; the daylighting keeps lights off during the day and allows a more modest/affordable PV array to power other areas of the facility. The key to bundling is to do all the conservation measures and energy retrofits together, and run the financial calculations as one project to allow the lower payback solutions to support the higher payback solutions."



Photo: Full Spectrum Solutions
With a lamp rating of 100,000 hours, Full Spectrum's new Everlast fixtures have unlimited on/off cycles and instant restrike features, allowing for occupancy sensors or frequent switching.

According to Bilbrey, the idea of bundling started with big energy service companies like Honeywell, Sylvania, and Siemens on military bases. They'd put "perhaps a dozen different energy solutions mixed together into one contract for the whole base," he says. As a small company, Bilbrey says "it's becoming a way for investors to build a business, by bundling four or five companies with different solutions and take that to the market. So it's both for creating businesses and taking the bundled solutions to customers. Many small technology companies still get brought in as sub contractors, just as we are a 'solutions partner' sub-contractor for Honeywell and the utilities."

Natural Lighting Co. started bundling for their customers, first with Frito-Lay, at the Casa Grande facility in Arizona. There, they bundled daylighting and lighting retrofit and lighting controls, plus occupancy sensors and automation controls on the conveyor belts. "When they aren't running, they automatically shut off most of the lights, because no one is working there," says Bilbrey. "We try to harvest every bit of energy savings we can on a site, right down to

the old exit signs and their incandescent bulbs."

Bilbrey feels that utilities like bundling because, "they end up dealing with one contractor, having just one point of contact and one warranty. So it's best on the customer and the supplier side. Plus, you can cash flow big-ticket items with solutions that have a better payback. "We're a smaller company, and it gives us a better piece of the pie," he says. "Take Pfister Energy—they're on the roof with their roofing company and solar stuff, and they can do the daylighting installation.

"And," he continues, "they have electrical people onsite, so they can do the lighting controls. With bundling, the customer no longer has a constant parade of contractors."

Wayne Pfister, President of Pfister Energy, agrees. "We're a renewable energy company, and we offer a little bit more of a holistic approach," he says. "Our role is to come into a facility to find what components work best. Many variables drive us—lighting, daylighting, and photovoltaic. Most companies have a product to sell, thus, a narrow point of view. We started with photovoltaic three or four years ago, but we don't sell it if it doesn't make sense. There's no single golden arrow for every solution."

Which brings one back to bundling, according to Bilbrey. "The concept of bundling challenges the traditional cost-accounting process where every solution stands alone and must meet certain return-on-investment [ROI] standards," he says. "Bundling requires a stronger commitment to evaluating a facility, and a more long-term focus than the old standard where the best ROI gets the budget allocation."

Harnessing the Daylight

Daylighting systems are sophisticated, engineered skylights with highly reflective lightwells that bring diffuse, bright light into buildings, allowing facilities to significantly reduce power consumption by diminishing the total burn hours of electric lighting systems. A smart twist on daylighting began about 10 years ago with the Natural Lighting Co.

Innovation seems to be locked in the DNA of the Bilbrey brothers—founders and owners of the company. Their “twist” came in developing hybrid daylighting, and they continue to innovate with this efficient lighting system. Bilbrey says, “We went to Home Depot and bought a two [feet] by four [feet] lay-in fixture, cut it up, restyled it a little bit, and installed it in our office where we had daylighting. It was our first prototype hybrid daylighting.”

Daylighting is more like a light fixture, in part because “Architects always say how cluttered ceilings got and that drove us to create a combination fixture,” says Bilbrey. “Every daylighting product, whether active or passive, is a knockoff on what we’ve brought first to market.”

Pfister, a licensed distributor for the Natural Lighting Company’s product line, says of daylighting, “It’s one of the quickest return on investments and can offset lighting, in some situations up to 70% to 80%.”

A big market for the hybrid daylighting system is schools. In Arizona, for example, “If a school uses our daylighting system, they get the equivalent of 20 cents per saved kilowatt-hour for one year’s worth of savings,” says Bilbrey.

Currently, Natural Lighting’s hybrid daylighting unit uses T-8 or T-5 fluorescent lamps, and “in every project we put in automated lighting controls to maintain the proper lighting level,” he says. “Late in the afternoon, we begin sequencing lights—then at night, the lights are on.” Their hybrid daylighting units can be used for hi-bay, low-bay, and finished ceiling designs, both for new construction and retrofit projects.

Now the company is pushing the lighting “window” by experimenting with LED’s in hybrid daylighting—introduced in May 2008 at the International Light Fair in Las Vegas. Bilbrey also has a demonstration project at a community college in Chandler, AZ. A huge advantage of LED is that there is no ballast and no ballast maintenance, “so the fixture design is very simple and less expensive,” says Bilbrey. “This drew us to LED, along with the new white light—like daylight.”

Although he admits that LED “is not quite there yet, in terms of light output and price,” those areas are changing quickly. Bilbrey says that LED’s output has grown “10 to 20 times over the past three years, and lamp costs are half of what they were 12 to 18 months ago. All the big lighting manufacturers—[such as] GE and Phillips—are very heavily invested in producing LED lighting products.”

Compared to a T-8 fluorescent lamp, an LED lamp uses half the energy. “LED is 13 watts for the four-foot lamps we use, verses 32 watts for a T-8,” says Bilbrey. That alone bumps up the energy savings from 70% to 90%. Since LED lamps last from 50,000 to 75,000 hours, that means lower energy costs and virtually no maintenance for 15 years, with the bonus of a much simpler fixture design.

Bilbrey didn’t try induction lighting for the hybrid daylighting, even though “induction lighting is one of the technologies more people are getting excited about,” he says. Induction lighting technology involves a fluorescent lamp without electrodes. The power to produce light comes from a system containing a discharge vessel, power coupler, and generator using an electromagnetic field.

“It’s great for areas that are hard to get to or are expensive to service, but with induction lighting you have to take what they have as a product,” says Bilbrey. “There are pre-made, pre-built fixtures, so for us it’s a much more limited scope. With our LED, we can make any size product that we want. We get an idea; go into our shop; and chop, and whack, and put it up.”

Bilbrey sees much in store for LED, but adds, “To be real honest, we’re inching along with the LED daylighting hybrid. We want a few demonstrations first; we’re not selling it real hard right now. With new technology, people stand back and watch.”

Topics: [Lighting](#)
