The benefits of LED lighting retrofits include a longer lifespan and less maintenance requirements.

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# LED Benefits a Townhouse Retrofit

Smart building owners and property managers are gradually retrofitting fluorescent lighting systems to LED lighting systems because of the tremendous benefits of the LED solid lighting technology. Its lower energy output reduces the building's overall energy consumption. Compared with fluorescent lamps, LED's longer lifespan reduces the building's maintenance costs. Overall air conditioning requirements can also be reduced by LED's low heat working condition. Unlike fluorescent lamps, LED tubes contain no mercury or hazardous materials.

The City of Toronto Building Code states that motion sensors are allowed for use in multi-residential hallways and parking garages as long as the overall brightness in these areas meets the minimum illumination. New lighting systems offer dimmable, repairable and remote controllable LED products which are the latest breakthrough in the residential and commercial lighting market and specialized for underground parking garage and common hallways. These LED tubes have a built-in motion sensor that can help clients achieve different dimming modes and maximum energy savings compared to regular LED tubes. These LED tubes' modularization decreases the cost of repair rather than changing the tube completely; it also decreases waste. The remote-control feature allows clients to change the dimming mode freely between 0W, 3W, 6W and 9W to achieve the maximum energy savings.

The dimmable feature is very useful for hallways and underground parking lots since these areas are seldom used but all the lights are fully lit, especially for the period from 12 a.m. to 6 a.m. The dimmable feature can achieve 40 per cent more energy saving than using regular fully lit LED products.

Photo: Dianne Werbicki

## LED Townhouse Retrofit

Because of the large floor area, townhouse complexes usually have large underground parking lots. Take the First Markham Village (FMV), located at 8 and 10 Cox Blvd., Markham, Ontario. Before the LED lighting retrofit project, the underground parking garage had 895 pieces of 110W 8' T12 fluorescent lamps and 284 pieces of 60W 4' T12 fluorescent lamps. The lighting system had 347V voltage and was outdated, as well as consuming a huge amount of energy.

In order to test the significant energy saving result, three portable power meters were installed at parking stall #85, #87 and #89 on December 16, 2013 to track the electricity consumption of two 4' T8 LED tubes with motion sensor, one 110W 8' T12 fluorescent lamp and two regular 18W 4' T8 LED tubes, accordingly.

The full power of our LED tubes with motion sensor is 18W. The LED technician sets both tubes' dimming mode to 6W. Both LED tubes will dim down to 6W automatically if there is no motion detected in the motion sensor's detectable range for a minute.

After 92 days' examination, the typical light fixture of one 8-foot T12 110W fluorescent lamp consumes 281.11 kWh in total and $42.17 in dollars. Two regular 4-foot T8 18W LED tubes consume 79.49 kWh in total and $11.92 in dollars. Two GLL LED tubes with motion sensor only consume 20.77 kWh and $3.12 in dollars. Therefore, 92 percent of electricity consumption savings in the underground parking garage can be achieved if retrofit the existing fluorescent lamps to LED tube with motion sensor. Please see the power meter consumption table and diagram below in Table 1.

The FMV LED lighting retrofit project was started on July 12, 2014 and finished on August 25, 2014. 1,800 pieces of LED tubes with motion sensor and 300 LED tubes without motion sensor were installed. The total project cost is $205,635 and the government incentive is $42,500. The project was completed almost three years ago and there is no failed report since.

After one year of operation of LED with motion sensor, the actual hydro

**Table 1:** Energy Consumption in 92 days of three kinds of lamps (The data came from portable meters)

| | Lot #85 (two GLL 4' T8 LED tubes with motion sensor)<br>Full Power 18W/ECO Power 6W | Lot #87 (one 8' T12 110W fluorescent lamp)<br>Always on full power of 110W | Lot #89 (two regular 4' T8 LED tubes without motion sensor)<br>Always on full power of 18W |
|---|---|---|---|
| Energy(kWh) | 20.77kWh | 281.11kWh | 79.49kWh |
| Money($0.15/ per kWh) | $3.12 | $42.17 | $11.92 |

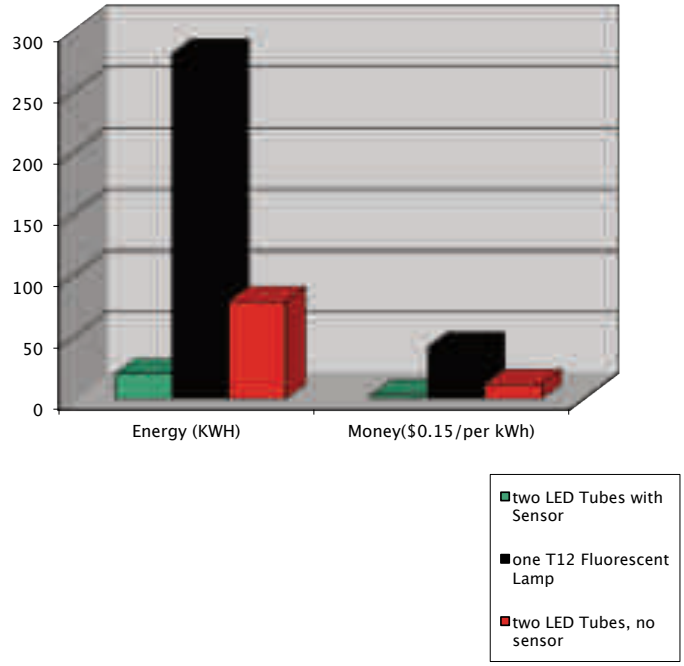
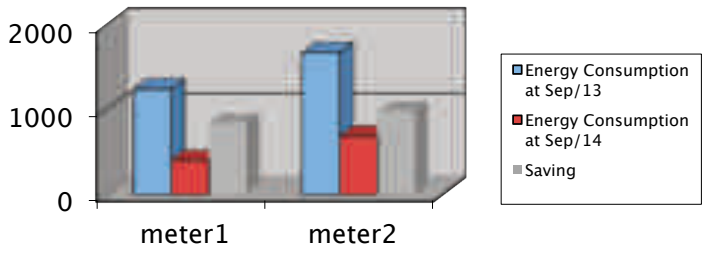



**Table 2:** Comparison of Energy Consumption per day before and after retrofit light (Sep,2013/Sep,2014)

| | Energy Consumption (kWh/per day) in Sep,2013 | Energy Consumption (kWh/per day) in Sep,2014 | Saving |
|---|---|---|---|
| Meter1(20490-103) | 1243.64kWh/ per day | 401.38kWh/ per day | 842.26kWh/ per day |
| Meter2(20270-109) | 1672.50kWh/ per day | 686.90kWh/ per day | 985.60kWh/ per day |



meter readings also explain how significant the electricity consumption savings are after retrofitting the fluorescent lamps to LED with motion sensor. (The hydro meter reading not only includes the electricity consumption of the underground parking garage, but also contains other electricity consumptions.)

Please see the actual hydro meter data comparison table between September 2013 and September 2014; October 2013 and October 2014. Meter 1 (20490-103) belongs to 10 Cox Blvd. and Meter 2 (20270-109) belongs to 8 Cox Blvd.

See Table 2 and Table 3.

Also, after the LED retrofit project, the 2015 total hydro bill of 10 Cox Blvd. has been reduced by 68 per cent from the 2013 hydro bill. The amount is 308,253.45 kWh or $46,238. The 2015 total hydro bill of 8 Cox Blvd. has reduced by 59 per cent from the 2013 hydro bill. The amount is 364,187.88 kWh or $54,628. Please see Table 4.

The company provides a six-year warranty, including labour and materials. So, within the warranty period, $0-dollar maintenance cost should be expected. However, if without changing the fluorescent lamps to LED tubes, the maintenance cost for the FMV is about $5,000 including replacing the failed lamps and failed ballast.

With the $42,500 government incentive and the total saving on electricity and maintenance. The payback period is only 1.5 years.

Within our six year warranty period, this specific LED tube with motion sensor can help the FMV saves $472,063.68 in electricity consumption and maintenance cost. ■

**Michael Chen** is sales manager with Globe LED Lighting Inc. Because of the safety feature, the smart built-in sensor design and the reliable performance, the company's Dimmable, Repairable and Remote Controllable LED tube won the 2015 Engineering Project of the Year Competition hosted by the Awards Committee of York Chapter, Association of Professional Engineers Ontario. Recent contracts were awarded by Toronto District School Board and Ajax housing. globeledlighting.com/

**Table 3:** Comparison of Energy Consumption per day before and after retrofit light(Oct,2013/Oct,2014)

| | Energy Consumption (kWh/per day) at Oct,2013 | Energy Consumption (kWh/per day) at Oct,2014 | Saving |
|---|---|---|---|
| Meter1(20490-103) | 1249.66kWh/ per day | 402.86kWh/ per day | 846.80kWh/ per day |
| Meter2(20270-109) | 1721.38kWh/ per day | 711.43kWh/ per day | 1009.95kWh/ per day |

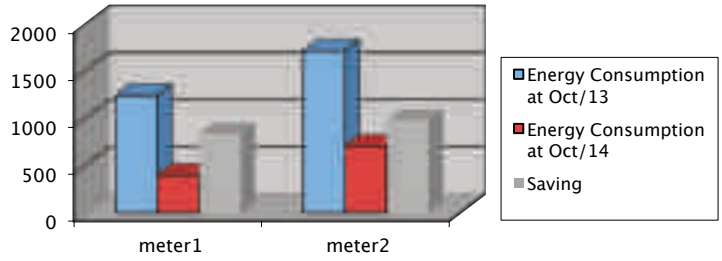



**Table 4:** Comparison of yearly energy consumption before and after light retrofit (2013/2015)

| | Energy Consumption in 2013 | Energy Consumption in 2015 | Saving |
|---|---|---|---|
| Meter1(20490-103) | 455027.25kWh/ year | 146773.80kWh/ year | 308253.45kWh/ year |
| Meter2(20270-109) | 619383.10kWh/ year | 155195.22kWh/ year | 364187.88kWh/ year |