

LEDs for Commercial Applications



Light-emitting diode (LED) technology is rapidly improving and is becoming more common in commercial settings. Although LEDs are not ready for all general illumination applications, they may be the best choice for refrigerated grocery cases, commercial signage, architectural lighting, retail displays, and other niche applications.

The ABCs of LEDs

LEDs are compact, solid state light sources that are resistant to vibration and offer significantly longer operating lifetimes than most other sources. In the past, LEDs were limited to niche applications such as traffic signals, exit signs, and other uses where they displaced highly inefficient filtered incandescent lighting. But in recent years, the technology has made great strides. Today's LEDs are cheaper, more efficient, and longer-lasting than just a few years ago, allowing for growth into areas long dominated by more traditional light sources.

Current Applications

Today's white LEDs are more efficient than incandescent sources, but still less efficient than fluorescent and high-intensity discharge (HID) lamps. However, because LED light can be directed to where it is needed without inefficient lenses or reflectors, LEDs can compete with fluorescent and HID sources in certain applications. And because LEDs can emit colored light without an energy-wasting filter, they are often the smartest choice when an application calls for colored lighting.

Refrigerated Display Cases

Conventional refrigerated display cases are illuminated by fluorescent lights. LEDs offer several advantages in this setting, the most important being that they perform very well in cold temperatures, unlike fluorescent lamps, for which output drops appreciably. And with fluorescent lighting, the waste heat is dis-

sipated inside the case, whereas the heat generated by an LED system can easily be transferred outside the case entirely, resulting in reduced refrigeration energy needs. Also, because LEDs are directional in nature, there is less wasted light, which means even greater energy savings. As a solid state technology, LEDs are easy to dim as well. In November 2006, Wal-Mart became the first major retailer to announce plans to use LED lighting in refrigerated display cases. In 500 stores, the company is installing low-wattage LEDs connected to occupancy sensors, which will automatically dim the lights when no shoppers are nearby. Wal-Mart believes light use will drop from 24 hours a day to 15 hours. Overall, the company expects a 66 percent reduction in refrigerated case lighting costs. Because LED technology will allow Wal-Mart to transmit waste heat outside the case, the company expects to save additional energy and money from reduced refrigeration demands.

Exterior Signs and Architectural Lighting

Businesses can effectively use LEDs in a number of outdoor applications. Using LEDs for marquee lighting and exterior commercial signage can result in better visibility, lower maintenance costs, and considerable energy savings. In addition to signs, many businesses have begun to use LEDs for architectural lighting applications. Traditional architectural lighting may include neon border lighting running around the top of a building or colored floodlights used to illuminate building exteriors, facades, or signs. Many high-profile businesses, such as the Hard Rock Casino and Hotel in Las Vegas, now use LEDs to provide this sort of exterior nighttime lighting. Even a traditional neon "open" sign can be replaced with a comparable LED unit for very little additional cost, while saving 75 percent or more on energy expenses. And because an LED sign will last two to five times longer than a comparable neon sign, it can be a decade or more before replacement becomes necessary (see **Figure 1**, next page).

Figure 1: Energy use of an LED open sign compared with a neon open sign

An LED open sign will save \$455 in energy and replacement costs over its lifetime compared with a comparable neon open sign.

Variable	LED	Neon
Watts	10	50
Hours of daily use	10	10
Annual kWh consumed	36.50	182.50
Annual energy cost	\$3.65	\$18.25
Lifetime (years)	13.0	3.3
Number of signs purchased over 13 years	1	4
Cost per sign	\$135.00	\$100.00
Total spent on new signs over 13 years	\$135.00	\$400.00
Total costs over lifetime of LED sign	\$182.00	\$637.00

Notes: kWh = kilowatt-hour, LED = light-emitting diode.

© E SOURCE

Retail Display Lighting

Retail accent lighting is a growing area for LEDs because they can vary in color, create sparkle, and aim the light precisely on an object or area. LEDs have been used in high-end retail stores for their “high-tech” aesthetic, interesting effects, and design flexibility; in cosmetics shops because they do not radiate heat; and in jewelry cases because of the sparkling appearance a point source of light lends and because their small size enables them to be used unobtrusively. Although retail display illumination has been slow to catch on in North America, some of Europe’s largest retailers employ LEDs to create unique, attractive displays.

Other Lighting Applications

In bars, restaurants, and nightclubs, LEDs are becoming more prevalent for interior accent lighting. Because of LEDs’ wide range of available colors and the ability to dim to low levels, designers can custom-tailor lighting to the desired ambience. Outdoors, LED holiday lights have become widely available in recent years. LED holiday lights use considerably less energy than traditional incandescent lights, are only slightly more expensive, last far longer, and perform well in cold

environments. And because of their high efficiency and brightness, LEDs have begun to displace other light sources in large outdoor video screens in sports arenas and entertainment hubs. One very dramatic example is the curved video display that covers the outside of the NASDAQ building in New York City’s Times Square. This display, which is eight stories high and covers an area nearly one-quarter of an acre in size, uses more than 18 million high-brightness red, green, and yellow LEDs to display real-time video that can be seen from blocks away in full daylight.

Potential Pitfalls

Because they are a new and rapidly developing technology, LEDs are the subject of a lot of publicity and exaggerated claims. It is important to make sure that a particular LED product can meet your needs by independently verifying manufacturer claims or initiating pilot programs. Though the technology is rapidly advancing, it is still somewhat expensive and not as efficient as fluorescent or HID lighting in many applications, including general illumination.

To help potential users identify worthy products, the Energy Star program has issued specifications to qualify LEDs for an Energy Star rating. The guidelines, which are expected to take effect in September 2008, will ensure that products adhere to specific standards for lifetime, brightness, efficiency, beam pattern, and light quality. With a uniform industry standard, consumers should expect to see less of the widely varying—and often dubious—vendor claims.

The Future of LEDs

LEDs are poised to move beyond niche commercial applications into more general lighting purposes. In the near term, LEDs will continue to expand into such areas as recessed downlighting, shelf-mounted undercabinet lighting, portable desk or task lamps, and illumination for outdoor steps and pathways. Even though LED technology is rapidly improving, it will likely be a number of



years before the technology is cheap and efficient enough to displace fluorescent and HID light sources for general indoor illumination or parking-lot lighting.

Resources

If you need assistance in evaluating the best technology for your needs, you can start with your utility or energy service provider. LED consultants or vendors may also provide the needed expertise. The following resources may provide useful information as well.

Energy Star has produced a fact sheet on LED exit signs, which can be found at www.energystar.gov/ia/business/small_business/led_exitsigns_techsheat.pdf.

Lighting for Tomorrow maintains a web site that describes promising LED products at www.lightingfortomorrow.com.

A Lighting Research Center study demonstrating some benefits of LEDs, "Lighting Supermarket Freezers with LEDs," can be found at www.lrc.rpi.edu/programs/solidstate/cr_freezers.asp.

The new Energy Star standards and additional information on solid state lighting can be found at www.netl.doe.gov/ssl.

The California Lighting Technology Center at UC-Davis reports on new and emerging LED technologies on its web site at <http://cltc.ucdavis.edu>.

Choosing the Right Applications for LEDs

Consider LEDs:

- When directional light is required
- As an alternative to dimmable incandescent lights
- As an alternative to filtered incandescent light (for example, exit signs)
- When very limited space is available for a lighting fixture
- In high-vibration environments
- Where routine lamp replacement is very expensive
- For use in cold environments

LEDs are less likely to be appropriate when:

- A CFL, fluorescent, or HID lamp can be used to provide general illumination
- Lamps will be subject to high temperatures
- Power quality is unreliable

