BY PAMELA YOUNG

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ILLUMINATING IDEAS FOUND ON CAMPUS

The University of Toronto is saving on energy and maintenance with a new LED retrofit kit and the not-so-new idea of induction lighting

Given that the University of Toronto has approximately 2,000 exterior light fixtures on its central, 132-acre St. George campus, it's not surprising that the university's Facilities and Services department would put considerable effort into selecting types of outdoor lighting that combine energy efficiency with low maintenance requirements. Researching the options recently led to two noteworthy choices. For pole-mounted lights, the university went with a retrofit kit that transforms conventional high-intensity discharge (HID) fixtures into LED ones. For wall packs, the best option for U of T has proven to be induction lighting – a less widely known but well-established technology that delivers attractive return on investment.

Before (top) and after views of HID pole-mounted fixtures converted to LED with Osram Sylvania's retrofit kits.

CFM&D spoke with three senior University of Toronto Facilities and Services people about these lighting choices: assistant vice president Ron Swail; sustainability initiatives manager Attila Keszei, and trade services manager Blair Mochrie. What became clear early in the discussion was that while energy savings are part of the story, they are by no means the whole story. Although LED and induction technology *are* both more energy efficient than HID lighting (such as metal halide or high-pressure sodium), they also have much greater longevity, which translates into lower maintenance costs. "Whenever we need a pole relamped, it takes a couple of guys, it takes a long time, it's inconvenient, and we have to ensure that the whole operation is done as safely as possible for our own staff and for everyone on campus," Mr. Swail said. Mr. Keszei noted that the conventional high-pressure sodium or metal halide lamps typically used for exterior lighting applications "last on paper for 15,000 to 20,000 hours, and in reality they don't last as long as that." He added that LED lamp life for the same sorts of applications is at least double that, and that induction lamp life is consistently in the 100,000-hour range, or five times that of the conventional lighting options.

UNIVERSITY OF TORONTO LIGHTING CASE STUDY NO. 1: LED RETROFIT FOR POLE-MOUNTED FIXTURES

Although U of T has several different types of pole-mounted light fixtures on the St. George Campus, some of them dating back to 1919, a great many of the existing fixtures on the site are from the Contemporary Lantern Series manufactured by Lumec. The university has now retrofitted approximately 100 of these Lumec fixtures with Osram Sylvania's Post Top Fixture LED Retrofit Kit. "The kit has allowed us to reduce the system wattage and increase the system light levels, and it's easy to install," said Mr. Mochrie. He added that the whole operation of removing the existing lamp and ballast and refitting, rewiring and installing the LED parts takes about an hour, and that the new kit fits securely into this style of fixture. According to Mr. Keszei's projections, each retrofitted fixture will save 288 kWh of energy per year, and the higher initial material cost of the switch to the LED system would be recouped in about three years, due in large part to the maintenance cost savings associated with switching to longer-lasting LED lamps. It's expected that the new LED lamps will last about 12 years before they require replacement, which is approximately four times the lifespan of the HID lamps that were previously installed in these poles. Over that 12-year period, the anticipated total saving in energy, materials and labour works out to just under $2,500 per fixture. And there's an added plus: the retrofit has not only improved the quality and intensity of nighttime illumination on campus, but has also reduced light pollution by eliminating light emission upward into the night sky. *(Continued on page 12)*

Former HID fixture after its LED retrofit

Views of the University of Toronto's anthropology building as it was previously illuminated by HPS (High Pressure Sodium) wall packs (left) and lit by new wall packs incorporating induction lighting technology (right). The new lamps are brighter and much longer lasting.

UNIVERSITY OF TORONTO LIGHTING CASE STUDY NO. 2: THE INDUCTION OPTION FOR WALL PACK FIXTURES

"I've been in the property management business for more than 20 years and I had never heard of induction lighting until some of the manufacturers we had approached for quotes mentioned it," Mr. Swail said. "Then Attila did some research, and to our shock it turned out that induction lighting is cheaper, provides more lumens, costs less and lasts longer than LEDs." The technology certainly isn't new: Serbian-born engineer and inventor Nikola Tesla pioneered it in the 1890s, and products of this type have been on the market for decades. In induction lighting there are no electrodes or filaments. Instead, magnetic coils surrounding a glass tube create an electromagnetic field using a high frequency generated by the electronic ballast. When electrons discharged by the coils collide with mercury atoms inside the tube, energy is produced in the form of invisible UV light. This energy is converted to visible light when it passes through a phosphor coating on the inner surface of the tube. (Note: induction lighting uses less mercury per hour of operation than HID lighting; LED technology is mercury-free.)

U of T's Facilities and Services department concluded that existing induction products are too cumbersome to be ideal for pole-mounted applications, but are an outstanding option for wall-mounted exterior lighting. Given that induction lamps have 100,000-hour longevity and that U of T estimates that its wall packs are on average required to provide illumination for about 4,000 hours, the lamps should last 20 years or more before they will have to be replaced. Conventional HID wall pack lamps would have to be replaced approximately every three years, and each replacement translates into several hundred dollars in maintenance costs. Mr. Keszei estimates that the total parts, labour and energy costs of running an HID wall pack for 20 years would be $5,100. "With induction," he said, "it costs $1,100 to install and then you can really forget about it for 20 years." There's a three-year payback, and the savings per fixture add up to about $4,000 over 20 years. Energy savings over the same period are expected to exceed 9,000 kWh per fixture.

The university has already installed induction lighting at several sites and is very happy with the quality of the illumination. In comparison with HID wall packs, Mr. Mochrie said, induction produces a brighter, whiter but still warm-looking light. Mr. Keszei added that induction wall packs have also fared well on campus in side-by-side comparisons with LED wall packs. Induction provides a more even spread of light, while with LEDs there can be bright spots and dark spots. Manufacturers including Metalumen and Gerrie Electric produce induction wall packs, and Phillips, GE and Osram Sylvania are among those who produce induction lamps.

In addition to improving the quality of outdoor nighttime illumination at U of T, the switch to long-lasting induction bulbs means that fewer lights will be burnt out on campus at any given time. "The bottom line," said Mr. Swail, "is we're going to save a substantial amount of labour and energy and also provide a safer environment." | CFM&D