

## It's Time for Your Business to Reap the Rewards of LED Lighting

Light-emitting diode (LED) technology is rapidly improving and becoming a mainstay in a widening range of lighting applications. According to the US Department of Energy (DOE), LEDs have the potential to cut lighting energy use across the nation by one-third and could account for more than 50 percent of light produced by 2025. LEDs are not only more efficient than the alternatives, they also last longer. And though the price tags on LEDs in comparison to traditional options may initially give you sticker shock, it's important to consider the significant savings you'll see in your energy and maintenance costs over the lifetime of your new LEDs. Those savings will outweigh the extra up-front expense of the LEDs. As a bonus, the DOE has determined that LEDs affect the environment far less than incandescent bulbs or compact fluorescent lamps.

LEDs are proving to be an effective option for a growing variety of commercial uses, including incandescent replacement lamps, parking-lot lighting, commercial signage, task lighting, refrigerated cases, recessed downlighting, ambient lighting in offices, and many high-bay applications. Successful use of LEDs requires care in selecting products that will meet specific illumination needs, match manufacturer's claims, and be compatible with any controls you employ. Understanding how various LED attributes relate to effective applications can help lead to successful installations in your business.

### High Efficiency

LEDs are beating out the competition when it comes to energy efficiency—today, the best white LEDs outperform even the most efficient linear fluorescent lamps. LED efficiency is usually expressed in terms of efficacy, which is the amount of light produced, in lumens, divided by the input power, in watts. Though efficiency is one of the top selling points of LEDs, it's important to know that their efficiency varies among applications and color qualities. LEDs are available in a wide range of color temperatures and color-rendering capabilities, with the highest efficacy for a particular application coming from products with higher color temperature and lower color-rendering indices. LED products for different applications also vary in efficiency. For instance, LED screw-in lamps aren't as efficient as LED troffers. In

addition, there is roughly a three- or four-to-one difference in efficacy between the best and worst LED products in a given application category. For example, troffers range in efficacy from 46 to 130 lumens per watt—that’s a significant difference, so chose your products carefully.

### **DIFFERENCES AMONG LED COLOR QUALITIES**

LEDs are available in a wide range of color temperatures (that is, how “cool” [bluish] or “warm” [yellowish] the light appears) and a span of color-rendering index (CRI) values (which indicate the measure of a lamp’s ability to reproduce colors of objects in comparison with a natural light source). Understanding what these values represent will help you make the right LED purchase for your business’ specific needs. A CRI greater than 80 is generally considered good, but CRI isn’t always the best indicator of the color-rendering capabilities of LEDs. New metrics are under development, but for now, many manufacturers add a value known as R9 to describe their products. R9 is a measure of how well a light source renders vibrant red objects, which is important for capturing skin tones, earth tones, and the deep reds found in many retail products. It’s a good idea to look for this when shopping for LEDs for your business. An R9 value greater than 0 is generally considered acceptable, but the California Quality LED Lamp Specification calls for an R9 of at least 50 and a CRI of 90.

### **Long-Lasting**

LED light sources have a deserved reputation for long life, boasting a lifespan ranging from 25,000 hours to more than 100,000 hours, depending on the application (**Table 1**). The competition ranges from 1,000 hours for incandescent lamps to as much as 70,000 hours for induction lighting. LEDs don’t generally fail outright like incandescent or fluorescent lamps; their output instead declines over time—so the industry generally defines LED life as the point at which the light output has declined to 70 percent of its original value. Several factors in addition to lamp life affect the longevity of a complete LED fixture. Look for warranties of at least five years to ensure long fixture life.

**Table 1: LEDs Outlast Their Competition**

Light-emitting diodes (LEDs) offer longer lamp life than most other light sources, although induction lighting and some linear fluorescent products also provide a long lifespan.

LED lamp type	Life (hours)	Incumbent technology	Life (hours)
A-lamps and PAR lamps	25,000–50,000	Incandescent	1,000
		Halogen	6,000
		Compact fluorescent	10,000
Troffers	50,000–100,000	Linear fluorescent	25,000–60,000
High-bay lamps	50,000–100,000	Linear fluorescent	25,000–60,000
		Ceramic metal halide	20,000–30,000
		Induction	70,000

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### Controllable

LEDs are easier to control than either fluorescent or high-intensity discharge (HID) lamps. For example, LEDs respond instantly, unlike HID lamps, and their lamp life isn't shortened by frequent switching, unlike fluorescent lamps. Controls can also be used to change the color temperature of LED lighting, a feature that's being used in a growing number of products to mimic the dimming behavior of incandescent lamps. When incandescent lamps are dimmed, the filament temperature decreases, causing the light to change from white to a warmer yellow or red-orange hue—a desired effect in residential, restaurant, and hospitality environments. No compact fluorescent products can match this capability, but several LED products can.

LEDs are outshining their competition—now it's your turn. Enlightened by an understanding of the benefits and characteristics of LED lighting, you're ready to pursue LED lighting options for your business. Bring on those energy savings!

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