

Ballast-Free LEDs for High-Bay Fixtures Reduce Energy Use by 50%

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[About a year ago, I wrote about “snap in” LED retrofits.](#) One of the key advantages of this design was that it is “ballast-free”, which removes another energy consumer and potential point of failure from a lighting system. These LED tubes are a little different and look like “light sabers” from Star Wars Movies because they do not have pins on their ends (like fluorescent lamps and other “LED tubes”). They also do not need any lamp holders (aka “tombstones”), which removes another point of failure and hassle because old plastic lamp holders often break during installation of other types of retrofits. The LED tubes are wired directly to line voltage and literally just “snap in” to the existing fixture using magnets. Many clients have reported high CRI lighting and good energy savings.

Today- I present a case study on applying this design approach to a high-bay application. Specifically- I will show the economic advantages of removing T5HO lamps (or T8 lamps) and inserting these LED tubes on a “one for one” replacement. It may seem strange to replace relatively a new T5 system with LEDs, but when you’re going from 230 watt/fixture to 96 watts (and doubling lamp life and maintaining brightness), it is worth investigating. *If you are unfamiliar with “T-Bay fixtures”, you can find this type of high-bay lighting in many Sams Clubs, Wal-Marts and Costco warehouses.*

Video Available Here: <http://www.profitablegreensolutions.com/resources/ballast-free-led-snap-retrofits>

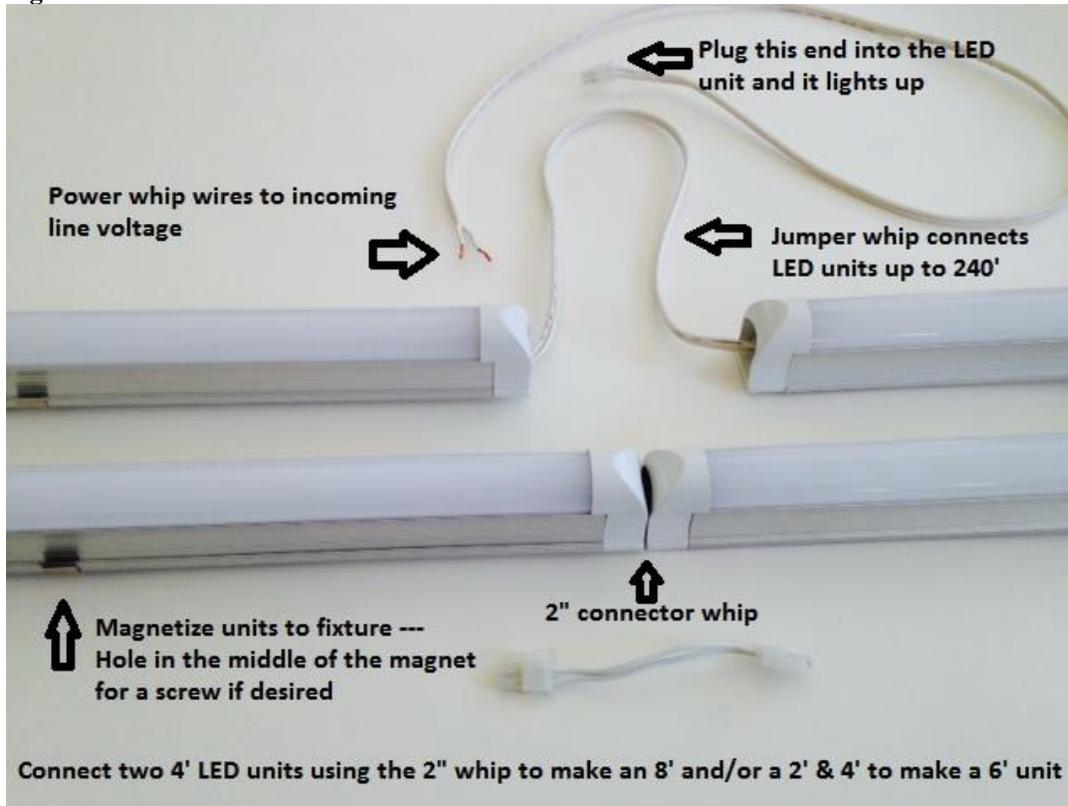
Retrofit Details

The building had “T-Bay” fixtures mounted over 20 feet high, each with four 54 watt T5HO lamps per fixture. The lamps and ballast were consuming about 230 watts per fixture and providing adequate lighting. The retrofit involved removing all four lamps and the ballast, which results with an empty fixture with only the incoming power wires remaining (and the empty lamp holders). Next, you connect the line voltage wires directly to the first LED tube. Then there are “jumper whip” plugs that allow you to wire (in series) the remaining LED tubes very quickly. Each tube has magnets on one side, so they just “snap in”. Therefore, within



minutes you can have four LED tubes mounted where the Fluorescent tubes used to be located. The figure below shows how these types of LED tubes are connected.

Figure 1. LED Tube Connections



FYI- you can also use this design to replace 8 foot fluorescent lamps by using a “connector whip” to have 2 four foot LEDs line up (end to end). In that type of retrofit, you are going from a minimum of 150 watts (2 F96T12 lamps) to only 2 four foot LED strips (end to end), which give off enough light and only requires 48 watts (and no ballast losses). Figures 2 and 3 show a “before” and “after” retrofit in a low-bay shop.

Figure 2. 8 Foot Linear Lighting (BEFORE)



Figure 3. Linear LED Lighting (AFTER)



Economics for the T-Bay Retrofit:

Site Information:

- Existing Fixture Energy Input: 230 watts/fixture
- LED Fixture Energy Input: 24w/tube or 96w/fixture
- Material Cost: \$40/tube
- Installation: \$25/Fixture
- Electrical Demand Cost: \$7/kW per month
- kWh Cost: \$0.10/kWh
- 3000 Operating Hours per Year

kW Savings per fixture:

$$= [(0.230 \text{ kW/fixture}) - (0.096 \text{ kW/fixture})] * [\$7/\text{kW} * 12 \text{ months/year}]$$



= \$11.2 per year in Demand (kW) Savings

kWh Savings per fixture:

= [(0.230 kW/fixture) – (0.096 kW/fixture)] * [\$0.10/kWh * 3,000 hours/year]

= \$40.2 per year in kWh Savings

Therefore, the total dollar savings per fixture would be about \$50 per year.

Note- with these retrofits, you may also want to count the labor and material relamping savings too, as well as HVAC savings...

Installation Costs per fixture:

= (\$40/tube)*(4 tubes) + (\$25 installation)

= \$ 185 per fixture

Simple Payback:

=(\$ 185 per fixture) / (\$50/ per year in savings)

= 3.7 years

In addition, there may be current tax and utility rebates that can help you reduce your payback by 50% (sometimes more). These were written about in previous column articles and there are also [webinars about them online](#).

Aesthetic Benefits, Risks and Downsides

Whenever you do a retrofit, install some samples for a few weeks to see how the occupants like the new fixtures (or if they notice at all). You want to be sure the LED lights aren't contributing to glare, although this is not as much an issue in high-bay environments. Many LED strips/tubes come with either a frosted shield or clear plastic. You should test which is best for a particular environment before doing a whole building retrofit. In many cases, the LEDs will provide a brighter environment with more vibrancy of colors. Some occupants have chosen to retrofit a 6 lamp Fluorescent T-Bay with only 5 LED tubes (while maintaining the light levels and achieving additional savings).

As I have experienced on other LED installations, LEDs are basically mini-computers that are sensitive to voltage or current fluctuations. Regarding maintenance, when the LEDs eventually fail, you will have to replace \$40 tubes, which requires a different budget than fluorescent lamps. However, if the retrofit economics works today, it is likely to work in the future too. In addition, material costs of LEDs are likely to be much less 5 years from now. Even though these LEDs had a 5 year "no questions asked" unconditional warranty, it is likely they will last about twice as long as the fluorescent systems. The ballast-free LEDs also have less "points of failure" to worry about.



In Conclusion, I am pretty excited about the simplification that these types of LED technologies are providing. They provide good energy savings and short paybacks, as well as improved lighting conditions. *Although I don't like to mention "brands" in an article, if you want to learn about these LED tubes, feel free to email me (eric@ericwoodroof.com) and I will provide the name of the manufacturer.*

