TRADE ARTICLE
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TLEDs Revisited

Last fall, I wrote an article about LED replacements for T8 and T12 fluorescent lamps, called tubular LED's or TLEDs. I reported that there was little or no economic advantage to TLED replacement lamps compared to fluorescent alternatives. In a dynamic field where changes occur frequently, this article provides an update on the state of TLEDs.

THE MATH: LUMENS TO LUMENS and WATTS TO WATTS
Four-foot TLEDs are designed to replace the common four-foot T12 (1.5" diameter) 34-watt fluorescent lamps and the common four-foot T8 (1" diameter) 32-watt lamps. Most TLEDs are advertised to use fewer watts than the fluorescent lamp they replace. For instance, the average TLED produces 2100 lumens and consumes only 20 watts. This TLED is usually designed to replace a 32-watt T8 fluorescent lamp or a 34-watt T12 fluorescent lamp. The savings appear to be around 12-14 watts, or about 38-41%.

However, watts do not measure light - light is measured in ***lumens***. Only 1% of all DLC listed TLEDs produce as many lumens as the standard fluorescent lamp. More than half of the listed TLEDs will cause lower light levels by 15-30%, and the lowest wattage TLEDs reduce light levels more than 30%. What this means is that **TLEDs save energy primarily by having less light.**

For fluorescent lamps, lumens and related watts are documented according to National Electrical Manufacturer's Association standards, which all major manufacturers follow (see table below). But TLEDs are different. At this point they are not manufactured to any performance standards; the only protection against poor performing products is the listing service of DLC. DLC requires rigorous testing and certification of performance results. Without independent testing bodies like DLC, TLED manufacturers would be free to make unsubstantiated claims about the quality and performance of their products without having to provide independent data to support their claims.

The table below outlines typical values for power and lumens for fluorescent lamps. It should be noted that due to electronic ballasts for F32T8 lamp types, lamps use a little less power than that for which the lamp is rated.

Fluorescent Lamp Type	**Lamp Rated Watts**	**Actual Watts per lamp including ballast loss**	**Lumens per lamp**		
			Standard lamp 70 CRI	***Premium lamp 80+ CRI***	***High Performance Lamp***
F40T12	40	43	2400	2750	3000
F40T12/Energy Saving	34	36	2300	2400	2700
F32T8	32	26-28	2300	2550	2700
F32T8/28	28	22-24	N/A	2350	2500
F32T8/25	25	20-21	N/A	2150	2300

Now let's compare similar information for TLEDs. The following representative data is the average of several TLED's on the DLC QPL list.

TLED Catalog Rating	Actual Watts and lumens		
	Direct wire-in TLED	***External driver and TLED***	***Fluorescent ballast powered TLED***
16 watts	16/1700	18/1900	19/1800
18 watt	18/1900	20/2100	21/2000
20 watt	20/2100	22/2300	23/2200
22 watt	22/2300	24/2500	25/2400

From these two tables, you can closely estimate the energy savings from a TLED replacement of a fluorescent lamp while still maintaining the original light level. For instance, you can replace a standard F40T12 energy saving lamp generating 2300 lumens and drawing 36 watts with a TLED generating 2300 lumens and drawing 22 watts, saving about 40%. Be careful, however, as the fluorescent lamp most likely has a magnetic ballast you will need to use either a direct wire-in type or an external driver type.

However, if you want to replace a standard F32T8 lamp (2300 lumens, 28 watts), you could choose between a 25-watt reduced wattage fluorescent replacement lamp (21 watts, 2300 lumens) and a 20-watt TLED (22-23 watts, 2200-2300 lumens). This makes it easy to see that the $5.00 fluorescent lamp is a bargain compared to the $50+ TLED.

Many TLED's claim over 100 lumens per watt and 50,000 hours of rated life as good reasons to choose them over fluorescent. In fact, high performance fluorescent lamps produce over 100 lumens per watt and most are now rated 36,000 hours of life or more. It is also more cost effective to upgrade F40T12 lamps to high performance T8 lamps than to TLEDs.

There are a few TLEDs that claim far higher efficiency than most on the DLC list. Be wary –the DLC list was established to prevent unsubstantiated claims, of which the LED industry is unfortunately often guilty.

WHY TLEDs?

TLEDs are getting better every day. Today, they are equal to the very best fluorescent lamps, but they are still much more costly. For now fluorescent alternatives are still the most cost effective lamps for fluorescent lighting systems. However, there are a number of cases where TLEDs represent a smart choice right now:

- In locations where switching occurs very frequently, such as in a restroom.
- In locations where temperature can vary widely, especially outdoors.
- Inside of cold locations such as walk-in refrigerators.
- In locations where fluorescent lighting is overpowering, such as under shelves and inside of small cases.

Nonetheless, this is a dynamic field in which changes will soon occur. LEDs are priced per lumen, but fluorescent is priced per lamp. As LED efficacy increases and per lumen prices fall, all of the values will change and TLEDs will become viable replacements sometime in the future.