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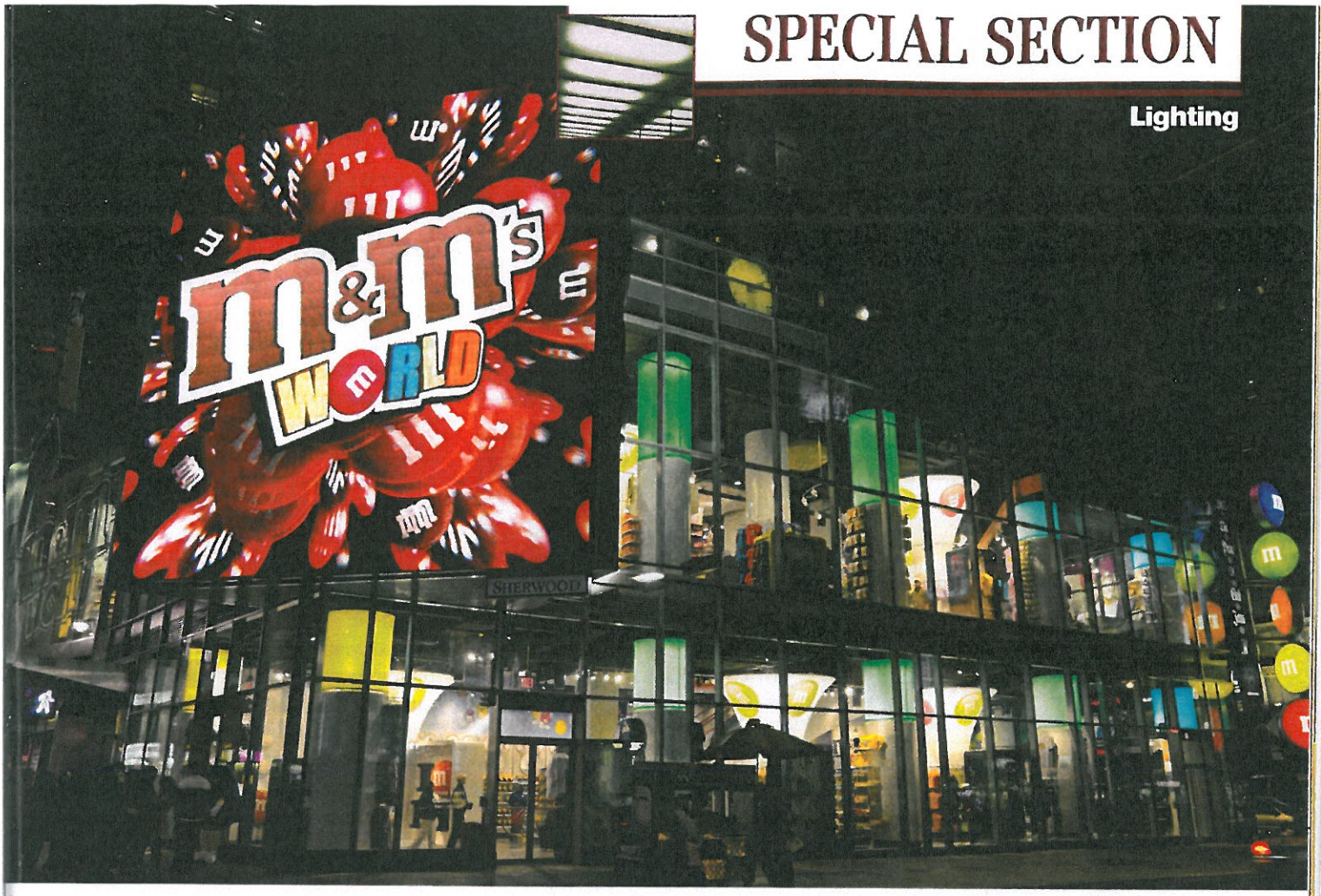

True green? Why you should proceed with caution on LED retrofits

By Ron Harwood

We have all seen salespeople claiming to have the answer to our lighting energy and efficacy concerns. Virtually every "pitch" deals with LEDs, and only a rare few will be touting the older fluorescent and the new, almost miniature metal halide lamps.

But some salespeople omit some key facts or, perhaps, have had so little training that they only know how to sell what's in their bag, with little facts about their products' performance. I actually believe that LEDs will eventually become a significant – if not dominant – light source; but as with many new or revolutionary products, it often is being misrepresented and clearly misunderstood.

Where to begin?

Let's first understand the current and commonly used light sources. A great many commercial spaces are illuminated with fluorescent tubes of some form. These tubes have prescribed quantities of light output (measured in lumens) and concomitant energy consumption.

Many have fluorescent lighting systems that were not designed to dim. Imagine that your space had an array of florescent-like lights (LED retrofit) that could be dimmed. Simply by dialing them down 10 or 20 percent, you would actually save the commensurate amount of energy.

Some have opted for more sophisticated metal halide light sources in the past 10 or more years. These sources provide good color rendering and a high degree of texture rendering, unlike most fluorescent tubes. For example, in retail stores, metal halide was a great option to provide sparkle and save as much as 70 percent of the

Ron Harwood is president and founder of Farmington Hills, Mich.-based Illuminating Concepts, one of the world's largest lighting design firms. Founded in 1981, the company is a full-service design and implementation firm providing award-winning lighting, multimedia and entertainment systems for architectural, retail, environmental, public and theatrical environments worldwide. You can reach him at ronh@illuminatingconcepts.com.

energy that would otherwise be used by quartz halogen. These HID lamps, like fluorescent, come in prescribed light outputs with coincident power consumption. Unfortunately, they cannot be easily or cheaply dimmed.

Now that LED light sources have arrived, where do they fit in? For the most part, the most efficient and least expensive LEDs to manufacture are physically small and have low wattage consumption. At typically one to three watts per chip, they produce between 80 and 120 lumens per chip in theory. Placed in light bulbs or fixtures, these LED sources emit more like 40 to 80 lumens per watt, so they are essentially the same or slightly lower in light production efficiency than fluorescent and metal halide.

What's being missed in promoting LEDs is in the area of "usable light." Usable light is a quantification of how much light actually escapes the light fixture and becomes usable within a space. This figure is in contrast to the raw efficiency of the light source in open air.

But in the near future, we will see raw LED efficiencies higher than 120 lumens per watt and usable light in the area of 80 lumens per watt. This potential is what makes LEDs so interesting as the source of the future.

Because higher efficiencies for LEDs are achieved with the low-wattage chips, many chips arrayed together is what we commonly are seeing in the commercial replacement market. This means that to replace any form of incandescent, quartz halogen, metal halide or fluorescent lamp, several chips need to be clustered near one another to produce enough light.

If a 39-watt metal halide lamp produces 2,600 lumens, in theory, it could take about 26 one-watt LED chips clustered together to replace it. When manufacturers place this many chips close together, the heat produced by the tightly knit grouping becomes significant enough to require large aluminum "heat sinks" behind the chips.

In addition, some LED lamps cannot be dimmed, so why make a lamp replacement without that capability? Suffice it to say that these lamps are not a true replacement for incandescent lamps if they are not dimmable, so be cautious if you're replacing lamps in track heads or recessed lights, where there are already dimmers on the circuit, or if you wish to add dimming in the future.

What's the return?

In general, the quickest payback in the retrofit market is when you can accurately replace an incandescent or quartz lamp to the degree that there is acceptable color rendering and brightness. There are many examples of LED light sources saving four to six times more energy than incandescent lamps; you have to be cautious on going about the process.

Actual payback in retrofitting to LEDs is a bit challenging to ascertain. Some operators hire a lamp company and others simply tell the building or office manager to figure it out themselves. It's obvious that, at $50 or more an hour, hiring a company to just change a few light bulbs is really costly. Therefore, some lamp salespeople, looking to enhance the payback time, factor in the cost of replacement as a potential direct savings.

When this is done, coupled with saving around 40 percent on electricity when the retrofit is done properly, a payback within five to seven years is possible. When the only factor is the cost of energy and the cost of lamp replacement, the payback could take up to 15 years. To add a factor typically forgotten in the payback formulas, many LED linear sources require a special remote power supply.

Power supplies are similar to transformers in that they convert the input voltage to something different on the output side. Because power supplies take up space and produce heat, manufacturers often place these in a separate envelope, and not within the LED fixture itself. Where linear LEDs are used to replace neon or fluorescent for under-shelf or cove lighting, or generally when a power supply is needed to convert the voltage from 120 or more to 12/24 volts, the power supply typically lasts only seven years, on average.

This means that an electrician may

be needed somewhere down the line, maybe five to 10 years from installation, to replace the power supply. When this occurs, the payback formulas do not look good. If you have to demo your ceiling in five years (like a mall tenant improvement), the payback for energy savings needs to occur before the lease requires a total refit.

What happens when just a few LED fixtures or lamps fail, and how would you replace them? For linear systems used for cove lighting, where LEDs have replaced neon or fluorescent, there is a big concern that the replacement fixtures will not match in color or light output. LED manufacturing techniques continue to improve both color and light output, and replacement LEDs are actually time-sensitive in that regard. The passing of just one year could potentially make the accurate "matching" replacement of LED products difficult.

Are LEDs easy to install? In the case of simply unscrewing a light bulb: absolutely. The standard socket LED replacements are installed in the same way as a regular light bulb. But even though the LED lamp is almost always lower wattage consumption, and even though these lamps typically produce less heat than what they replace, the fixtures have not been listed by a testing agency such as UL for use with an LED lamp. Be sure to check with your inspection authority before simply replacing your old PAR lamps with LED replacements.

In the end...

Contrary to this cautionary tale, I'm not necessarily against the use of LEDs in commercial spaces. Of course, I believe in reducing our national carbon footprint. When wisely specified and properly installed, LEDs can be a effective means of lighting, providing many design opportunities that did not exist before LEDs were commercialized.

When applied to areas where the lighting tasks and the light source can be within a few feet, LEDs are the best way to go. Under shelves, in display cabinets, in lower ceilings (nine feet and less), for nightlights and emergency lighting, and especially in coves, LEDs absolutely can be the right choice.

But like any other new change in technology, we need to be cautious and use common sense so that our hard-earned dollars burn the least amount of coal and get the most light for the investment. CCR