

# FACT SHEET

## LED REFRIGERATED DISPLAY CASE LIGHTING

“In 2007, after being tested in our experimental stores in the US, LED lights in refrigerated cases became popular additions in many of our stores around the world. LED refrigerated case lighting technology is estimated to provide a more than 70 percent energy-efficient operation than fluorescent case lighting. The total energy savings for LED refrigerated case lighting is estimated to be more than 90,000 kWh per year for an average supercenter. Therefore, each store with LED case lighting saves enough energy to power almost eight single-family homes for an entire year. The lifespan of LED refrigerated case lighting is projected to be at least six years beyond conventional fluorescent refrigerated case lighting, which must be replaced, on average, every two years in a refrigerated case environment. This life expectancy allows for a significant reduction in re-lamping and maintenance costs. Additionally, LEDs contain no mercury, perform well in the cold, and produce less heat than fluorescent bulbs — heat which must be compensated for by the refrigeration equipment.”

*Wal-Mart 2009 Global Sustainability Report*

In 2006, Wal-Mart Stores, Inc., made energy efficiency headlines when it announced that it would install LED lighting in low- and medium-temperature refrigerated display cases in more than 500 U.S. stores, and that it planned to retrofit more than 6,000 additional stores.

### THE PROBLEM WITH FLUORESCENTS/ THE ADVANTAGES OF LEDS

Fluorescent lamps are an efficient source of lighting for many types of applications, but in refrigerators and freezers, their performance can be poor. Cold temperatures cause the mercury vapor pressure inside fluorescent lamps to drop; reducing light output up to 25% under the conditions found in, for example, a beverage cooler display case. LEDs, however, thrive in cold



environments, and in some cases, their light output even improves in colder environments.

The low profile of LEDs is another advantage in the close quarters of a refrigerated display case, and because the light from LEDs can be “aimed,” they can enhance the visual appearance of a display. Additionally, the flexibility of LEDs allows them to be mounted in various locations (along doors and shelves, for example) to illuminate products evenly and provide better shelf access to products for stockers and shoppers. Their flexibility also means that freezer interiors can be redesigned for more efficient cool-air flow, increasing the energy efficiency of compressors and other cooling equipment.

LEDs last much longer than fluorescent lamps in freezer environments, providing a much lower lifecycle cost for owners. And because they use no breakable glass or filaments, LEDs are well-suited to locations where breakage is an issue.

Fluorescent lamps will burn out sooner if switched on and off frequently, but LED life and lumen maintenance are unaffected by rapid cycling, and LEDs in refrigerated display cases are often combined with sensors that turn them off and on depending on customer traffic.

## THE CUSTOMER IS ALWAYS RIGHT — AND PREFERS LEDS

A study done by the Lighting Research Center at Rensselaer Polytechnic Institute found that shoppers overwhelmingly prefer LED lighting inside supermarket freezer cases when it comes to merchandise appeal and the brightness, comfort, and evenness of the freezer lighting. In a two-year field study sponsored by the New York State Energy Research and Development Authority (NYSERDA), LRC researchers evaluated shoppers' preferences for a four-door LED-lighted freezer case installed at an Albany, N.Y., area supermarket compared with a matching freezer with conventional fluorescent lighting. LRC researchers also analyzed sales data and measured the energy usage of the two test freezers, which were installed side by side next to the existing freezer cases in the frozen-food aisle.

More than 300 shoppers were asked their opinions about the lighting of the two test freezers. More than 86% of shoppers stated that products were more appealing, and the lighting was brighter, more comfortable to look at, and more even, in the LED freezer. Researchers believe that the LED freezer got high marks because of the more uniform light distribution and the "sparkle" the LED lighting created within the lighted space. Although the average illuminance level of the fluorescent-lighted freezer was slightly higher, the uneven distribution of the fluorescent lighting led to "dark areas" at the center of the case, while light levels were more uniform in the LED freezer. A statistical analysis of sales in the test freezers compared with sales of the same products at a control store located nearby showed no significant difference in sales due to the change in lighting.

### A SMART IDEA

Replacing fluorescent refrigerated case lighting with LED technology can qualify for prescriptive incentives of \$20 per door from ComEd's *Smart Ideas for Your Business*<sup>SM</sup> program, but careful attention to product specifications is essential. Testing by the US Department of Energy (DOE) has shown wide variability in performance of LED products, with some products not meeting the ratings listed by the manufacturer. There are currently only a few LED lighting products that are ENERGY STAR<sup>®</sup> rated and listed on the ENERGY STAR Web site.

ComEd's *Smart Ideas for Your Business* program has defined specifications that LED lights must meet to be eligible for incentives, and these specifications are detailed on the application form. LED lamps and downlight luminaires over 18 watts must:

- Be tested to IESNA LM-79-08 — an industry standardized test procedure that measures the performance qualities of LED luminaires and integral lamps — by a third-party DOE-accredited lab
- Carry a warranty on the light source and power supplies of three years or more
- Have a minimum efficacy of 35 lumens per watt
- Have a CRI of 75 or above

Motion or occupancy sensors can qualify for prescription incentives of \$.09 per watt controlled.



Kroger has undertaken a major energy-efficiency initiative: replacing fluorescent lighting with high-efficiency LED lighting in frozen food reach-in cases and refrigerated dairy and beverage cases in their grocery stores across the country.

In a project in the ComEd service territory, freezer and refrigerated display cases in 21 Kroger, Food4Less and Highlander stores were upgraded from fluorescent to LED: 58-watt fluorescent lamps were replaced with 20-watt LED "sticks" plus motion sensors. Energy savings came from three sources:

- Wattage reduction from the fluorescent-to-LED switch
- Runtime reduction from the motion sensors
- Reduced refrigeration energy consumption due to the lower heat generation of LEDs

The size of the Kroger project is on a grand scale: In 12 Chicago-area Food4Less stores, for example, more than 2,000 fluorescent lamps were removed and some 2,000 LED sticks and 180 motion sensors were installed. Energy savings were estimated to be more than 1,000,000 kWh per year, and \$80,000 in incentives were paid for the \$335,000 retrofit.

A project doesn't have to be on that scale to provide significant savings, as the Kroger store in Bourbonnais, Illinois, illustrates. In this small-town grocery store, 263 58-watt fluorescent lamps and the associated ballasts were removed and replaced with 20-watt LED sticks and drivers. Fourteen motion sensors turned off the lighting in the absence of customers (about 30% of the run hours). The wattage cut plus the runtime decrease results in a reduction of the refrigeration system loading — an additional 25% energy savings.

Here's how the energy savings were calculated:

$$\begin{aligned} & 263 \text{ fluorescent lamps} \times 58\text{W} / 1,000^* \\ & \times 8,760 \text{ hours per year} \\ & - 239 \text{ LED sticks} \times 20\text{W} / 1,000^* \\ & \times (8,760 \text{ hours per year} \times .70^{**}) \\ & \times 1.25 \text{ refrigeration load saving} \\ \hline & = 130,392.6 \text{ kWh/yr} \end{aligned}$$

\* to convert to kW

\*\* reduction due to motion sensors

The project earned incentives on both the motion sensors and the LED lighting, and annual electricity savings are estimated at \$11,735. Impressive as these savings are in themselves, they are even more dramatic for a grocery store: the US EPA estimates that, because grocery store margins are so thin, every \$1 saved on energy is the equivalent of an additional \$59 in sales.

### CONTACT US

For more information about ComEd's *Smart Ideas for Your Business* visit [www.ComEd.com](http://www.ComEd.com) or call **888-806-2273**.

