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LED LIGHTING. A BRIGHTER WAY TO SAVINGS

# 6 TIPS

LED  
Lighting  
for Business

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## V6 TIPS LED LIGHTING FOR BUSINESS

A Resource Guide  
to LED lighting, including:

1. The advantages of LEDs, compared to conventional lighting
2. The best ways to compare LED fixtures
3. What payback and ROI you can expect from LED lighting
4. How long LEDs *realistically* last
5. The reason why LEDs cost more than other types of lighting
6. How you can be sure your actual savings will match your estimate



## How to Take Advantage of Everything LED Lighting Has to Offer

The BIG Picture: The energy used to generate artificial light represents a significant portion of global energy use.

Today, **less than 10%** of existing lighting is LED-based, but it's estimated that by 2020, LEDs will represent **33% of all global installations**. And by 2030, they're expected to account for close to **75% of all lighting sales**.

In other words, LEDs are here to stay - primarily because they offer outstanding performance when compared with other lighting sources. So it only makes sense that having a better understanding of what LEDs are all about will help to ensure your business takes advantage of everything they have to offer.

*Let's get started...*


**TIP#1**

## The advantages of LEDs, compared to conventional lighting

LED lighting, also referred to as **solid-state lighting (SSL)**, offers a number of significant advantages that include both energy and cost savings. Because LEDs are essentially a solid-state electronic device, they're perfectly suited to controlling mechanisms like dimmers, instant on/off controls, occupancy sensors, and daylight harvesting controls. By combining LEDs with various types of **lighting controls**, they've been shown to offer as much as an **extra 20% to 60%** in energy savings, depending on the application.

In fact, lighting controls have proven to be so effective in saving energy that California introduced a building code (Title 24) requiring the use of these controls for demand-response, daylight harvesting, and aisle and open area occupancy sensing. Title 24 calls for controls to reduce lighting in some spaces by at least 50% during unoccupied periods; including the lighting in parking garages, parking lots, and loading areas.

As the market for LED lighting continues to skyrocket, so too does the use of advanced control systems that further optimize the controllability of LEDs. Such innovations include connected, intelligent, and adaptive lighting that can be customized to deliver light not only where and when it's needed, but in the colour (kelvin) preferred, to soften or brighten a targeted space.

*And taking things one step further...*

### Introducing: Visible Light Communications (VLC)

With VLC technology, the light generated by LED fixtures can communicate with other electronic devices, such as your smart phone.

As an example of VLC in use today, Target is trumpeting its new "mobile in-store experience". This experience involves using a smart phone app to guide shoppers through store aisles, and deliver relevant product information. By using VLC technology, shoppers can be led to within 10 centimeters of their selected product.

Although many of the advanced features and capabilities of solid-state LED lighting are not pertinent to every user, the primary advantages of LEDs over conventional lighting are indisputable, and they include:

- long life
- huge energy savings
- superior controllability – instant on/off, sensors, daylight harvesting, dimming
- lower maintenance costs
- better lumen maintenance
- good performance in cold temperatures
- resistance to breakage
- lack of infrared or ultraviolet emissions
- highly competitive TCO (Total Cost of Ownership)

**One final point that's worth mentioning:** because LEDs emit light in a specific direction, the need for reflectors and diffusers is greatly reduced. Fluorescent and "bulb"-shaped incandescent lamps emit light in all directions, with much of it being lost within the fixture itself, or escaping in a direction that's not useful for the intended application. With many fixture types, this loss of light can equal 50% to 60% of the total light produced.

# TIP#2 The best ways to compare LED fixtures

## 1. Has the fixture been UL Certified and DLC listed?

The first things I look at when selecting an LED fixture for a project are the **certification labels**. Is the fixture DLC listed and UL approved by the electrical safety authority?

Fixtures on the DLC Qualified Products List have been tested to ensure they perform as promised. And without DLC listing, fixtures may not be eligible for government incentives.

## 2. How efficient is the fixture at producing light?

Next, I look at the fixture’s efficiency rating as expressed in **Lumens Per Watt (LPW)**. Simply put, this is an

expression of how many lumens (how much light) the fixture provides for every watt of power consumed. The higher the LPW, the greater the efficiency. **Note: You want the highest number of lumens from the lowest amount of energy consumption.** This is like having a car with great gas mileage!

Let’s look at an example of a **120W** high bay LED fixture from a national brand manufacturer. In the specifications below, you can see that the **LPW** rating is approximately **120 LPW**, which in turn provides **14,528 lumens**. A rating like this is an indication of a quality product:

MODELS PERFORMANCE DATA				
MODEL	LPW	ACTUAL INPUT WATTS	LUMENS	VOLTS
TITAN HB 80	117.9	81.5	9,609	120/277   347/480
TITAN HB 120	<b>120.6</b>	120.5	14,528	120/277   347/480
TITAN HB 160	126.1	159	20,048	120/277   347/480
TITAN HB 240	120.4	240.8	29,002	120/277   347/480
TITAN HB 320	119.2	318	37,912	120/277   347/480
TITAN HB 480	121.9	477	58,139	120/277   347/480



Now, let’s contrast this example with a fixture showing a lower **LPW** rating. In the specifications below, you can see how this fixture requires **150W** to provide comparable light levels (lumens).



## ITEM SPECIFICS

USAGE: <b>INDUSTRIAL</b>	BRAND NAME: <b>SITATONE</b>
FEATURES: <b>SPOT LIGHT</b>	BADY MATERIAL: <b>ALUMINUM</b>
LIGHT SURCE: <b>LED BULBS</b>	WARRANTY: <b>3 YEARS</b>
SWITCH TYPE: <b>KNOB SWITCH</b>	<b>WATTAGE: 150 W</b>
CERTIFICATION: <b>CE, FCC, ROHS</b>	BASE TYPE: <b>WEDGE</b>
IS DIMMABLE: <b>NO</b>	VOLTAGE: <b>85-265V</b>
IS BULBS INCLUDED: <b>YES</b>	POWER SOURCE: <b>AC</b>
MODEL NUMBER: <b>H</b>	LED QTY: <b>154PCS BRIDGELUX 3030 LED</b>
COLOR TEMPERATURE: <b>WARM WHITE (3000-3500K), COLD WHITE (6000-6500K)</b>	<b>LUMINOUS FLUX: 15000LM</b>
WHOLE SIZE: <b>433*350MM</b>	WARRANTY: <b>3 YEARS</b>
PLACE OF ORIGIN: <b>GUANGDONG, CHINA (MAINLAND)</b>	VIEW ANGLE: <b>25/60/90 DEGREE</b>
NET WEIGHT: <b>5KG</b>	POWER FACTOR: <b>&gt;0.9</b>

Here's the math:

**15,000 lumens/150W = 100 LPW.**

In comparison to our first example, this fixture consumes **25% more power** to provide the *same amount of light*.

Now let's see what an extra **25% efficiency** looks like in terms of savings.

Using **QTY=200** of the same fixtures from our examples above, with a (blended) cost of hydro at \$0.14, and the lights operating 24hrs/day, 5/days per week, here's how the savings compare:

### National Brand (120W)

PROJECT SAVINGS = \$59,218 per year

### Offshore from China (150W)

PROJECT SAVINGS = \$53,962 per year

Although the additional annual savings of **\$5,256.00** from the 120W LEDs may not buy you your dream vacation, when it's factored over the warrantied, 10-year life of the fixture, you're suddenly looking at well over **\$52,000** – *and that's without a hydro rate increase*.

Even when only a conservative, **3% per annum** increase is applied to the savings, you'll find they jump to over **\$60,000**. Now you're vacationing in style!

## Fixture Design

The next thing I look at is the overall fixture design and, if possible, the electronic components.

In terms of design, it's important to understand that, unlike conventional light sources that simply produce and emit heat build-up, solid-state LEDs must dissipate heat through the luminaire itself, using heat sinks. Heat is the number one reason for fixture failure in LEDs, and fixture design plays a crucial role in helping to prevent this failure. Design can also have a significant effect on lumen maintenance.

The bottom line is that the efficiency of a poorly designed fixture using even the best LEDs, will be only a fraction of what it could be if the fixture were well-designed.

## 3. Warranty

If a manufacturer is not willing to stand behind its product, with a strong warranty program that's comparable to leading manufacturers, I would see this as a caution flag.

Warranties of up to ten years, and 100,000 to 200,000 hours, are not uncommon for quality, commercial-grade products. Note: Operating hours of 24/7 equal **8,760** hours per year.

## TIP#3

## What payback and ROI you can expect from LED lighting

It's expected that LED fixtures will remain more expensive than conventional lighting on a **first-cost basis** for some time. But higher operating efficiency and longer operating life (reduced maintenance and replacement costs) ensure that LED lighting is already highly competitive on a **total cost of ownership basis**. This would include all expenses incurred over the life of the system.

In certain high usage applications, the payback period can be less than one year with an ROI in excess of 100%. However, for outdoor lighting applications such as parking lots and exterior building fixtures, where the lights are typically on for about 12hours/day, payback periods tend to be significantly longer due to fewer operating hours, and higher installation costs.

So you may be asking, if the ROI is only going to get better as the efficiency of LEDs improves, why not wait?

Here's how I'd address this question, using a project I recently installed as an example. In this project, **400W** metal halides (458W with ballast load) were replaced with **120W LEDs**, with a rating of **120 LPW**. This project ended up generating an annual savings of **\$92,000 per year**, with a **payback time of .95** - or just under one year.

As you can see from this example, the LEDs were paid for after just one year, while years 2 through 10 will see the customer reaping the full savings benefit of **\$92,000 per year**, or **\$828,000** over the nine years.

So, after 10 years of terrific savings, if LEDs do hit their projected efficiency target of **250 LPW by 2025**, it will still be well worth replacing the 120 LPW LEDs at that time with 250 LPW LEDs, to cut energy costs by a **further 55%**.



## TIP#4 How long LEDs realistically last



Unlike other light sources, LEDs don't emit heat as infrared radiation, so the heat must be removed by conduction or convection. Thermal management is arguably the most important aspect of a successful LED system design"

Unlike traditional lighting where the lamp, or bulb, simply burns out, LEDs gradually fade in brightness over time. Because of this, the useful life of LEDs is measured based on the number of operating hours until light emissions reach **70%** of their original output. This rating is referred to as 70% lumen maintenance, or **L70**.

Good quality, white LED lighting products are expected to have a useful life of 50,000 to 100,000 hours, or even longer. By comparison, a typical incandescent lamp lasts about 1,000 hours; a comparable CFL, 8,000 to 10,000 hours; and the best linear fluorescent lamps, more than 30,000 hours.

### **So, what causes LEDs to fail?**

Studies have shown that the power supply, or drivers, are the primary cause of luminaire failure. Drivers, which are similar to the ballast found in fluorescent lighting, provide clean, consistent power to the LED lighting package. The driver is like an electronic engine for your LEDs.

The second most common cause of failure is usually the result of overheating caused by poor luminaire design. Overheating is the primary cause of lumen depreciation. Unlike other light sources, LEDs don't emit heat as infrared radiation, so the heat must be removed by conduction or convection. Thermal management is arguably the most important aspect of a successful LED system design.

As a minimum, you should expect your fixtures to perform for no less than the warrantied period stated by the manufacturer – and they may last much longer.

It's also important to look beyond the manufacturer's warranty, to the product's **"expected service life"**. Some manufacturers limit their warranties to **5 years**, even though they rate their fixtures with an expected service life of over **100,000 hours** - more than **11 years!** Whereas some manufacturers offer a full **10-year warranty**.

## TIP#5

### The reason why LEDs cost more than other types of lighting

Producing LED chips is a highly specialized and expensive process. The cost of LED lighting products varies widely, but good quality products usually entail a significant premium when compared to standard lighting technologies. The good news is that these costs are declining rapidly. And while LED lighting products are initially more expensive than their conventional counterparts, when the costs of energy and maintenance are included in the total cost of ownership (TOC), LED-based products often have a distinct advantage.

You can expect to see further advancements in LED efficiency (LPW) as the Department of Energy's (DOE) long-term goal calls for LED packages to produce 250 lumens per watt, by 2025.



## TIP#6

### How you can be sure your actual savings will match your estimate

The only way to be certain that your projected savings estimates are being realized is to have a licensed electrician conduct meter readings of your lighting circuits before, and after, LED installation. This involves opening up your breaker panel and identifying the individual lighting switches where a voltage meter can read the load going through the circuit.

A reading can be done on as many circuits as you want to monitor, and the measurements can be recorded for comparative review after the new fixtures are installed. This method generally proves to be about 97% accurate.

It's not realistic to use your monthly electrical bill as a guide for this process because the cost of lighting is typically a small percentage of your overall electrical load/cost. There are far too many variables in the day-to-day operation of most businesses that can have an effect on monthly electrical costs. But by isolating the lighting circuits, and recording before/after readings for those circuits, you can feel confident that your savings are being realized.



For more information, or to find out how much your business can really expect to save with LED lighting, contact Greg Jones, Owner of Outdoor Lumination, Toll-Free at 877-LED-3305 (877-533-3305) or at [greg@outdoorlumination.com](mailto:greg@outdoorlumination.com)