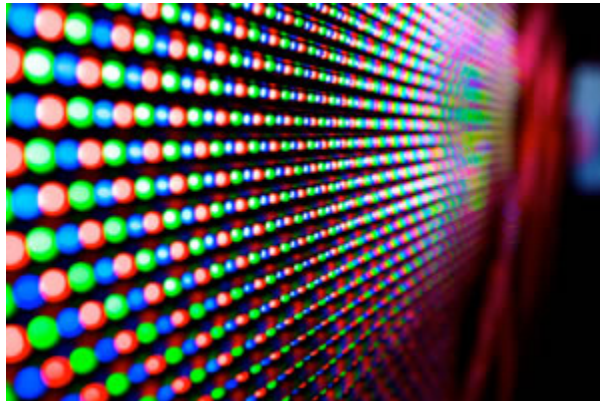


ONLINE EXCLUSIVE: Lighting the Way for Efficiency: Upgrading Lighting Systems Could Boost Bottom Lines

By Adam Madison

When revenues are down and manufacturers are struggling to cut costs, the solution could be flickering above a manager's head.

Inefficient lighting in factories and storage facilities drains hundreds of thousands of dollars from companies every year, said Inland



Inland Lighting CEO Ed Mattox predicts that all lights will be LED in 20 years.

Lighting CEO Ed Mattox. This is true for any company operating in a facility built before 1995 that has not been upgraded. These facilities are likely fitted with high-bay, high-intensity discharge (HID) lamps or T12 fluorescent fixtures.

The Department of Energy estimates replacing either of these systems with modern technology will yield up to 70 percent in energy savings. Mattox said a recent Inland Lighting customer made a \$150,000 investment, which reduced the company's annual electric bill by more than \$80,000. Incentive programs offered by utility companies, as well as various grants and tax credits offered by government agencies, have sweetened the deal. Mattox said there has been a strong push by the government and energy suppliers to reduce energy consumption. Increased demand nationally has led to the need to build more power plants, which can be \$8 billion projects with 20 years of permitting required. Also, installers are quick to offer financing because most customers see a return on investment within 18 months, he said.

Still, many companies fail to act because the decision-makers work in maintenance departments and don't usually see electric bills, Mattox said.

Personnel may even be intimidated by upgrades because the life expectancy of new lights is much greater, reducing the need for manpower. Meanwhile, CFOs sit back, completely unaware of the money being drained by outdated systems, he said.

HID Lamps

The biggest culprits of lighting energy drain are high-intensity discharge (HID) light sources, such as metal halide or vapor lamps, that range from 175 to 400 watts per bulb. These are the oldest lighting sources, which are expensive to operate and incredibly inefficient. HIDs begin losing light-output performance the moment they are plugged in and die completely in about five years, Mattox said. They are difficult to adjust and take time to warm up during the first shift.

T12 Fluorescent

Companies still relying on T12 technology, fluorescent tubes measuring 1.5 inches in diameter, may find themselves in serious trouble soon. The government has begun phasing out these magnetic ballasts in support of greener technologies. Effective July 12, production of these units will cease in accordance with 2009 DOE General Service Lamp legislation. The decrease in supply will drive costs higher and the utility companies will likely end incentive programs to upgrade, as users will have no choice but to abandon these fixtures.

T5 and T8 Fluorescent

The most common replacements for these old technologies are the T5 and T8 fluorescent fixtures. T5s measure 5/8 inch, and T8s measure 1 inch. When applied correctly, each consumes 30 percent less energy and boasts a 15-year life expectancy. Unlike their predecessors, they do not dim at the end of their cycle. Nor do they emit a flicker or buzz commonly associated with fluorescent tubes. The light produced is much more intense, so one T5 can easily replace two T12s. A remaining downside is a decrease in life expectancy, as voltages are manipulated to dim or brighten outputs.

LEDs

Light emitting diode (LED) is an intelligent light source that doesn't suffer the same degradation that ballast systems experience when manipulated. LEDs surpass any light source in output, savings and ability for controls. LED components are digital, solid-state and intelligent. In fact, manipulating LED lights may actually increase life expectancy already rated for 50,000 hours, said Lithonia Lighting's Dave Ranieri in *EC&M* magazine.

Each LED essentially has its own IP address and can communicate through a building's control devices. This allows for computer monitoring and the ability to respond to the environment and perform preprogrammed tasks such as managing lumen output, adapting to ambient temperature or detecting faults; Ranieri said.¹ These tasks even can be performed with remote devices, including smart phones and laptops.

"LED is going to continue to climb and dominate more and more," Mattox said. "It's all very exciting stuff that is cutting-edge."

Fluorescents, however, still control the market for industrial applications such as warehouses and production lines. LED technology is reserved for homes, offices and other low-ceiling applications. Their time will come, however. Mattox predicts that all lights will be LED in 20 years, and 30 percent will likely be solar powered. Solar and the batteries designed to store the energy are advancing quickly, especially as the technology is pushed by the auto industry for use in electric cars.

Installation

A good installation should incorporate the use of LEDs, T5s and T8s, because every facility serves multiple purposes. Although LED makes sense for the reception office, T5 and T8 remain the best options for the assembly line. Also, height and wattage should vary with each task.

Despite the complexity of design, most installations are quick because existing wiring is universal. Mattox said there rarely is any interruption to the end-user's business because electricians can work after hours. Installations in 24-hour operations are coordinated in sequences to minimize downtime for the customer. LED light installations may be more intensive if being linked to control devices because they require the addition of Ethernet cable.

Simple Solutions

Electrical efficiency can be pushed even further with simple and readily available solutions. First, the sun is still free and can be let into operations by installing skylights. On sunny days, sensors can coordinate with control systems to dim lights accordingly. Motion sensors can be installed in areas such as bathrooms to overcome the forgetfulness of employees who leave lights on for long periods of time.

Also, there are nifty gadgets such as the Bert, which is a wireless smart-plug/timer that can manage the flow of current at the outlet. It can be controlled remotely, as well. One practical use is for water coolers or pop machines. By plugging these devices into a Bert, they can be programmed to stop chilling contents during off-peak hours.

There is nothing more efficient than "off," Mattox said. Consumers need to educate themselves or they will remain in the dark while the cost of energy continues to rise.

The Human Factor

Calculating the annual savings achieved by upgrading a lighting system is easy. Figure the difference of the new bill, multiply by 12 and subtract the cost of installation. Analyzing the impact that light has on worker productivity, however, is questionable science.

Productivity is measured by how quickly and accurately workers can perform

assigned tasks. Light is only one variable; productivity is more influenced by management, individual psychology or even what an employee ate for lunch. Therefore, it is with much difficulty that researchers explore this science.²

For years, scientists manipulated lights at Hawthorne Works, a Western Electric factory near Chicago. When the lights were dimmed, productivity increased. When the lights were brightened, productivity also increased. When research finally came to a halt, productivity plummeted. Years later, it was surmised that the brightness of the environment had less of an impact than the awareness of being observed. Hence, the term: “Hawthorne Effect.”³ It illustrates how susceptible productivity research is to uncontrolled variables.

More recently, the Light Right Consortium conducted a field study, which concluded that providing employee access to brightness controls resulted in a 5-percent increase in productivity. It was argued that the ideal amount of light varies by individual. For instance, older employees typically require more light and others may exhibit sensitivity to bright lights. Either way, the result was an increase of comfort levels that arguably increased a worker’s ability to perform.

Several companies have reported increased productivity immediately following upgrades to lighting systems, said Craig DiLouie in *Buildings*. Both Lockheed and West Bend Mutual claimed 15- and 16-percent increases, respectively. Wal-Mart Stores Inc.’s EcoMart even attributed a boost in sales to skylights.⁴

Whether these results were directly influenced by light versus the myriad of unseen variables is debatable. But bright light, especially the sun, has long been accepted as a mood enhancer.

Footnotes

¹ www.ecmweb.com/lighting/leds-and-lighting-control-20111101

² www.lutron.com/CaseStudyPDF/productivity%20story.pdf

³ en.wikipedia.org/wiki/Hawthorne_effect

⁴ www.buildings.com/tabid/3334/ArticleID/1710/Default.aspx#top#top