Let there be light

Kirksey's Guide to LED Technology

By Colley Hodges, LEED AP

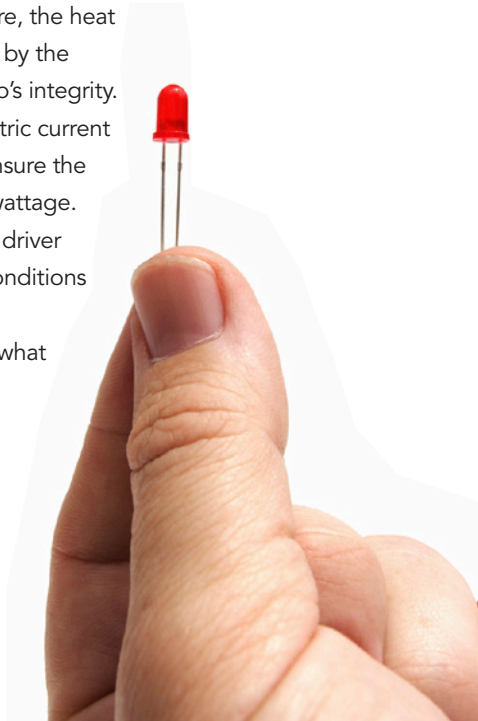
LEDs have been a popular topic of conversation among building owners, managers, and designers for over 10 years. Despite initially limited application, the LED market has been expanding and is expected to dominate the global illumination market, claiming as much as a 90% share by the year 2020.[1] Recent advances have made LEDs an increasingly versatile and cost-effective option for commercial lighting, but certain challenges remain. So, why LEDs? Why now?

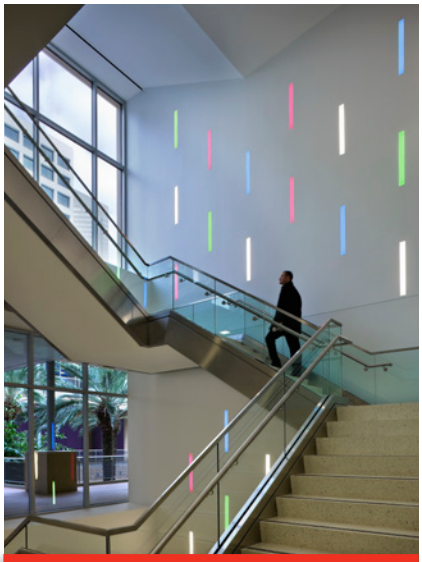
THE EXPANDING LED MARKET

Prior to 2002, LEDs were only available in red, green, and blue and were used primarily in digital microscopes, aviation lights, automotive lighting, traffic signals, and for advertising signage.[2] The first white light LEDs were created in 2002 and were utilized in commercial lighting by 2003. Since then, the LED market has been on the upswing, and prices have been falling due to increased competition among manufacturers. There are several reasons for this continued expansion. First, LEDs have an extremely long lifespan, four to seven times longer than current competing technologies. LEDs currently in use in lab fixtures are projected to last more than 200,000 hours, or run 24 hours a day, seven days a week, for 22 years.[3] With LEDs, owners and operators can reduce downtime due to re-lamping, preventing logistical headaches and saving man-hours. Second, LEDs save energy and offer the highest efficacy, or amount of lumens-per-watt emitted, of any light source. In 2012, CREE LEDs hit the 200 lumen-per-watt mark which, when commercially available, will double the efficiency of linear fluorescents and be 13 times more efficient than incandescent bulbs.[4,5] Third, LEDs have a much broader spectrum than linear fluorescents, which means they allow the eye to read truer color, similar to incandescent light sources.[6] Lastly, the widespread use of LEDs can help eliminate the presence of mercury, a highly toxic substance, within the built environment. Every linear and compact fluorescent bulb contains mercury and requires special disposal, but LED technology eliminates this hazard.

WHAT'S IN AN LED?

Understanding the components of an LED fixture is critical to maximizing the expected energy savings and longevity. The Light Emitting Diode (LED), optic, driver, heat sink, and casing are essential components of each fixture. The diode holds two isotopes that, when electrified, induce a light-creating reaction. The diode naturally casts its light outward from the base, and the optic directs the light in a variety of directions depending on the intended use of the fixture. The optic and diode both sit directly on a heat sink. Since heat is the enemy of the electronics in the fixture, the heat sink removes heat produced by the diode and preserves the bulb's integrity. The driver regulates the electric current to create the reaction and ensure the LEDs are receiving optimal wattage. It is important to protect the driver from exposure to extreme conditions or it will result in reduced performance.[6] The casing is what holds the four components together, keeps water out, rejects heat, and allows for connection with utilities.





Questions you should ask before implementing LEDs:

- What kind of warranty does the manufacturer provide?
- How does the manufacturer handle end of life? Do they want the fixture back?
- Do we have a process for measuring the L70 point to ensure appropriate change over?
- Will the fixture work with the control platform you are currently using?

Companies searching for energy-saving measures that benefit both their clients and the environment should view LED light fixtures as a viable solution. Kirksey has successfully implemented LEDs in several recently completed buildings, and our team is prepared to guide you through the process.

Contact **Colley Hodges,**
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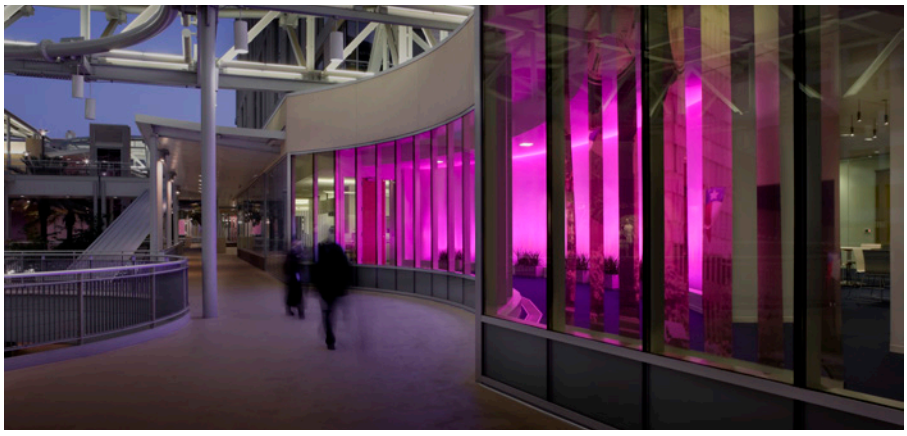
for more information.

A WORLD OF LED POSSIBILITIES

LEDs offer an unparalleled range of options in color, arrangement, continuity, and performance, allowing for the design of built environments that were previously impossible to create. LEDs are uniquely suited to combine with advanced lighting controls to display variable pictures, patterns, or walls of color (see the Kirksey projects featured on these pages). Prior to LEDs, this level of lighting sophistication was often too difficult or cost-prohibitive to execute. Since LEDs can be configured in any pattern, universal distribution of light is possible with no linear or circular banding. Dimming is simple with LED fixtures, and a full range of dimming options come standard, assuming compatible building wiring and dimmable switches. With energy codes reducing lighting allowances below one watt per square foot, LEDs will increasingly become the preferred option to create the sophisticated lighting that owners and tenants desire while reducing energy consumption.

BENEFITS & CHALLENGES

Despite their benefits, LEDs still face significant competition and challenges. Since light from linear fluorescents is cast in 360 degrees, and its indirect light can be reflected in a particular direction, they remain competitive in the amount of light produced per individual lamp, although that production consumes more energy. Currently, linear fluorescents also have a lower initial cost. Another obstacle to LEDs' market dominance is precision binning. The millions of diodes that are produced as part of the LED manufacturing process can lead to slightly differing brightness and color. Binning is the process of sorting LEDs based on certain specifications, and if all the LEDs in a fixture or display are not created within certain tolerances, individual LEDs will appear noticeably dim or discolored. However, manufacturers are working together to create standards for this process, such as the ANSI C78 377A standard, to help ensure quality when specifying fixtures.[7] Lastly, color temperature can be an issue. LEDs' white light seems brighter and bluer than what the eye is accustomed to and can cause glare. As LED technology continues to evolve, these challenges will have to be minimized or overcome in order to realize the design potential and energy savings LEDs already offer.



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