

LED streetlights help Toronto become brighter and greener



LED street lights illuminate Toronto's Exhibition Place.

An installation of 16 LED streetlights in Toronto demonstrates reduced energy usage and improved light quality.

An installation of 16 LED streetlights, the largest in Canada, has been unveiled in Exhibition Place in Toronto, Ontario. The pilot project is intended to show how LED lighting can dramatically reduce city lighting costs. "LED street lighting is one of the options we are enthusiastically examining in order to bring Toronto another step closer to becoming the greenest city in North America," said the city's mayor David Miller. "This one step will reduce costs, increase safety and improve our environment."

The LED luminaires were manufactured by Leotek Electronics, and were supplied by electromega, a Canadian distributor. The initial



investment needed to cover the cost (approximately \$1200 per luminaire) and installation of the new LED streetlights is expected to be recouped from electricity savings as well as reduced replacement and maintenance requirements.

A total of 12 LED streetlights have been installed at Exhibition Place on unique, bow-style streetlight poles surrounding the perimeter of the Automotive Building. An additional four LED streetlights are positioned in the parking lot south of the Direct Energy Centre.

The street-lighting poles were fitted with electricity meters to measure precisely the power draw of the lighting fixtures. The result: the LED fixtures drew 146 W compared with 314 W for the HPS fittings. The HPS ballast consumes a significant amount of power since the HPS lamps themselves are rated at 250 W. In contrast, the LED fixtures have a power efficiency of 90% or greater.

The LED fixtures were built by Leotek Electronics, and contain 117 one-watt LEDs from Nichia. John McKinness from Leotek said that



A conventional luminaire containing a high-pressure sodium (HPS) lamp, and Leotek's LED street light.

these LEDs provide "the highest efficacy (lm/W) among production LEDs, and very good reliability". Leotek's luminaires contain a built-in heat sink to deal with thermal issues, and have a five-year warranty.

The LED luminaires are designed as direct replacements for conventional cobra-head fittings, and provide a type-II roadway distribution. IES files for Leotek's SL-250 luminaire, the type used in Toronto, show a downward flux distribution of 1202 lm on the house side and 3505 lm on the street side for a total of 4708 lm, which puts the overall fixture efficacy at around 32 lm/W. Very significantly, the upward flux distribution is zero, while cobra-head fittings containing other types of lamp can typically waste as much as 30% of their light output in the upwards direction.

McKinness says that Leotek currently uses one-watt class LEDs

since these have been around longer and there is more life-testing data available. "Using a smaller number of LEDs driven at higher power would change the arrangement of LEDs and require a different reflector to meet the light distribution pattern," he says.

Light output and quality

The launch ceremony on 28 February provided an excellent opportunity for observers to study and compare lighting from LED fixtures on one side of a street and conventional HPS fixtures on the other. Peter Strasser of the International Dark-Sky Association was there, and reported a very positive response to the new lights. "All the observers said that the LED lighting appeared brighter, and enabled people and objects to be viewed much more clearly," said Strasser. "In fact, I took measurements with a simple light meter, and the LEDs produced a little under half the number of foot candles that came from the HPS lamps."

So, while drawing less than half the power of the HPS fixtures, and producing half the measured light output, the LEDs provide improved light quality as far as the observers were concerned.

The reason for this relates to the spectrum of LED light, which has significant blue content (most white LEDs are manufactured by combining a blue-emitting LED chip with a yellow-emitting phosphor material). "In dim lighting conditions, the eye is more sensitive to the blue end of the spectrum and can detect more light," explains Strasser. While LEDs provide a better match with mesopic vision, which is prevalent under dim lighting conditions, the standards and codes that determine light distribution patterns are written in terms of photopic lumens. This favours low-pressure sodium light, which matches the eye's photopic response. There are suggestions that the standards should be revisited and possibly rewritten to take mesopic vision into account, but, of course, this will take a long time.

Strasser says that LED lighting is of considerable interest to the Dark-Sky Association, which seeks to reduce light pollution and preserve dark-sky heritage through good lighting design. By placing light where it is needed, when it is needed, this approach saves light and reduces energy expenditure. "LEDs provide very good control, and are excellent for reducing wasted light," says Strasser. "They also provide very good cut-off at the edge of the distribution."

Energy conservation

Toronto's LED project was organized by greenTbiz, a program developed by the Toronto Association of Business Improvement Areas (TABIA) to assist businesses and property owners with energy conservation and environmental improvement.

The City of Toronto has about 160 000 streetlights and if these were all converted to LEDs the city could save \$6 million a year in electricity costs and reduce greenhouse gas emissions by 18 000 tonnes, the equivalent of removing more than 3600 cars from the streets. The pilot program will continue through 2007 to test public acceptance, durability, light performance and weather resistance, and additional pilot tests of LED technology are planned in other areas of Toronto. ●

Links

Leotek Electronics: www.leotek.com

International Dark-Sky Association: www.darksky.org

'On the verge: LEDs ready to challenge incumbent light sources in the street lighting market' *LEDs Magazine* October 2006
www.ledsmagazine.com/features/3/10/4