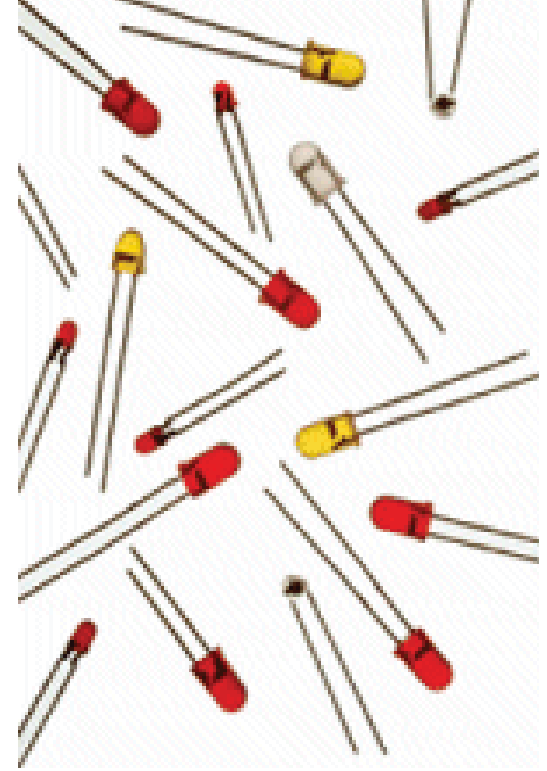


LEDs can handle many applications, but they are still evolving for others



By Douglas Carver

As seen in the May/June 2004 issue of Retail Construction Magazine.

Are LED's ready for 'prime time' lighting? Do they perform at a level promoted by manufacturers? Can they replace conventional lighting? With no standards or common terminology, how do you separate fact from fiction? Will they play a major role in the new ASHRAE 90.1 standards coming on line?

Lighting designers, specifiers and end-users need to be educated as to what can and can't be accomplished using LED's. Solid-state lighting has been developing at a rapid pace over the past five years, and that pace does not appear to be slowing down in the near future. The LED industry is not that different from the computer industry, light emitting

diodes are changing yearly. With so many lighting companies applying the product and so much research going into the manufacturing of the chips themselves it is not surprising that designers, engineers and distributors have to almost consider it a full-time job staying current with the technology.

Do LED's perform at the level being touted by the manufacturer? First of all, a benchmark of what is acceptable "rated life" needs to be defined. It is commonly assumed that LED's will last 100,000

hours. Companies promoting the technology have used that number for years. The problem is LED's don't just simply fail. Rated life cannot be easily measured using conventional lamp life standards. If you put a hundred LED's in a testing

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lab and waited for the fiftieth to fail, you would have a long wait. By that time, the technology would have changed so much that the results would be of no value.

Does that mean no one has a basis to make a claim for rated life? No, there are other ways to test for “life”. The problem lies in the terminology. What is an acceptable rated life? Is it 50 percent of initial lumen

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output? Is it 70 percent? LEDs will last 100,000 hours largely because there are no filaments to break. They simply degrade. At 100,000 hours plus, it is possible if you cup your hand around the LED fixture in a dark room you will probably see that it is still emitting light.

It is important to have the manufacturer of the product in question explain what they are doing to draw or sink the heat away from

the LED chip. Heat is the biggest culprit for shortened life. Most quality manufacturers have specific data to show how they rate life and how they manage heat. Ask them.

Several years ago, answering the question as to whether LEDs can replace conventional lighting would

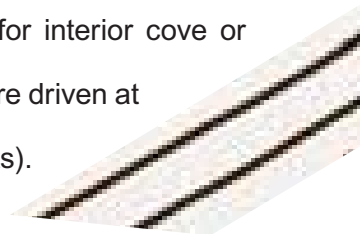
have been more difficult. The **Lighting Research Center** (LRC) in Troy, NY offers a three-day seminar for lighting professionals to understand the basics of LED lighting technology. When I took the course in 2002, we were given the task to light a mock up of a typical display window. Of the four groups that were assigned this task, no group adequately achieved a desired look simply by using LED lighting. Conventional Par and MR fixtures were often added for general illumination.

This doesn't mean that LEDs were a failure; in fact the use of colored light and color changing light added a higher degree of dramatic effect and contrast than would have normally been possible with conventional lighting. It just meant that LEDs were not ready to replace conventional lighting for all applications, primarily general or ambient lighting.

We came to understand that LEDs were great for task lighting or for theatrical effect. In fact, the LRC has published a study that demonstrates the use of colored light on display window backdrops did in fact help attract customer awareness to the display.

Other key benefits of LEDs over conventional lighting are lower heat (UV/IR) output making them effective for display case lighting, especially of perishable goods and museum quality products. They are intrinsically safer than most forms of lighting (especially valuable when you are considering using neon for interior cove or exterior border tube since LEDs are driven at a low voltage, usually 12 or 24 volts).

They are durable (no



filaments to break), better suited for lighting environments that have a high degree of vibration to contend with (roadway, bridges, trams etc) and perform extremely well in cold weather (LED's love the cold). They are often very compact, which makes them ideal candidates

for lighting tight spaces such as niches or low profile coves. Long life (potentially) is usually true, making them a valuable consideration for areas that are difficult to service and maintain.

The IES and the manufactures need to agree upon terminology and testing standards. This is a critical step in the evolution of the LED industry. These standards will allow the "cut sheets" we get from manufactures to carry more validity and give the specifiers the clout to know what questions to ask and put the vendors to task.

Rated life is one issue; another is how we use CRI. It is customary for designers (and even their clients) to ask what the CRI is of a particular lamp.

A recent study seems to indicate that a higher CRI doesn't always correlate to "better light" when it comes to LED's. In many cases, when comparing different sources of white light, a lower CRI with LED's was preferred over conventional lamps with a

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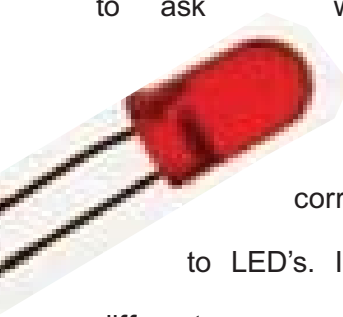
higher CRI. Until that time, it is up to the specifiers, contractors and their distributors to become educated and stay current on the technology and the research being carried out.

Will LED's have an impact on

the ASHRAE/IESNA Standard 90.1 that becomes effective in July? A definite yes. Besides the many attributes listed above that allow LED's to be beneficial, one of the biggest benefits is the ability to reduce the energy necessary to light certain areas.

LED's use very little electricity. Most LED single color products draw less than 5 watts. Some less than a watt. Safety lighting (exit signs and aisle lighting in particular) has gone almost exclusively to LED's several years ago due to energy savings (especially beneficial when on battery back-up), less maintenance and longer life than conventional lamp technology. Neon can be replaced by safer and lower energy consumption LED's. Most of the border tube LED manufacturers are achieving between 2.5 to 3.5 watts per foot as opposed to more than triple that for neon. Not to mention the safety factor of using low voltage to drive the LED's.

There is also the potential of having the LED neon-replacement products put into the electrical



package and installed by the electrical contractor. Depending on the color of LED's, they more than likely would not be quite as bright as neon. Fortunately, the brightest and least expensive LED's are red, which happens to be the most common border tube and signage color being used in the industry.

LED's are also being manufactured in MR-16 and A-lamp configurations. They can easily retrofit into existing fixtures. Though a word of caution, they do not compete in light output with their conventional brethren. Most of the MR LED's are achieving the light output (in white light) equivalent of a 15 or 20-watt lamp with a 2 watt LED. Jewelry display cases and some perishable displays, such as cosmetics, perfumes, chocolates and leather goods would benefit from the use of LED's and help the store meet the ASHRAE standards that will be implemented.

It is important to note that many areas where LED's are of exceptional impact such as window displays, museum lighting, exit signs, directional signage, the ASHRAE/IESNA 90.1 standards have classified as exemptions.

That doesn't mean that LED's should not be considered, just that the light calculations for these areas won't help the cause of reducing overall

energy efficiency to meet 90.1. It does mean they can save energy now.

Another aspect of energy savings that won't be impacted by ASHRAE/IESNA 90.1 is refrigerator/freezer case lighting. These areas will be exempt but LED's may impact the bottom line of grocery store owners. Grocery stores spend almost half their electrical costs each year on refrigeration. The ability to integrate LED's to light these cases is being studied seriously by the New York State Energy Research

and Development Authority in conjunction with the Lighting Research Center.

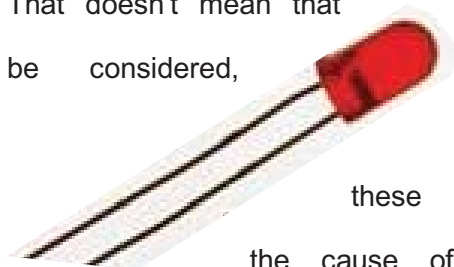
Preliminary results indicate consumers prefer the quality of the light from LED's. The light is more focused (less wastage) on the products being displayed.

And as I mentioned previously, LED's perform

better in cold environments and what is colder in a store than refrigeration cases? Unfortunately the cost and the amount of LED's required to equal or improve on fluorescent lighting shows that there is still advancements to be made on the brightness and costs of the LED's.

It is important to point out that within the next 2 to 4 years, the industry expects to be competitive. Less heat means less refrigeration means less electricity.

The ability to change color by using RGB (red, green and blue LEDs in combination) fixtures opens up an exciting and challenging world to designers.



Longer life means less maintenance. Better light directed at what is important, the products being sold, means more sales. More sales and less cost. The case is too strong to discount LED's becoming an important ingredient in grocery store lighting.

Are LED's ready to enter the light arena of conventional lamp/fixture technology? Unfortunately the answer is still "yes" and "no". It is still a niche lighting product. It can still be expensive and the light output to replace most conventional lamps just isn't there yet.

I've mentioned, enthusiastically, where LED's have a place on our lighting palette and can be of good

value. They will not (yet) replace compact fluorescents in the downlights of retail stores or wash a wall with even white light. They need to be promoted and designed into applications where they serve a purpose that conventional lighting cannot achieve. Design criteria will be different than conventional lighting. The ability to change color by using RGB (red, green and blue LED's in combination) fixtures opens up an exciting and challenging world to designers. All the colors of the rainbow are at your fingertips. It is time to bring these products to our clients. It is time to become educated and apply the technology properly. LED's are ready. Are we?